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FINAL RECORD OF DECISION FOR LAB AREA NSWC INDIAN HEAD MD
09/01/2011
CH2M HILL

Final

RECORD OF DECISION

for

Lab Area

Naval Support Facility Indian Head
Indian Head, Maryland

September 2011

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Acronyms and Abbreviations

AA	area of attainment
ARAR	applicable or relevant and appropriate requirement
BERA	baseline ecological risk assessment
bgs	below ground surface
CDI	chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CF	cubic feet
COC	constituent of concern
COPC	constituent of potential concern
CSF	carcinogenic slope factor
CSM	conceptual site model
CTE	central tendency exposure
CWAP	comprehensive work approval permit
CY	cubic yard(s)
ELCR	excess lifetime cancer risk
EPA	U.S. Environmental Protection Agency
FFS	Focused Feasibility Study
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
IAS	Initial Assessment Study
IC	institutional control
IEUBK	Integrated Exposure Uptake Biokinetic
IHIRT	Indian Head Installation Restoration Team
IR	Installation Restoration
LOAEL	lowest observed adverse effect level
MDE	Maryland Department of the Environment
mg/kg	milligram(s) per kilogram
Navy	Department of the Navy
NC	nitrocellulose
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEESA	Navy Environmental Enforcement and Support Activities
NG	nitroglycerin
NOAEL	no observed adverse effects level
NPL	National Priorities List

NQ	nitroguanadine
NSF-IH	Naval Support Facility, Indian Head
O&M	operation and maintenance
OWAP	Old Waste Acid Disposal Pit
PA	preliminary assessment
PCE	tetrachloroethene
PETN	pentaerythritol tetranitrate
PRG	preliminary remediation goal
RAO	remedial action objective
RBC	risk-based concentration
RfD	reference dose
RI	Remedial Investigation
RME	reasonable maximum exposure
ROD	Record of Decision
SERA	screening-level ecological risk assessment
SF	square feet
SI	Site Inspection
SRG	site remediation goal
SVOC	semivolatile organic compound
TAL	target analyte list
TCE	trichloroethene
TCL	target compound list
UCL	upper confidence limit
VOC	volatile organic compound

SECTION 1

Declaration

1.1 Site Name and Location

The Lab Area
Naval Support Facility Indian Head
Indian Head, Maryland
Comprehensive Environmental Response, Compensation, and Liability Act Information System ID No. MD 170024684

1.2 Statement of Basis and Purpose

This Record of Decision (ROD) presents the Selected Remedy for the Lab Area at the Naval Support Facility Indian Head (NSF-IH) in Indian Head, Maryland. The Lab Area consists of Sites 14, 15, 16, 49, 50, 53, 54, and 55; other buildings (Buildings 303, 304, 555, and 596); and the Wetland Area. For the purpose of this ROD, the site is divided into two areas: Upland Area and Wetland Area. The Upland Area consists of the buildings and roads at the site, and the Wetland Area consists of a wetland in a low-lying area to the southeast of the site. The location of NSF-IH and the Lab Area are shown in Figure 1-1. The Selected Remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act, and, to the extent practical, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP; 40 Code of Federal Regulations [CFR] Part 300). This decision is based on information contained in the Administrative Record file for NSF-IH.

The response action presented in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment. The Department of the Navy (Navy) and the U.S. Environmental Protection Agency (EPA) jointly selected the remedy, and the Maryland Department of the Environment (MDE) concurs with the Selected Remedy.

1.3 Description of the Selected Remedy

The Selected Remedy is excavation, offsite disposal, and site restoration for surface soil at Sites 15, 16, 50, 53, 54, and 55; and other buildings (Buildings 303, 304, 555, and 596); excavation, offsite disposal, and site restoration for the wetland sediment; and institutional controls (ICs) for the subsurface soil (including sewer pipes) at Sites 15, 16, 50, 53, 54, and 55; and other buildings (Buildings 303, 304, 555, and 596). Based on the human health risk assessment (HHRA) (CH2M HILL, 2004), and screening-level ecological risk assessment (SERA) (CH2M HILL, 2004), no constituents of concern (COCs) were identified for surface water; therefore, no remedial action is warranted for surface water. Shallow groundwater was not encountered at the site during the Remedial Investigation (RI); therefore, it was not identified as a pathway for transport or exposure. As a result, a remedial action is not

warranted for groundwater. No further action is recommended for Sites 14 and 49 because of past removal actions performed at these sites.

The components of this remedy include the following:

- Excavate the Upland Area surface soil and Wetland Area sediment to a depth of 1 foot below ground surface (bgs)
- Conduct lateral post-excavation confirmatory sampling
- Backfill the excavated areas in the Upland Area with a 6-inch layer of clean fill and a 6-inch layer of topsoil, followed by proper compaction and reseeding
- Restore the Wetland Area with native wetland species
- Improve and maintain best practices in surface water runoff management in the Upland Area
- Transport and dispose the excavated material to an offsite permitted facility
- Implement ICs on the subsurface soil over the entire site because of the poor integrity of the sewer pipes, which may contain mercury
- Conduct 5-year reviews

1.4 Statutory Determinations

The Selected Remedy is protective of human health and the environment, complies with federal and state applicable or relevant and appropriate requirements (ARARs), is cost-effective, technically and administratively implementable, and implements permanent solutions and alternative treatment technologies to the maximum extent practicable. The Selected Remedy does not satisfy the statutory preference for treatment as a principal element of the remedy for the following reasons:

- The *in situ* treatment was considered not feasible because it would result in the loss of the wetland and a change in the land use that would be incompatible with the NSF-IH mission on a short-term basis.
- The onsite *ex situ* treatment was technically feasible, but the volume of waste to be treated would be too small to be treated cost-effectively.

Although this remedy does not meet the statutory preference for treatment, it is expected to adequately meet the remedial action objectives (RAOs) for the Lab Area. Implementation of the Selected Remedy will result in hazardous substances, pollutants, or contaminants remaining onsite above levels that allow for unlimited use and unrestricted exposure. Therefore, a statutory review will be conducted within 5 years after initiation of the remedial action and every 5 years thereafter to ensure that the remedy is protective of human health and the environment.

1.5 ROD Data Certification Checklist

The following information is presented in Section 2, the Decision Summary section of this ROD. Additional information can be found in the Administrative Record file for the Lab Area:

- COCs requiring remediation and their respective concentrations (Section 2.5)
- Baseline risk represented by all COCs (Sections 2.7.1 and 2.7.2)
- Cleanup levels established for constituents requiring remediation and the basis for these levels (Section 2.8)
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD (Section 2.6)
- Potential land- and groundwater-use that will be available at the site as a result of the Selected Remedy (Section 2.12.4)
- Estimated capital, annual operation and maintenance (O&M), and total present-worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section 2.12.3)
- Key factor(s) that led to the selection of the remedy (Section 2.10)
- Principal threat waste (Section 2.11)

1.6 Authorizing Signatures

Peter R. Nette

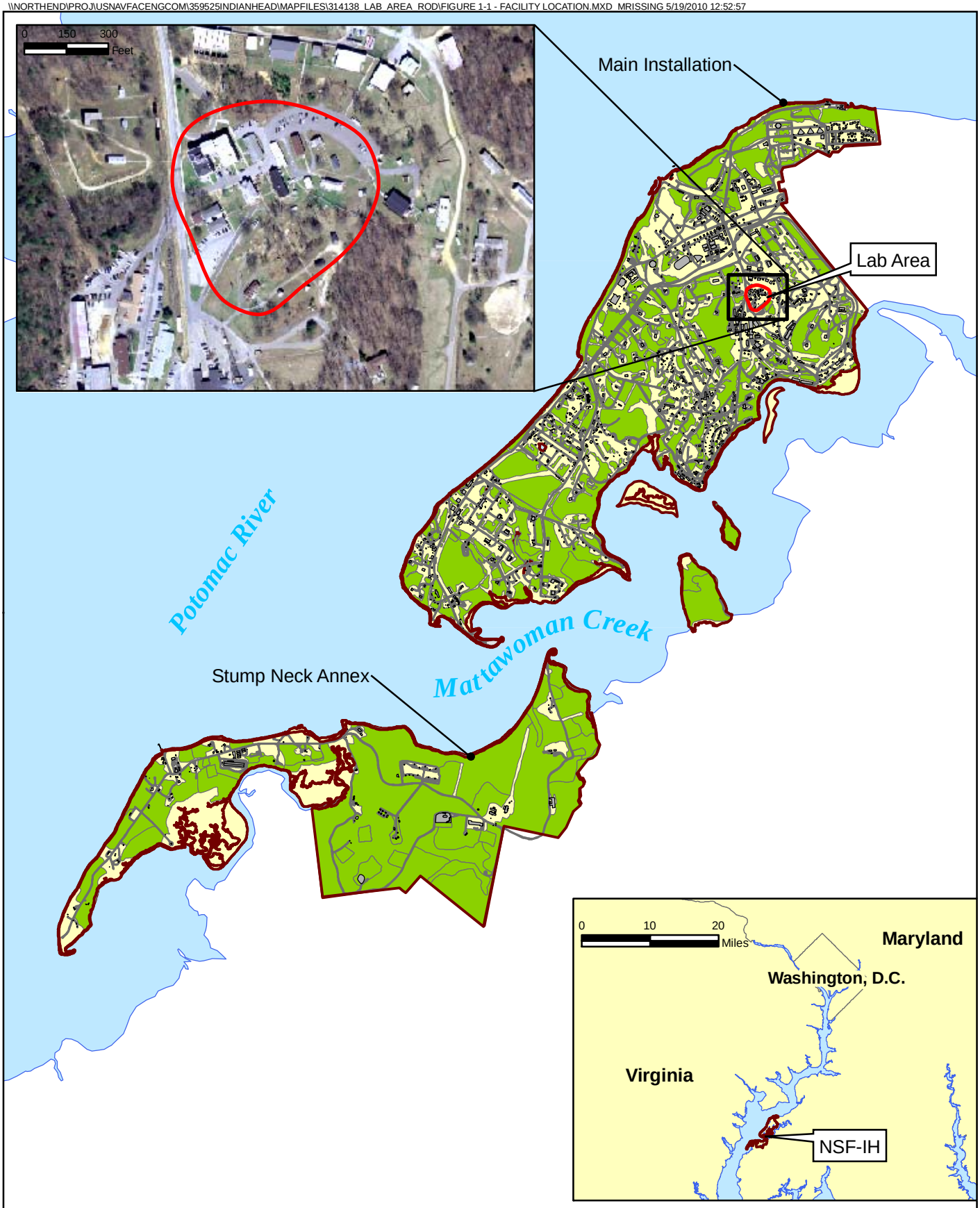
P. R. NETTE
Captain, U.S. Navy
Commanding Officer
NSA South Potomac

27 SEPT 2011
Date

K Hodge Sim for

Ronald J. Borsellino, Director
Hazardous Site Cleanup Division
U.S. EPA - Region III

9/30/2011
Date



Legend
- Approximate Lab Area Site Boundary
- Buildings
- Roads and Paved Areas
- Wooded Area
- Water Bodies
- NSF-IH Base Boundary

N

0 2,000 4,000
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Figure 1-1
Facility and Site Location
Lab Area Record of Decision
NSF-IH, Indian Head, Maryland

CH2MHILL

SECTION 2

Decision Summary

This ROD presents the Navy's and EPA's Selected Remedy for the Lab Area at NSF-IH. MDE concurs with the Selected Remedy.

2.1 Site Name, Location, and Description

NSF-IH is in northwestern Charles County, Maryland, approximately 25 miles southwest of Washington, DC. NSF-IH is a Navy facility consisting of the Main Installation on the Cornwallis Neck Peninsula and the Stump Neck Annex on the Stump Neck Peninsula. The Main Installation contains approximately 2,500 acres and is bounded by the Potomac River to the northwest, west, and south; Mattawoman Creek to the south and east; and the town of Indian Head to the northeast. Included as part of the Main Installation are Marsh Island and Thoroughfare Island, which are in Mattawoman Creek. The Lab Area is located on the Main Installation (Figure 1-1). Most of the area contains maintained grassy areas and trees, mostly oaks. The areas around the buildings consist of paved roads, parking areas, and lawn. The buildings are generally clustered near the top of a gradual hill that slopes downward towards the southeast and south. The approximate boundary of the Lab Area, the various sites it contains, and the site layout, including the network of the sewer lines and manholes, are shown in Figure 2-1.

The Navy is the lead agency for site activities and provides funding for site cleanups at NSF-IH.

2.2 Site History, Previous Investigations, and Enforcement Activities

2.2.1 Site History

The Lab Area covers approximately 14 acres and consists of Sites 14, 15, 16, 49, 50, 53, 54, and 55; other buildings (Buildings 303, 304, 555, and 596); and the Wetland Area. Because of similar historical usage, proximity, the sharing of sewer utilities, and overlapping field investigations, the area encompassing these sites is referred to as the "Lab Area." Detailed histories of the Lab Area sites are presented in the Preliminary Assessment (PA) report (Navy Environmental Enforcement and Support Activities [NEESA], 1992), Phase II report (Ensafe/Allen & Hoshall, 1994), and/or the RI report (CH2M HILL, 2004). A summary of each site, taken from one or more of the three reports, is provided below.

Site 14 – Old Waste Acid Disposal Pit

Site 14, the Old Waste Acid Disposal Pit (OWAP), was not included as part of the Lab Area RI; however, the OWAP was thought to be located close to the Lab Area, specifically, close to the Chemical Disposal Pit (Site 49). The Initial Assessment Study (IAS) ((NEESA, 1983) and the PA (NEESA, 1992) both state that the OWAP was removed and filled in with concrete in 1975; however, the location of the OWAP was not identified.

Since the IAS and PA were completed, further research by NSF-IH personnel (as well as the Lab Area RI field investigation) suggested that the Chemical Disposal Pit might have been built on top of the OWAP location. Specifically, an interview with a retired Lab Area worker of 40 years (Baroody, 2001) revealed that after digging out the OWAP and filling it with concrete in the mid 1970s, the Chemical Disposal Pit was installed on top of the abandoned OWAP.

Site 15 – Mercury Deposits in Manhole, Fluorine Lab

Site 15 is the location of the Surveillance/ Sample Control Building (Building 103) and the Fluorine Laboratory (Building 502), which were constructed in 1902 and 1942, respectively. Building 103 contained facilities to analyze raw materials and manufactured propellants for surveillance tests. Laboratory equipment containing mercury was reportedly used at various times throughout the history of Building 103. The equipment included nitrometers, pycnometers, talianis, and thermometers. Liquid wastes from this facility consisted of water, acetone, and alcohol used to wash laboratory glassware.

Building 502 housed a laboratory to develop, provide, and analyze bench-scale quantities of experimental chemicals and fuels. The extensive variety of products and processes developed in Building 502 required a large amount of equipment, such as water aspirators and condensers of different size and capacities, as well as jacketed reactors and vessels of up to 50 gallons in capacity.

The wastewater from Buildings 103 and 502 was discharged through underground pipes and combined in a storm drain manhole approximately 100 feet from Building 502. From this manhole, the wastewater flowed in a southeasterly direction, eventually emptying into Mattawoman Creek. This manhole received wastewater discharge 4 days per week between 1942 and the late 1980s. Contaminants known to be in the wastewater included mercury, lead, total suspended solids, and oil/grease. In 1969, 10 pounds of mercury were recovered from this manhole (NEESA, 1992). Average combined wastewater discharges from Buildings 103 and 502 into the manhole were estimated to be 1,150 gallons per day, or 4,600 gallons per week over the more than 40-year period of operation (NEESA, 1992).

Site 16 – Laboratory Chemical Disposal System

Site 16 consists of the sewers draining the Research and Development Building (Building 600). Building 600 housed the chemical research laboratories and division offices. Reportedly, waste chemicals were disposed of into the plumbing system, where they combined with sanitary sewage and flowed to the sewage treatment plant.

Approximately 80 chemical compounds were generated or procured by this facility on an annual basis. Chemicals used in annual quantities exceeding 10 gallons included acids, amines, cyanide compounds, and both chlorinated and non-chlorinated solvents. Other materials used in Building 600 in smaller quantities included alkalis, alcohols, aldehydes, metals and metal compounds (zinc, iron, cadmium, lead, and mercury), and asbestos. Analysis of the wastewater from Building 600 showed detections of amines, metals (cadmium, lead, zinc, copper, mercury, and silver), cyanides, nitrate esters, trichloroethylene, and methylene chloride.

Site 49 – Chemical Disposal Pit

The Chemical Disposal Pit is designated as Site 49. The site consists of a circular concrete pit, approximately 2.5 feet in diameter and 3 feet deep, northwest of Building 444. The pit was designed to dispose of laboratory containers without exposing personnel to the contents. To dispose of laboratory waste in laboratory containers, the containers were placed on a steel grate in the pit. A metal plate was dropped on the containers. The fragments of shattered glass were caught in a wire basket below the steel grate, and the contents of the containers collected in the bottom of the pit and drained from the pit via a drain line to the sanitary sewer system. Reportedly, the pit received limited use until the early 1970s, when the container-crushing hardware was removed. The concrete pit was still structurally sound with no visible fractures before its removal in May 2001. Note that this Chemical Disposal Pit (Site 49) is different from the OWAP, Site 14 (NEESA, 1983; NEESA, 1992). The OWAP was approximately 15 feet to 20 feet deep with rocks placed on the bottom, and was reportedly filled with concrete in 1975 (NEESA, 1992).

According to the PA (NEESA, 1992), a drain line exited on the south side of the pit and connected the pit to the sanitary sewer Manhole 473, as shown on a Bureau of Yards and Docks drawing (Drawing Number 670,579) in that report; however, during a 1996 visual inspection of Site 49, another drain line entering the pit from the north was discovered. This line was thought to connect to sanitary sewer Manhole 472, as shown on a Bureau of Yards and Docks drawing (Drawing Number 15,699, 1964), which NEESA reviewed during the 1992 PA.

Site 50 – Building 103 Crawl Space

Site 50 is the crawl space beneath Building 103, which is a small one-story building with a concrete block foundation, built circa 1902. Laboratory equipment containing mercury (nitrometers, pycnometers, talianis, and thermometers) was reportedly used in Building 103 at various times. Spent mercury handling procedures at Building 103 and other buildings in the laboratory area that used mercury consisted of pouring spent mercury into “slop jars” and running tap water into the jar over a sink to remove sulfuric acid from the mercury. Spills often occurred while transferring the spent mercury from nitrometers, and the slop jars often broke. In addition, mercury was inadvertently washed out of the jars.

In 1988, while replacing two sinks in Building 103, workers discovered that the sinks were connected to a single drain line, which discharged directly to the soil beneath the building rather than to the storm or sanitary sewer system. After the discovery, a 4-inch-diameter polyvinyl chloride pipe was installed from the sink drain line to Manhole A, which is west of Building 102. The quantity of solvents and mercury discharged to the soil from 1902 to 1985 is unknown.

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

the crawl space. The topography at the northern end of the building is relatively flat, and the ground slopes to the south at the southern end of the building.

Site 53 – Mercury Contamination of the Sewage System

Site 53 consists of the sewer lines serving the laboratory research buildings in the Lab Area.

The sewage system contains both the storm sewer lines and the sanitary sewer lines from several buildings. Between the early 1900s and the late 1960s, all sewage generated in the buildings was piped directly to Mattawoman Creek. Since the late 1960s, separate sanitary and storm sewer systems have served the Lab Area. As these upgrades to the sewer system were made, it is possible that some lines were abandoned in place and are not marked on any plot plans or maps. The sanitary sewage from the Lab Area was sent to the Sewage Treatment Plant No. 2 beginning in the early 1970s, when it was constructed, until the early to mid 1980s. From the mid 1980s to the early 1990s, the sanitary sewage was rerouted to the upgraded Sewage Treatment Plant No. 1, and Sewage Treatment Plant No. 2 was closed. In the early 1990s, Buildings 103 and 502 were connected to the Industrial Wastewater Treatment Phase I System, which is designed to collect operations wastewater for analysis before discharge to Sewage Treatment Plant No. 1.

Laboratory workers reported that approximately a liter of mercury was lost per month down the sinks from Building 102. Over the 77-year period (1909—1986), Building 102 laboratory operated without mercury traps on the sinks (NEESA, 1992). Additional quantities of mercury may have been disposed down the drain lines as the result of similar mercury handling and disposal practices at the other laboratory buildings within the Lab Area.

Site 54 – Building 101

Building 101 is a two-story brick building where mercury compounds were used in research and development. As noted in the PA report, in the mid-1980s an NSF-IH employee in Building 101 detected mercury droplets and an organic solvent odor in the basement office when solvents were discharged through the pipe system, suggesting a potential leaky drainage pipe. In January 1990, several droplets of mercury were discovered on the insulation of a steam pipe in the southeast corner room of the first floor in Building 101.

When Base Safety Office personnel began removing the drop ceiling tiles, mercury vapors were detected in the breathing zone, but no visible signs of mercury on the ceiling tile tracks were observed. A 1918 blueprint showed four nitrometers in the room above where the mercury droplets were discovered. It was reported that the nitrometer bulbs would sometimes explode under pressure during sensitivity testing.

Site 55 – Building 102

Building 102 is located in the center of the Lab Area and was constructed in 1909. It was used as a laboratory for testing nitrocellulose by the nitrometer method. Other mercury-containing equipment, including pycnometers, talianis, vacuum stability testers , and thermometers, was used to evaluate the densities and sensitivity of propellants throughout the 80 years of laboratory operations in Building 102. On October 6, 1987, metallic mercury was discovered dripping from the ceiling onto the sink table top of the coffee mess, in the

northern end of the basement of Building 102. The source of the mercury was believed to be the equipment on the first floor (NEESA, 1992).

Building 102 was abandoned in February 1989, and the water supply to Building 102 was terminated to help alleviate the high mercury levels found in the sanitary sewage sludge (NEESA, 1992). According to employee interviews, a major spill occurred upstairs in Building 102 in the early 1960s.

Other Buildings (Buildings 303, 304, 555, and 596)

Most of the structures in the Lab Area have been used as laboratories or for chemical storage at some time during their history. The accounts of various personnel currently or formerly employed in the laboratories have indicated that historical practices, such as disposing of unusable chemicals directly on the ground surface outside laboratory doors, may have led to surface soil contamination in the Lab Area.

Wetland Area

The Wetland Area is a small emergent wetland (less than 0.5 acre) containing cattails, rushes, and several trees. The shape and size of the wetted area associated with the wetland changes depending on precipitation (and the subsequent saturation of the soil), condensate from nearby aboveground steam pipes, and leaking freshwater pipes that lie beneath this area. Groundwater is more than 40 feet bgs throughout the site (Ensafe/Allen & Hoshall, 1994) so it does not discharge to the wetland. Overflow from the wetland area drains into the storm drain system, which discharges to Mattawoman Creek near Site 41.

2.2.2 Previous Investigations

Preliminary Assessment

The PA report (NEESA, 1992) evaluated 17 sites (Sites 39 to 55) to identify contamination resulting from past activities. This report is an addendum to the IAS (NEESA, 1983) completed for other sites. Except for Sites 51 and 52, all sites were recommended for further study.

Phase II Site Inspection

In 1994, a Site Inspection (SI) was conducted in two phases as a followup to the PA at Sites 39 through 50, 53, 54, and 55 (Ensafe/Allen & Hoshall, 1994). Based on the results of the SI, all the sites were recommended for further study. Site 15 (Building 103 and 502) and Site 16 (Building 600 sewers) were not independently investigated, although they are encompassed by Site 53.

Remedial Investigation

The objectives of the RI were to: (1) characterize the nature, extent, and concentrations of site-related contaminants in surface soil, subsurface soil, manhole and wetland sediments, and surface water; and evaluate the rate of migration of site-related contaminants in the environment; (2) remove the Chemical Disposal Pit at Site 49 to facilitate sampling at Site 14; and (3) identify actual or potential human or ecological receptors and potential contaminant migration pathways (CH2M HILL, 2004).

Field activities included surface soil sampling, subsurface soil sampling, (including near sewer pipes), sewer sediment sampling, and wetlands surface water and sediment

sampling. Figure 2-2 shows the surface soil, wetlands sediment, subsurface soil, and sewer sediment sampling locations. In addition, the Chemical Disposal Pit was removed. In most instances where analytical samples were collected, a full suite of analyses was performed, comprising target compound list (TCL) volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs); target analyte list (TAL) inorganics (i.e., metals and cyanide); and explosives (which included nitroglycerin [NG], nitroguanadine [NQ], pentaerythritol tetranitrate [PETN], and perchlorate, in addition to the list of analytes included in EPA SW-846 Method 8330). It is noted in Section 2.5.3, *Nature and Extent of Contamination*, if any of the analyses differed from those listed above.

As part of the RI, an HHRA and SERA were conducted. The results of the HHRA and SERA are presented in the "Summary of Site Risks" section.

Baseline Ecological Risk Assessment

A baseline ecological risk assessment (BERA) was completed for the Upland Area (CH2M HILL, 2006a). High contaminant levels encountered in the Wetland Area precluded the need for a BERA. The objective of the BERA was to confirm the potential risks posed by the constituents of potential concern (COPCs), as defined in the Step 3A evaluation in the SERA. The area of focus was the surface soil around Buildings 102, 103, 304, 444, 502, 555, and 600. In support of the BERA, surface soil (0 to 6 inches bgs) samples were collected and analyzed for TAL metals, methylmercury, and SVOCs. To evaluate direct toxicity to soil invertebrates, laboratory toxicity tests with the earthworm *E. foetida* were conducted on split samples from the soil sampling locations. The results of the BERA are presented in the "Summary of Site Risks" section.

Focused Feasibility Study

A focused Feasibility Study (FFS) was completed to address potential sources of contamination at the Lab Area and to evaluate remedial alternatives for mitigating potential hazards associated with the soil and sediment (CH2M HILL, 2009). The alternatives evaluated were No Action; Institutional Controls; and Excavation of Upland Area Surface Soil and Wetland Area Sediment, Offsite Disposal, Site Restoration, and ICs.

As part of the FFS, a wetland delineation was conducted in April 2006 (CH2M HILL, 2006b). The objective was to refine the boundary of the Wetland Area, which was based on visual observation of wet conditions during the RI. Figure 2-2 shows the boundary, which was drawn based on the three criteria used to delineate wetlands - vegetation, hydrology, and hydric soils.

Proposed Plan

A Proposed Plan was completed to present the remedial alternatives evaluated and recommended for addressing contaminated surface soil, subsurface soil, and sediment at the Lab Area. The recommended alternative is excavation, offsite disposal, and site restoration for surface soil at Sites 15, 16, 50, 53, 54, and 55; and other buildings (Buildings 303, 304, 555, and 596); excavation, offsite disposal, and site restoration for the wetland sediment; and ICs for the subsurface soil (including sewer pipes) at Sites 15, 16, 50, 53, 54, and 55; and other buildings (Buildings 303, 304, 555, and 596). No action is warranted for Sites 14 and 49, surface water, or groundwater.

2.2.3 Enforcement Activities

In September 1995, the NSF-IH facility, including the Lab Area, was placed on the National Priorities List (NPL), but to date, no enforcement actions have occurred at the site. The Federal Facility Agreement provides for CERCLA-directed enforcement activities at the Lab Area. As a result, an RI, FS, and Proposed Plan have been completed for the Lab Area.

2.3 Community Participation

The NSF-IH Restoration Advisory Board is made up of representatives from the community, EPA, MDE, and the Navy. Meetings are held two times a year to provide a forum for exchanging information among all parties regarding Installation Restoration (IR) activities.

In accordance with the requirements established in Sections 113 and 117(a) of CERCLA and the NCP at 40 CFR §300.430(f)(2), the RI report (CH2M HILL, 2004), FFS report (CH2M HILL, 2009), and Proposed Plan (CH2M HILL, 2010) were made available to the public in May 2004, October 2008, and April, 2010, respectively. These documents, which are included in the Administrative Record file, can be found in the Information Repositories maintained at the following locations:

Indian Head Town Hall	Charles County Public Library	NSF-IH General Library
4195 Indian Head Hwy.	2 Garrett Ave.	Building 620 (The Crossroads)
Indian Head, MD 20640	La Plata, MD 20646-5959	Indian Head, MD 20640

The notice of the availability of the Proposed Plan was published in the *Maryland Independent* on April 9, 2010. A public comment period was held from April 12, 2010 to May 12, 2010. A public meeting was held on April 15, 2010, to present the Proposed Plan to a broader community audience.

At this meeting, representatives from the Navy, EPA, and MDE answered questions about the site and the remedial alternative. No written comments were received during the public comment period.

2.4 Scope and Role of Response Action

The Lab Area is included in the NSF-IH IR Program. The human health and ecological risk assessments performed during the RI and BERA for the Lab Area identified unacceptable risks for human exposure in the surface soil, subsurface soil, and wetlands sediment, and unacceptable risks for ecological exposure in the wetlands sediment. Based on these risk assessments (CH2M HILL, 2004), no COCs were identified for surface water, so no remedial action is warranted for surface water. Shallow groundwater was not encountered through borings advanced to a maximum depth of 40 feet bgs at the site, so it was not identified as a pathway for transport or exposure. This response action addresses these risks using excavation, offsite disposal, and site restoration of Upland Area surface soil and Wetland Area sediment, and ICs for the subsurface soil (including sewer pipes).

2.5 Site Characteristics

Characteristics of the site, the nature and extent of contamination, and the human health and ecological risk assessments are presented in greater detail in the RI report (CH2M HILL, 2004) and in the FFS report (CH2M HILL, 2009), and are summarized in the following sections.

2.5.1 Geology and Hydrogeology

The shallow geology at the Lab Area consists of fine- to medium-grained silty sand from ground surface to a depth of approximately 4 feet bgs. Below this depth, a dense clay layer is encountered. The lower limit of this clay layer was not encountered in borings advanced to depths of up to 16 feet bgs during the RI. However, previous investigations detailed that the clay layer extends from 4 to 40 feet bgs, below which a medium- to fine-grained, reddish to white quartz sand, moderately cemented with a very hard marker bed was encountered (Ensafe/Allen & Hoshall, 1994). Groundwater was not encountered at the site during advancement of boreholes. Because groundwater is more than 40 feet bgs at the site, it does not discharge to the wetland. Overflow from the wetland area drains into the storm drain systems, which discharge to Mattawoman Creek near Site 41.

2.5.2 Conceptual Site Model

The conceptual site model (CSM) integrates information regarding the physical characteristics of the site, potentially exposed populations, sources of contamination, and contaminant mobility (fate and transport) to identify exposure routes and receptors evaluated in the risk assessment. A well-defined CSM allows for a better understanding of the risks at a site and aids in evaluating the potential need for remediation. The potential for the materials disposed of at the site to leach into the soil is the source of contamination for the site.

Human Health Receptors

Figure 2-3 presents the CSM for human receptors at the Lab Area. The Lab Area is located in the restricted area of NSF-IH. The buildings within the Lab Area are currently unoccupied or are used as offices and laboratories. Because of its location, the future use of the site is anticipated to remain industrial.

The media currently accessible at the site are subsurface soil and sewer sediment for the Underground Sewer Lines, and surface soil, surface water, and sediment for the Upland Area and Wetland Area.

Ecological Receptors

Figure 2-4 presents the CSM for ecological receptors at the Lab Area. The topsoil over the Upland and Wetland Areas is relatively shallow, with an organically rich layer, varying from 4 to 10 inches, overlying a clay layer. Therefore, the mostly likely exposure pathway for ecological receptors is limited to the topsoil layer. The current and future potential ecological receptors at the site are:

- Terrestrial species (plants, soil invertebrates, and wildlife): via direct contact with the soil or consumption of organisms or plants that have direct contact with the soil and could accumulate chemicals in their tissues (e.g., carnivorous wildlife)

- Semi-aquatic and wetland species (raccoons, frogs, and benthic invertebrates): via feeding in upland and wetland areas or direct contact with the sediment

2.5.3 Nature and Extent of Contamination

The summary of the nature and extent of contamination at the Lab Area described below is described in detail in Section 6.4 of the RI report (CH2M HILL, 2004).

Upland Area - Surface Soil

The extent of contamination in surface soil was based on the samples collected during the RI. A total of 84 surface soil samples, including samples taken from areas considered to be uncontaminated (background samples), were collected and analyzed for metals and for the following explosives: PETN, NG, NC, and NQ. Nineteen samples were further analyzed for TCL VOCs and TCL SVOCs.

Tetrachloroethene (PCE) was the only VOC detected and was observed in four surface soil samples at low concentrations. SVOCs— most commonly benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, butylbenzylphthalate, chrysene, di-n-butylphthalate, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene—were detected in 18 of the 19 surface soil samples. The concentrations of these compounds exceeded the basewide 95 percent upper confidence limits (UCLs); however, the distribution did not show a distinct spatial pattern.

Four explosive compounds were detected in the surface soil samples: 2,4-dinitrotoluene, 2-amino-4,6-dinitrotoluene, octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine , and NC. The concentrations of one or more of these compounds exceeded the facility-wide background 95 percent UCLs.

Twenty-four inorganic analytes were detected, all of which were above facility-wide background 95 percent UCLs in one or more surface soil samples. The metals with the highest detection frequencies were arsenic, lead, and mercury. Figure 2-5 shows the concentrations of mercury in the surface soil, sediment, and dry sediment samples throughout the Lab Area. Figure 2-6 shows concentrations of lead in the surface soil and dry sediment.

Upland Area - Subsurface Soil

A total of 28 subsurface soil samples were collected during the RI and analyzed for TAL inorganics. Ten of the 28 samples were further analyzed for TCL VOCs, TCL SVOCs, and explosives.

Low concentrations of three VOCs (i.e., cumene, PCE, and trichloroethene [TCE]) were observed in two subsurface soil samples. PCE was detected beneath the Chemical Disposal Pit in the confirmatory soil sample, but not in any other subsurface soil or sediment sample associated with the Chemical Disposal Pit. This suggests that VOC contamination was localized directly beneath the pit. Overall, the low concentrations of VOCs in the subsurface soil and sewer sediment (discussed in the following section) suggest that leaky sewers or manholes have caused minimal VOC contamination.

Five SVOCs (butylbenzylphthalate, di-n-butylphthalate, diethylphthalate, pyrene, and bis(2-ethylhexyl)phthalate) were detected in 9 of the 10 subsurface soil samples. These detections were estimated (J-qualified) and considered low.

Two explosives compounds (NC and 4-nitrotoluene) were detected in the subsurface soil samples. A high concentration of NC was detected in the Chemical Disposal Pit confirmatory subsurface soil sample and two sewer sediment samples from Manholes 471 and 466. However, no explosives were detected in the subsurface soil around Manhole 466. The absence or low detection of explosives in the subsurface soil samples outside the manholes suggests that leaky sewers or manholes have minimal contribution to the subsurface soil contamination.

Twenty-two inorganic analytes were detected in the subsurface soil samples collected. Arsenic, calcium, copper, iron, lead, mercury, potassium, sodium, vanadium, and zinc were all detected above facility-wide background 95 percent UCLs in one or more subsurface soil samples. The metals with the highest detection frequencies were arsenic, lead, and mercury.

Upland Area - Sewer Sediment

Sewer sediment sampling activities consisted of collecting a total of eight sediment samples from the sewer lines and analyzing them for TCL VOCs and TCL SVOCs. VOC detections in the sewer sediment were limited to low-level detections of PCE, which were observed in two sewer sediment samples near Manholes A and 466. Overall, the low concentrations of VOCs in the subsurface soil and sewer sediment suggest that leaky sewers or manholes have caused minimal VOC contamination.

The highest concentration of SVOCs was observed in the samples from Manholes 466 and C. SVOCs detected in the subsurface soil and sewer sediment at the site and in its vicinity may be site-related, considering the absence of SVOCs in the subsurface background samples, the lack of sewer sediment background data, and the presence of various SVOCs both inside and outside of various manholes.

Two explosives compounds (NC and 4-nitrotoluene) were detected in the sewer sediment samples from Manholes 466 and 471. It is notable that various explosives were detected in Manhole B during the SI; however, none were detected during the RI. No correlation between subsurface soil and sewer sediment data for explosives could be ascertained. Therefore, the explosives subsurface soil and sewer sediment data did not suggest the presence of significant explosives contamination in the Lab Area resulting from leaky sewers or manholes.

Twenty-four inorganic analytes were detected in the sewer samples collected. The metals with the highest detection frequencies were arsenic, lead, and mercury. Figure 2-7 shows the concentrations of mercury in the subsurface soil and sewer sediment.

Wetland Area – Surface Water

One surface water sample was collected from a channel that developed in the wetland, within the boundary of the Lab Area. The surface water sample was analyzed for TCL SVOCs, TAL inorganics, explosives (PETN, NG, NC, and NQ), perchlorate, and hardness. No SVOCs or explosives were detected in the sample. Eighteen inorganic analytes were detected in the sample at relatively low concentrations.

Wetland Area - Sediment

Six sediment samples were proposed for collection. During the field event, four of the six samples were characterized as surface soil because they were dry during sampling. The two sediment samples collected were analyzed for TAL inorganics and explosives (including ammonium perchlorate). One sample was further analyzed for TCL SVOCs. Neither sample was analyzed for VOCs. Twenty inorganic analytes were detected. Of these, nine analytes (arsenic, cadmium, cobalt, lead, mercury, silver, sodium, vanadium, and zinc) were detected at concentrations above base-wide background 95 percent UCLs. Similar to the subsurface soil samples, the metals with the highest detection frequencies in sediment were arsenic, lead, and mercury. No explosives were detected in either of the two samples. The only SVOC detected was di-n-butylphthalate, which was found at a low concentration. Figure 2-8 shows the arsenic concentrations in the wetland sediment.

Confirmatory Soil Sampling for Chemical Disposal Pit Removal

Following the removal of the Chemical Disposal Pit (Site 49), three confirmatory soil samples were collected. Two of these were surface soil samples from outside of the excavation footprint and the third was a subsurface soil sample from the base of the excavation footprint. All three samples were analyzed for TCL VOCs, SVOCs, explosives, and TAL inorganics.

In the surface soil, all VOC and SVOC detections were low. The detection of explosives was limited to NC, which was found at a high concentration. Ten metals (arsenic, calcium, chromium, cobalt, copper, magnesium, mercury, nickel, potassium, and zinc) were all detected above their respective base-wide background 95 percent UCLs.

In the subsurface soil, the VOC detections were limited to cumene, PCE, and TCE, all of which were at low concentrations. Three SVOCs [diethylphthalate, pyrene, and bis(2-ethylhexyl)phthalate] were detected at low concentrations. Metal detections above the base-wide background 95 percent UCLs were limited to arsenic, calcium, copper, lead, and mercury.

The confirmatory soil sampling data from Site 49 were combined with the data collected from other sites within the Lab Area. These combined data were used in the HHRA and SERA that were performed as part of the RI. The results are presented in Section 2.7.

2.6 Current and Potential Future Land and Resource Uses

The Lab Area is located in the restricted area of NSF-IH. The buildings within the Lab Area are currently unoccupied or are used as offices and laboratories. Because of its location, the future use of the site is anticipated to remain industrial. It is unlikely that the Lab Area would be developed for residential use. However, hypothetical future residential use of the site was evaluated in the risk assessment to assess whether land use restrictions would be necessary at the site. Shallow groundwater was not encountered through borings advanced to a maximum depth of 40 feet bgs at the site; therefore, it is not believed to be affected by past activities at the site.

2.7 Summary of Site Risks

A detailed discussion of risks at the Lab Area and the risk evaluation process is presented in the RI report (CH2M HILL, 2004), BERA report (CH2M HILL, 2006a), and FFS report (CH2M HILL, 2009).

2.7.1 Human Health Risk Assessment

As noted earlier, a baseline HHRA was performed as part of the RI for surface soil, subsurface soil, sewer sediment, wetland area sediment, and wetland area surface water at the Lab Area to evaluate the current and future effects of constituents in site media on human health. A detailed discussion of the HHRA is provided in Section 5 in the RI report and Sections 2.3.2 and 2.3.3 in the FFS report. Tables 5-7 through 5-18 of the RI report summarize the calculated risks.

Exposure to groundwater was not evaluated during the HHRA because it was not encountered at the site and, therefore, was not identified as a pathway for transport or exposure. The HHRA evaluated the Lab Area using the following groupings of sites:

- Upland Area subsurface soil and sewer sediment (referred to as "Underground Sewer Lines" in the HHRA)
- Upland Area surface soil and Wetland Area sediment and surface water

The receptors evaluated for the Underground Sewer Lines group were as follows:

- For current uses – sewer maintenance workers
- For future uses - adult and adolescent trespasser/visitor, adult and child resident, industrial worker, and construction worker

The receptors evaluated for the Upland Area surface soil and Wetland Area group were as follows:

- For current uses - adult and adolescent trespasser, recreational adult and child, and industrial worker
- For future uses - adult and child resident, and construction worker

As noted in Section 2.6, the site is located in the restricted area of NSF-IH. The buildings within the Lab Area are currently unoccupied or are used as offices and laboratories. Because of its location, the future use of the site is anticipated to remain industrial. However, the Navy evaluated the residential exposure scenario to assess whether land use restrictions would be necessary at the site. The HHRA is composed of four parts, as discussed below – identification of COPCs, exposure assessment, toxicity assessment, and risk characterization.

Identification of COPCs

A conservative screening process identified chemicals that may be present at the site at concentrations that could result in risks to exposed receptors. Because the screening process was conservative, the identification of COPCs does not necessarily mean that an unacceptable risk exists. These COPCs were further evaluated in subsequent steps in the

HHRA process to identify the COCs for each medium evaluated. During the FS process, the HHRA COCs were evaluated further to identify which COCs would require remediation.

The maximum detected concentration of each constituent in each medium (surface soil, subsurface soil, sewer sediment, wetland area sediment, and wetland area surface water) was compared to a human health risk-based screening value to identify the COPCs. If the maximum detected concentration of a constituent exceeded the screening value, the constituent was classified as a COPC and retained for further evaluation. The EPA Region III risk-based concentrations (RBCs) for residential receptors were used as the screening levels to identify COPCs (EPA, 2002). The residential soil RBCs were used to screen the soil data; the ambient air RBCs were used to screen the soil data for the soil-to-air exposure pathway; 10 times the tap water RBCs were used to screen the surface water data; and 10 times the soil RBCs were used to screen the sediment data. The RBCs that are based on cancer risk are conservatively set to represent an excess lifetime cancer risk (ELCR) of $1x10^{-6}$, or a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. The RBCs that are based on non-cancer effects are based on a target hazard index (HI) of 1. Therefore, to conservatively account for exposure to more than one non-cancer constituent that affects the same target organ (i.e., liver), the EPA Region III RBCs that were based on non-cancer effects were divided by 10. Constituents not identified as COPCs and eliminated from further evaluation at this step present minimal risks to exposed human receptors.

Lead concentrations in soil and sediment were compared to the EPA residential child soil screening value of 400 parts per million, as calculated using the Integrated Exposure Uptake Biokinetic (IEUBK) model. If the lead concentration exceeded the screening value, it was evaluated quantitatively for residents using the IEUBK model and for the site worker using the adult lead model (refer to Appendix J of the RI).

Section 5.2 of the RI report discusses the identification of COPCs and presents the list of COPCs for the Lab Area. The COPCs for the Underground Sewer Lines were metals for both the subsurface soil and sewer sediment. For the Upland Area surface soil and Wetland Area sediment, the COPCs were PAHs and metals for the surface soil, and metals for the wetland area sediment and surface water.

Exposure Assessment

The exposure assessment defines and evaluates the type and magnitude of human exposure to the chemicals present at or migrating from a site. The exposure assessment is designed to depict the physical setting of the site, identify potentially exposed populations, and estimate chemical intakes under the identified exposure scenarios. Actual or potential exposures are based on the most likely pathways of contaminant release and transport, as well as human activity patterns. A complete exposure pathway has three components: a source of chemicals that can be released into the environment, a route of contaminant transport through an environmental medium, and an exposure or contact point for a human receptor (Figure 2-3).

The contaminated media currently accessible at the site are subsurface soil and sewer sediment for the Underground Sewer Lines, and surface soil, surface water, and sediment for the Upland and Wetland Areas.

For the Underground Sewer Lines, the current land use exposure routes are:

- Sewer maintenance workers: incidental ingestion of, inhalation of, and dermal contact with subsurface soil; and incidental ingestion of and dermal contact with sediment

For the Upland Area surface soil and Wetland Area, the current land use exposure routes are:

- Adult/Adolescent Trespasser: incidental ingestion of, inhalation of, and dermal contact with surface soil
- Recreational Adult/Child: incidental ingestion of and dermal contact with surface water and sediment
- Industrial Worker: incidental ingestion of, inhalation of, and dermal contact with surface soil

The potential future exposure scenario for the Underground Sewer Lines assumes that the subsurface soil will be excavated and become surface soil. Additionally, the industrial worker may be exposed to the sediment during repair of sewer lines. Therefore, for the Underground Sewer Lines, the future land use exposure routes include the current routes and the following additional routes:

- On-site Resident (adult and child): ingestion of, inhalation of, and dermal contact with subsurface soil (assumed to be moved to the surface)
- Industrial Worker: incidental ingestion of, inhalation of, and dermal contact with subsurface soil (assumed to be moved to the surface) and sediment
- Construction Worker: incidental ingestion of, inhalation of, and dermal contact with subsurface soil

For the Upland Area surface soil and Wetland Area, the future land use exposure routes include the current routes and the following additional routes:

- On-site Resident (adult and child): incidental ingestion of, inhalation of, and dermal contact with surface soil
- Construction Worker: incidental ingestion of, inhalation of, and dermal contact with surface soil

Pathway-specific information for these receptors, such as the values of exposure parameters used to quantify exposure and the exposure point concentrations, is presented in Section 5.3.3 of the RI report.

Toxicity Assessment

Toxicity assessment weighs the available evidence regarding the potential for a particular chemical to cause adverse effects in exposed individuals and provides a numerical estimate of the relationship between the extent of exposure and possible severity of adverse effects. Toxicity assessment consists of two steps: hazard identification and dose-response assessment. Hazard identification is the process of determining the potential adverse effects from exposure to a chemical. Dose-response assessment is the process of quantitatively evaluating the toxicity information and characterizing the relationship between the dose of the contaminant administered or received and the incidence of adverse health effects in the

exposed population. From this quantitative dose-response relationship, toxicity values (e.g., non-cancer reference doses [RfDs] and carcinogenic slope factors [CSFs]) are derived. These are the toxicity values, used in conjunction with the exposure assessment, to estimate non-cancer hazards and cancer risks associated with exposure to site media.

EPA has assessed the toxicity of many chemicals and has published the resulting toxicity information and toxicity values in the Integrated Risk Information System and Health Effects Assessment Summary Tables databases. Additionally, toxicity information is available from EPA's National Center for Environmental Assessment.

Health effects are divided into two broad groups: non-cancer effects and cancer effects. This division is based on the different mechanisms of action currently associated with each category. Chemicals causing non-cancer health effects were evaluated independently from those having cancer effects. Some chemicals may produce both non-cancer and cancer effects, and were evaluated in both groups. Non-cancer health effects were evaluated using the RfDs. Cancer risks were evaluated using CSFs. Section 5.4 in the RI report provides more detail about the toxicity assessment.

Risk Characterization - Methodology

The risk characterization summarizes and combines the results of the exposure and toxicity assessments to characterize baseline risks. For carcinogens, risk is generally expressed as the incremental probability of an individual developing cancer over a lifetime of exposure to the carcinogen. ELCR is calculated from the following equation:

$$ELCR = CDI \times CSF$$

where:

ELCR = a unitless probability (e.g., 33 percent) of an individual's developing cancer that is in addition to the incidence of cancer in the general population unaffected by these releases

CDI = chronic daily intake averaged over 70 years (milligrams per kilogram [mg/kg]-day) calculated in the exposure assessment

CSF = carcinogenic slope factor, (cancer potency factor), expressed as $(mg/kg\text{-}day)^{-1}$ from the toxicity assessment

These risks are probabilities that are usually expressed in scientific notation. An ELCR of 1×10^{-6} indicates that an individual experiencing the reasonable maximum exposure (RME) estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. The RME is the highest exposure that is reasonably expected to occur at a site. This is referred to as an ELCR because exposure to site conditions results in an additional risk in addition to the risks of cancer from other causes, such as smoking. The chance of an individual developing cancer from all other causes has been estimated to be as high as one in three (33 percent or 3E-1) for women and one in two (50 percent or 5E-1) for men. EPA's generally acceptable ELCR range for site-related exposure is 1E-04 to 1E-06 (i.e., 1 in 10,000 to 1 in 1,000,000, or 0.01 percent to 0.0001 percent).

The potential for non-cancer effects is evaluated by comparing an exposure level over a specified time period with an RfD, the dose at which no adverse health effects are expected

to occur, derived for a similar exposure period. The ratio of exposure to toxicity is called a hazard quotient (HQ). An HQ of less than 1 indicates that a receptor's dose of a single contaminant is less than the RfD and that toxic non-cancer effects from that chemical are unlikely. The HI is generated by adding the HQs for all COPCs that affect the same target organ (e.g., liver) or that act through the same mechanisms of action within a medium or across all media to which a given individual may reasonably be exposed. An HI of less than 1 indicates that, based on the sum of all HQs from different contaminants and exposure routes, toxic non-cancer effects from all contaminants are unlikely. An HI greater than 1 indicates that site-related exposures may present an unacceptable risk to human health.

The HQ is calculated as follows:

Non-cancer HQ = CDI/RfD

CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or short term). The CDI for HQ calculations is not the same as that used in the ELCR calculations. The CDI for HQ calculations is based on the assumption that the effect from exposure to a contaminant may occur only during exposure to that contaminant (the exposure duration and averaging time for the exposure for the effect are the same), while the CDI for the ELCR assumes that cancer can occur any time during or after exposure to the contaminant, throughout the receptor's lifetime (the exposure duration is typically less than the averaging time for the exposure, which is the receptor's lifetime).

A detailed discussion of the risk characterization and results of the risk assessment is provided in Section 5.5 of the RI report. Section 5.6 of the RI report presents the uncertainty analysis for the HHRA. RME non-cancer hazards and cancer risks were calculated for all receptors identified in the exposure assessment.

Risk Characterization - Results

The risk assessment calculation tables are provided in Appendix H of the RI report for the Lab Area Underground Sewer Lines and in Appendix J of the RI report for the Lab Area Surface Soil and Wetland Area. The Table 9 series in Appendices H and I summarize the potential hazards and risks to each receptor for the Lab Area Underground Sewer Lines Area, and the Lab Area Surface Soil and Wetland Area, respectively. The Table 10 series in both Appendices H and I show only those pathways with total HIs greater than 1.0 or total carcinogenic risks greater than 10-5.

The HHRA concluded that there were no unacceptable carcinogenic risks (above EPA's acceptable level of 10^{-4}) to human health. Subsurface soil in the Lab Area Underground Sewer Lines and surface soil and sediment in the Lab Area Surface Soil and Wetland Area were the only media that had noncarcinogenic hazards greater than the EPA acceptable level of 1. Table 2-1 presents the results of the HHRA. The main risk drivers for these media were:

- Underground Sewer Lines – Subsurface Soil
  - Mercury, primarily through inhalation and ingestion
- Upland Area Surface Soil and Wetland Area – Sediment
  - Arsenic, through dermal route of contact

- Upland Surface Soil and Wetland Area – Surface Soil
  - Mercury, through inhalation and ingestion
  - Lead - future potential health concern for children residing near Buildings 102, 103, and 304, and current/future health concern for adult industrial worker (and their unborn fetuses) working near Buildings 102, 103, and 304

2.7.2 Ecological Risk Assessment

An SERA was conducted for the Lab Area as part of the RI to estimate the risks the site would pose to ecological receptors under current conditions. The SERA provided a conservative assessment of potential ecological risk. The approach for the ecological risk assessment was provided in Section 6.1 of the RI report (CH2M HILL, 2004).

Identification of COPCs

COPCs were identified at the conclusion of the SERA. The COPC selection process involves consideration of HQs, which are calculated by dividing chemical concentrations in a given environmental media by ecological screening values, frequency of detection, consideration of likely risk from chemicals without screening values, and consideration of background concentrations. If there are COPCs at the end of the SERA, the risk assessment process can continue with a site-specific BERA to refine the screening-level risk estimates and reduce uncertainty, or risk reduction measures can be undertaken through remedial action.

Exposure Assessment

Exposure assessment is conducted to estimate the chemical concentration to which various ecological receptors will be exposed through either direct contact with site media or through bioaccumulation and food web transfer to upper-trophic-level receptors (e.g., carnivorous wildlife). Exposures for upper-trophic-level receptor species via the food web were calculated by estimating the chemical-specific concentrations in each dietary component using uptake and food web models.

Maximum detected concentrations in soil and sediment were used initially as the basis for estimating the chemical exposure to receptor communities and species. Exposure point concentrations for food web modeling of exposure for upper-trophic-level receptors were estimated using the methodology and models described in Section 6.1.2.2 of the RI report. Dietary items for which tissue concentrations were modeled consisted of terrestrial plants, soil invertebrates (earthworms), small mammals, aquatic plants, aquatic invertebrates, and amphibians.

According to Superfund guidance (EPA, 1997), Step 3 initiates the problem formulation phase of the BERA. Under Navy guidance (Chief of Naval Operations, 1999), the BERA is defined as Tier 2, and the first activity under Tier 2 is Step 3A. In Step 3A, the conservative assumptions employed in Tier 1 are refined and risk estimates are recalculated using the same CSM for the site.

In some cases, additional information is presented that has bearing on whether a chemical is identified as a potential risk driver. Risk estimates were based on maximum concentrations in Step 2 and average concentrations in Step 3A. For upper–trophic-level receptors, average chemical concentrations provide a more representative estimate of the likely level of chemical exposure because the local population (and, in many cases, individual organisms

for highly mobile species with large home ranges relative to the size of the site) would be expected to occur throughout the site (where suitable habitat is present) and, in many cases, off the site. Mean concentrations (or some other estimate of central tendency) may also be appropriate for evaluating potential risks to populations of lower–trophic-level terrestrial and aquatic receptors because the members of the population are expected to be found throughout the site (where suitable habitat is present), rather than concentrated in one particular area.

Although effects on individual organisms might be important for some receptors, such as rare and endangered species, population- and community-level effects are typically more relevant to ecosystems. In many cases, the average concentration is a conservative representation of the true site average because samples are generally biased toward areas of known or suspected contamination.

Potential Receptors

Potential ecological receptors at the site are terrestrial species that have direct contact with the soil (e.g., plants, soil invertebrates, and wildlife) or consume organisms or plants that have direct contact with the soil and could accumulate chemicals in their tissues (e.g., carnivorous wildlife), semi-aquatic species that feed in upland and wetland areas, such as raccoons, and wetland species that have direct contact with the sediment (e.g., frogs and benthic invertebrates). The topsoil over the wetland and surrounding area is relatively shallow, with an organically rich layer, varying from 4 to 10 inches, overlying a clay layer. Therefore, the mostly likely exposure pathway for ecological receptors is limited to the topsoil layer.

Exposure Pathways

An exposure pathway links a source of contamination with potential ecological receptors through exposure via one or more media and exposure routes. For the Lab Area, the source of contamination is historical disposal of laboratory waste near the laboratory buildings. Once released, contaminants could be transported via runoff to other areas of the site or to the wetland, which lies downgradient of the laboratory buildings. Contaminants may have been transported to the wetland via leaks in the storm water and/or sewer system.

Ecological receptors may be exposed to chemicals at the site through the following exposure routes:

- Direct contact with soil
- Direct contact with sediment
- Direct contact with surface water
- Ingestion of soil
- Ingestion of sediment
- Ingestion of surface water
- Root uptake (plants)
- Ingestion of biota that have accumulated chemicals from the soil, sediment, or surface water

Ecological Effects Assessment

The purpose of the effects evaluation is to establish chemical exposure levels (screening values) that represent conservative thresholds for adverse ecological effects. Direct contact screening values were used to assess potential risks to the soil invertebrate and terrestrial plant communities, the benthic invertebrate and wetland plant communities, and surface water receptors. Ingestion screening values for dietary exposures were derived for each avian and mammalian receptor species and chemical combination evaluated in the assessment. Section 6.1.2.1 of the RI report provides a detailed description of the screening values used in the ecological risk assessment.

Ecological Risk Characterization

Screening-level Risk Characterization. Section 6.5.3 of the RI report provides a detailed discussion of the screening-level risk calculations. The SERA indicated that inorganics, SVOCs and some explosives in surface soil may adversely affect the growth, survival, and/or reproduction of soil invertebrates and plants. These chemicals were selected as COPCs and carried forward into Step 3A of the ERA process. In addition, several organic chemicals had maximum detection limits in excess of screening values. **Screening-level Risk Estimates.** For surface water, several inorganics and SVOCs were identified as COPCs. VOCs, SVOCs, and inorganics were identified as COPCs in sediments. All organic chemicals identified as sediment COPCs were below detection limits, but the detection limits exceeded ecological screening values.

The results of food web modeling showed that several inorganics had HQs in excess of 1.0, and at least one or more of these inorganic chemicals may pose potential risks to upper-trophic-level receptors.

Because there were maximum chemical concentrations that exceeded screening values in surface water, soil, and sediment, and food web modeling indicated potential risks to upper- trophic-level receptors, the risk assessment process was continued to Step 3A.

Refined Risk Estimates. For soil invertebrates and plants, the mean concentrations of nine inorganics (aluminum, chromium, copper, cyanide, iron, lead, mercury, vanadium, and zinc) exceeded soil screening values, with HQs ranging from 2.5 to 531. The mean concentration of 13 SVOCs detected in soil also exceeded screening values.

In surface water, seven detected inorganics (aluminum, copper, cyanide, iron, lead, manganese and mercury) had HQs higher than 1.0, ranging from 1.2 to 10.8. In sediment, the mean concentrations of five detected inorganics (arsenic, lead, manganese, mercury, and silver) were greater than screening values, with HQs ranging from 1.2 to 144.

Inorganics were the only chemical group with food web HQs higher than 1.0. Levels of mercury resulted in no-observed-adverse-effects-level (NOAEL)-based HQs greater than 1 for four receptor species (white-footed mouse, raccoon, red fox, and American robin). The NOAEL-based HQs for cadmium, chromium, lead, and zinc also exceeded 1 for the American robin. Mercury exposure estimates also resulted in lowest-observed-adverse-effect-level (LOAEL)-based HQs greater than 1 for white-footed mouse (HQ = 6.0), raccoon (HQ = 1.3) and American robin (HQ = 15.6).

Screening-level Risk Conclusions. At the conclusion of the SERA, inorganics in soil and sediment (particularly mercury) were identified as the COPCs of greatest concern at the site, posing potential risks to soil invertebrates, sediment invertebrates, and upper-trophic-level-receptors that have substantial direct contact with soils, or consume prey that have direct contact with soils.

Baseline Risk Characterization. Following the SERA, a BERA was performed (CH2M HILL, 2006a) because the results of the SERA indicated there were potentially unacceptable risks to ecological receptors from exposure to chemicals in surface soil at the site. Considering the concentrations of mercury in the wetlands sediments, the Indian Head Installation Restoration Team (IHIRT) agreed on a path forward for the Lab Area, which included removing the contaminated sediment in the wetland and restoring the wetland, rather than conducting additional studies to refine risk estimates for the sediment as part of the BERA. In support of the BERA, surface soil samples were collected from 10 locations at the Lab Area and from 1 reference location for chemical and toxicological testing. To evaluate direct toxicity to soil invertebrates, laboratory toxicity tests with the earthworm *E. foetida* were conducted on split samples from the soil sampling locations.

To characterize the potential risk to birds and mammals that might consume soil invertebrates from the Lab Area more accurately, the test earthworms were analyzed for EPA TAL metals and methylmercury at the conclusion of the soil toxicity tests. The concentrations of metal COPCs (lead, mercury, and zinc) in the tissue samples were used to estimate exposure to insectivorous birds and omnivorous mammals.

The results of the soil invertebrate toxicity tests indicated that soil invertebrate survival is not affected at the Lab Area. Significantly reduced growth was observed in nine samples (eight sample locations plus one duplicate). Methylmercury was identified as possibly contributing to reduced growth in soil invertebrates at the Lab Area. However, the level of effect is unlikely to impair the soil invertebrate community. The observed decrease in growth was less than 20 percent at all locations except one in comparison to the reference sample. In general, a less than 20 percent reduction in the measurement endpoint is considered protective of the assessment endpoint (Suter *et al.,* 1996).

The results of the earthworm tissue analyses and exposure calculations for insectivorous terrestrial birds and omnivorous terrestrial mammals indicate that the risks to these receptors from COPCs in surface soils at the site are within ranges presumed to be acceptable. HQs based on the LOAEL were less than 1.0, indicating that population-level impacts are likely not occurring and no further investigation is required. The results of the BERA indicate that the COPCs identified in the RI report for the Lab Area surface soils do not pose unacceptable risks, so further investigation is not required.

2.8 Remedial Action Objectives

The HHRA discussed in Section 2.7.1 and the subsequent BERA concluded that unacceptable risk is posed by contamination in the Upland Area surface soil and subsurface soil and in the Wetland Area sediment. The human health risk-based COCs, mercury, lead, and arsenic, and the ecological risk-based COC, mercury, were addressed in the FFS and referred to as FFS COCs.

Based on the evaluation of site conditions, an understanding of the contaminants, the physical properties in media of concern, the results of risk assessments, and an analysis of ARARs, the following RAOs for the Lab Area surface soil, subsurface soil, and wetland area sediment were developed:

- Reduce risks to human receptors from exposure to mercury and lead in the surface soil in the Upland Area to acceptable levels under industrial use
- Reduce risks to human receptors from exposure to mercury potentially present in and around sewer pipes in the Upland Area to acceptable levels under industrial land use scenario
- Reduce risks to ecological receptors from exposures to mercury in the sediment in the Wetland Area to acceptable levels

The site remediation goals (SRGs) for the FS COCs were developed based on the greater of the site-specific, risk-based preliminary remediation goals (PRGs) or facility-wide background concentrations. If the facility-wide background concentration was higher than the risk-based PRG, the background concentration was selected as the SRG.

The SRG determination process was applied to the surface soil and the wetland sediment only. The IHIRT decided that active remediation in the subsurface soil would not be practical because of the unknown and extensive network of underground terra cotta pipes that may contain residual mercury. Therefore, the IHIRT decided to consider ICs, including requirements for actions to be taken if mercury is encountered, to minimize worker exposure as the remedial component for the subsurface soil with the associated underground sewer pipes. Table 2-2 summarizes the selection of the SRGs for the Lab Area. The rationale of the SRGs selection for mercury, arsenic, and lead are presented in Appendix C of the FFS report (CH2M HILL, 2009).

To evaluate the FS COCs that require remediation, their respective maximum concentration was compared to the SRGs. If the maximum concentration was greater than the SRG, the FS COC was retained for remediation; if the maximum concentration was less than the SRG, the FS COC was eliminated from remediation. Table 2-3 summarizes the process for identifying the COCs that will require remedial action. The FS COCs requiring remediation are mercury in the surface soil and wetland sediment, arsenic in the wetland sediment, and lead in the surface soil, based on their exceedance of the SRGs.

The area of attainment (AA) is defined as the area over which the RAOs, and, therefore, the SRGs, are to be met. Figure 2-9 shows the AAs for the Lab Area, which encompass approximately 28,710 square feet (SF) of the Upland Area and 15,423 SF of wetland. Three AAs were identified:

- Surface Soil AA: The surface soil AA has an area of 24,392 SF; its thickness was assumed to be 1 foot; the total volume is approximately 24,392 cubic feet (CF) or 902 cubic yards (CY)
- Subsurface Soil AA: The subsurface soil AA underlies the surface soil AA. Its area, however, cannot be easily estimated because it can be as large as the extent of the sewer pipe network, or it can have the same footprint as the surface soil AA. For the purpose

of the FFS, this AA was assumed to be the same as the site boundary, with a thickness of 6 feet (i.e., an interval from 1 to 7 feet bgs). The bottom interval was assumed to represent the average depth of sewer pipe plus 1 foot of the soil bedding beneath the pipe. Based on this assumption, the volume of the subsurface soil AA is approximately 2,453,172 CF, or 90,858 CY.

- Wetland Sediment AA: This AA is approximately 15,423 SF; its thickness was assumed to be 1 foot; the total volume was approximately 15,423 CF, or 571 CY.

2.9 Summary Descriptions of Remedial Alternatives

A detailed description of each remedial alternative is available in Section 5.1 of the FFS report. A summary of the three alternatives is presented below. A summary of estimated remediation costs and timeframes is presented in Table 2-3 of the FFS report and in Table 2-4 of this document.

Alternative 1—No Action: This alternative is required by NCP §300.430(e)(6) to be evaluated as a baseline. Under this alternative, no remediation is planned.

Alternative 2—ICs: This alternative consists of:

- Designating the site as a "restricted use" area with ICs. These ICs will include the prohibition of residential development (including housing, elementary and secondary schools, childcare facilities, and playgrounds). Secondly, the ICs will provide a warning to workers who may be conducting intrusive activities such as excavation that there is some potential for encountering mercury in drain lines. The requirements of ICs would be integrated into the comprehensive work approval process (CWAP) system and made into one of the criteria in the CWAP approval for any future work at the site.
- Conducting biannual inspections of AAs to confirm that the land is being used appropriately according to the ICs.
- Conducting 5-year reviews to report on site conditions.

These components represent a conceptual approach to Alternative 2; IC plans that describe the detailed components of the ICs would be prepared after the ROD is signed.

Alternative 3— Excavation of Upland Area Surface Soil and Wetland Area Sediment, Offsite Disposal, Site Restoration, and ICs: This alternative consists of:

- Excavating the surface soil and wetland sediment AAs as defined in Figure 2-9.
- Conducting lateral post-excavation confirmatory sampling; vertical confirmation would not be necessary because the depth of excavation is to 1 foot, which is beyond the affected ecological zone from 0 to 6 inches.
- Restoring the surface soil excavation area by backfilling the area with clean fill and topsoil, followed by compaction and reseeding.
- Restoring the wetland excavation area into a wetland.
- Improving and maintaining best practices in surface water runoff management.

- Transporting and disposing of the excavated material to an offsite permitted facility.
- Implementing ICs as described in Alternative 2.
- Conducting 5-year reviews.

2.10 Summary of Comparative Analysis of Alternatives

The NCP outlines the approach for comparing remedial alternatives at 40 CFR §300.430(e)(9). Evaluation of the alternatives uses "threshold," "primary balancing," and "modifying" criteria. To be considered for remedy selection, an alternative must meet the following threshold criteria:

- Overall protection of human health and the environment - This criterion addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or ICs. Alternative 1 is not protective of human health and therefore will not be carried forward in this summary. The land use restrictions of Alternative 2 are protective of human health but not the environment. The soil removal of Alternative 3, combined with land use restrictions, is protective of both human health and the environment. Therefore, Alternative 3 is preferred.
- Compliance with ARARs - Section 121(d) of CERCLA and 40 CFR §300.430(f)(1)(i)(A) require that remedial actions at CERCLA sites at least attain federal and state ARARs, unless such ARARs are waived under CERCLA Section 121(d)(4). Both Alternatives 2 and 3 are compliant with ARARs.

The primary balancing criteria are then considered to determine which alternative provides the best combination of attributes. The primary balancing criteria are:

- Long-term effectiveness and permanence - This criterion refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met. It also considers residual risk that will remain onsite following remediation and the adequacy and reliability of controls. Proposed land use restrictions are equally adequate for protection of human health in both Alternatives 2 and 3, and both can be maintained in the long term. Alternative 2 does not mitigate the risk to environmental receptors. The soil removal portion of Alternative 3 will address the current risk to ecological receptors in the Wetland Area and will permanently reduce the risk of contaminant migration from the Upland Area. Therefore, Alternative 3 is preferred.
- Reduction in toxicity, mobility, or volume through treatment - This criterion refers to the anticipated performance of the treatment technologies that may be included as part of the remedy. Neither alternative reduces toxicity, mobility, or volume through treatment.
- Implementability - This criterion addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other entities are considered. Both alternatives can be implemented. Both require long-term

administrative commitment to maintain the ICs, but a base-wide program already exists to which these controls can be added. The excavation and disposal of the soils that are part of Alternative 3 are standard practices and can be readily implemented.

- Short-term effectiveness - This criterion addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during construction and operation of the remedy until cleanup levels are achieved. Both alternatives are equally protective of human health in the short term, in that the ICs can be implemented quickly. Alternative 2 does not involve construction activities, so there are no short-term impacts. The excavation and transportation of soils in Alternative 3 will affect facility operations and result in increased vehicle traffic. These impacts will last from 3 to 6 months. Implementation of good health and safety practices will minimize impacts to workers and the community. The absence of any short-term impacts makes Alternative 2 preferable.
- Cost – This criterion refers to costs associated with construction and operation of the remedy; these include capital costs, operation and maintenance costs, and present-worth costs. There are no capital costs associated with Alternative 2 insofar as the system for adding and maintaining ICs is already in place across the Base. Associated with Alternative 3 is the cost of conducting the removal and disposing of the contaminated soils. Alternative is 2 therefore preferred.

The alternatives are evaluated further against the two modifying criteria:

- Acceptance by the state - The State prefers Alternative 3 insofar as Alternative 2 does not provide for protection of the environment.
- Acceptance by the community - The community expressed no objections to either alternative at the public meeting or during the comment period.

Table 2-4 presents the comparative analysis for the threshold and primary balancing criteria for the three remedial alternatives. Section 5 of the FFS report provides a detailed description of the comparative analysis of these remedial alternatives.

2.11 Principal Threat Wastes

The NCP establishes an expectation that EPA will use treatment to address "principal threats" posed by a site wherever practicable (40 CFR Section 300.430 (a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is one that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater, surface water, or air, or act as a source for direct exposure. Contaminated groundwater generally is not considered to be a source material. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. There are no principal threats in any of the media at the Lab Area.

2.12 Selected Remedy

The Selected Remedy for the Lab Area is Alternative 3 – Excavation of Upland Area Surface Soil and Wetland Area Sediment, Offsite Disposal, Site Restoration, and ICs. Figure 2-9 shows the proposed excavation areas and the IC boundary.

2.12.1 Summary of the Rationale for the Selected Remedy

Alternative 1 does not satisfy the threshold and the primary balancing criteria. Alternative 2 partially satisfies the threshold and the primary balancing criteria. This alternative does not provide protection to the environmental receptors. Alternative 3 fully satisfies the threshold criteria. However, it partially satisfies the primary balancing criteria because it does not provide reduction of toxicity, mobility, or volume through treatment. Despite the fact that Alternative 3 does not satisfy the preference for treatment, it provides adequate overall protection of human health and the environment at a reasonable cost.

2.12.2 Description of the Selected Remedy

The components of the Selected Remedy include the following:

- Excavating the surface soil and wetland sediment AAs to a depth of 1 foot as defined in Figure 2-9.
- Conducting lateral post-excavation confirmatory sampling; vertical confirmation is not necessary because the depth of excavation is to 1 foot, which is beyond the affected ecological zone from 0 to 6 inches. A detailed confirmatory or verification sampling plan will be prepared after the ROD is signed.
- Restoring the surface soil excavation area by backfilling the area with a 6-inch layer of clean fill and a 6-inch layer of topsoil, followed by compaction and reseeding the area.
- Restoring the wetland excavation area into a wetland; an approved combination of native wetland species will be planted, and the newly restored wetland will be inspected quarterly for the first year or longer until the plants are established, then twice a year for the second year, and once a year for the third through the fifth years.
- Improving and maintaining best practices in surface water runoff management, such as reseeding bare spots to minimize uncontrolled runoff sources and maintaining the condition of the surface water runoff ditches or lines.
- Transporting and disposing of the excavated material to an offsite permitted facility.
- Implementing ICs on the surface soil and on the subsurface soil prohibiting residential development (including housing, elementary and secondary schools, childcare facilities, and playgrounds) which would include a mechanism that will inform future construction workers that there may be underground sewer pipes that may contain mercury, and that appropriate health and safety precautions need to be taken. These ICs will apply to the entire site boundary (Figures 2-2 and 2-9) and will be placed in the Base GIS system. The requirements of the ICs will be integrated into the CWAP system and made into one of the criteria in the CWAP approval for any future work at the site. The

ICs will remain in effect as long as contaminants remain at the site at levels that do not allow for unlimited use and unrestricted exposure.

- Conducting 5-year reviews.

After the ROD is signed, as part of the remedial design, the Navy will also prepare the IC plan, which will be submitted to EPA and MDE for review before implementing the Selected Remedy.

The Navy will be responsible for implementing, maintaining, periodically reporting on, and enforcing the ICs in accordance with the IC plan. Although the Navy may transfer these responsibilities to another party by contract, property transfer agreement, or through other means, the Navy shall remain ultimately responsible for the remedy integrity and shall: 1) perform CERCLA 121(c) 5-year reviews; 2) notify the appropriate regulators and/or local government representatives of any known IC deficiencies or violations; 3) provide access to the property to conduct any necessary responses; 4) retain the ability to change, modify, or terminate ICs and any related deed or lease provisions; and 5) ensure that IC objectives are met to maintain remedy protectiveness.

2.12.3 Summary of Estimated Remedy Costs

A summary of the estimated costs for the Selected Remedy is presented in Tables 2-5 and 2-6. The capital cost of approximately $380,000 is associated with the removal and offsite disposal of the surface soil and wetland sediment. O&M activities are associated primarily with maintenance of the wetlands. Periodic costs incurred are primarily associated with the 5-year reviews. The present-worth lifetime O&M cost is approximately $18,500, and the total present-worth value of this alternative is estimated at $400,000 (Table 2-6).

2.12.4 Expected Outcomes of Selected Remedy

No future land use changes are projected for the Lab Area. No community impacts from the selected remedy are expected. The anticipated environmental benefit of the Selected Remedy is the complete mitigation of human health and ecological risks in the surface soil and sediment throughout the Lab Area following the completion of the excavation and site restoration. Through the IC mechanisms, NSF-IH can implement the notification processes to the current and future workers to prevent exposures to mercury in the subsurface soil and the sewer pipes. Table 2-7 summarizes the outcomes of the Selected Remedy.

2.13 Statutory Determinations

Remedial actions must meet the statutory requirements of Section 121 of CERCLA. Remedial actions undertaken at NPL sites must achieve adequate protection of human health and the environment, comply with ARARs of both federal and state laws and regulations, be cost-effective, and use, to the maximum extent practicable, permanent solutions and alternative treatment or resource recovery technologies. In addition, CERCLA states a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, and/or mobility of hazardous waste as the principal element and a bias against offsite disposal of untreated wastes. The following discussion summarizes the statutory requirements that are met by the Selected Remedy.

2.13.1 Protection of Human Health and the Environment

The Selected Remedy is considered protective of human health and the environment. This alternative will remove the contaminated surface soil and wetland sediment, thereby removing all identified FFS COCs. Human health also will be protected through implementation of ICs prohibiting residential development and providing for notice to construction workers regarding the potential to encounter sewer pipes containing mercury for the subsurface soil AA.

2.13.2 Compliance with ARARs

The Selected Remedy will comply with the chemical, location-, and action-specific ARARs identified in Tables 2-8, 2-9, and 2-10, respectively—specifically, the location-specific protection of wetlands, which will be achieved through recreating and improving the wetlands; the action-specific hazardous waste regulations which will be met through appropriate management of excavated waste prior to offsite shipment for disposal; and the action-specific erosion and sediment controls, which will be met by implementing best management practices and following state guidance.

2.13.3 Long-Term Effectiveness and Permanence

Releases of mercury into the sewer drains have long since ceased at the Lab Area. Lead abatement has been conducted to mitigate the buildings containing lead-based paints. These actions, combined with the excavation, offsite disposal, and restoration of the soil and wetland area sediment, as well as improvement of the surface water management practices, will minimize the residual risks associated with mercury and lead to acceptable levels at the site. Implementation of the ICs for the subsurface soil will eliminate the residual mercury risks in this medium. Restoration of the wetland would improve the habitat quality of the wetland in the long run. Based on these facts, the Selected Remedy fully satisfies the long-term effectiveness and permanence criterion.

2.13.4 Cost-Effectiveness

The Selected Remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness" (40 CFR §300.430(f)(1)(ii)(D)). This conclusion was reached by evaluating the overall effectiveness of the alternatives that satisfied the threshold criteria. Overall effectiveness was evaluated by assessing the five balancing criteria in combination. Overall effectiveness was then compared to cost to assess cost-effectiveness. The relationship of the overall effectiveness of the Selected Remedy was found to be proportional to its cost, and, therefore, represents a reasonable value for the money to be spent.

2.13.5 Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

The Navy, EPA, and MDE have concluded that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a practical manner at the Lab Area. The Navy, EPA, and MDE believe that the Selected

Remedy provides the best balance of tradeoffs in terms of the balancing criteria, while also considering state and community acceptance.

2.13.6 Preference for Treatment as a Principal Element

The Selected Remedy does not satisfy the preference for treatment as a principal element. In situ treatment was determined not feasible because it would result in the loss of the wetland. Ex situ treatment was determined to be not feasible because of the high cost.

2.13.7 5-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining onsite above levels that allow for unlimited use and unrestricted exposure, pursuant to 40 CFR §300.430(f)(4)(ii), the Navy will conduct a statutory remedy review within 5 years after initiating the remedial action and every 5 years thereafter to ensure that the remedy continues to provide adequate protection of human health and the environment.

2.14 Documentation of Significant Changes

There have been no significant changes to the preferred alternative presented in the Proposed Plan for the Lab Area, which was made available for public comment from April 12, 2010 to May 12, 2010, and presented at a public meeting on April 15, 2010. The Selected Remedy is the same alternative as the recommended alternative in the Proposed Plan.

TABLE 2-1
HHRA – Risk Characterization Results Summary
Lab Area Record of Decision
NSF-IH, Indian Head, Maryland

Receptor	Current Land Use		Future Land Use	
	Carcinogenic Risk	Non-Carcinogenic Hazard	Carcinogenic Risk	Non-Carcinogenic Hazard
Subsurface Soil – Underground Sewer Lines				
Sewer Maintenance Workers	Acceptable	Acceptable	Acceptable	Acceptable
Industrial Workers	Acceptable	Acceptable	Acceptable	Acceptable
Construction Worker	NA	NA	Acceptable	Not acceptable (HI = 2.3)
Child Resident	NA	NA	Acceptable	Not acceptable (HI = 7.0)
Adult Resident	NA	NA	Acceptable	Not acceptable (HI = 1.6)
Surface Soil – Upland Area Surface Soil and Wetland Area				
Adult Trespasser/Visitor	Acceptable	Acceptable	Acceptable	Acceptable
Adolescent Trespasser/Visitor	Acceptable	Acceptable	Acceptable	Acceptable
Industrial Worker	Acceptable	Not acceptable (HI = 2.3) For lead only applicable to area around Buildings 102, 103, and 304	Acceptable	Not acceptable (HI = 2.3) For lead only applicable to area around Buildings 102, 103, and 304
Construction Worker	NA	NA	Acceptable	Not acceptable (HI = 7.7)
Child Resident	NA	NA	Acceptable	Not acceptable (HI = 25) For lead only applicable to area around Buildings 102, 103, and 304
Adult Resident	NA	NA	Acceptable	Not acceptable (HI = 6.3)
Surface Water – Upland Area Surface Soil and Wetland Area				
Recreational Adult/Child	Acceptable	Acceptable	Acceptable	Acceptable
Sewer Sediment – Underground Sewer Lines				
Sewer Maintenance Worker	Acceptable	Acceptable	Acceptable	Acceptable
Industrial Worker	NA	NA	Acceptable	Acceptable
Sediment – Upland Area Surface Soil and Wetland Area				
Recreational Adult	Not acceptable (ELCR = 1.3×10^{-4})	Not acceptable (HI = 9.0)	Not acceptable (ELCR = 1.3×10^{-4})	Not acceptable (HI = 9.0)
Recreational Child	Acceptable	Not acceptable (HI = 12.6)	Acceptable	Not acceptable (HI = 12.6)

Notes:
HI- hazard index
ELCR-excess lifetime cancer risk
NA – Not evaluated because it is not applicable
Acceptable – HI < 1 for non-carcinogenic hazard and carcinogenic risks below a range of 1×10^{-4} to 1×10^{-6}
Unless otherwise noted, central tendency exposures are below U.S. Environmental Protection Agency's benchmark level
Exposure to lead – evaluated using adult lead model for industrial workers and Integrated Exposure Uptake Biokinetic model for child residents

TABLE 2-2
Summary of SRGs
Lab Area Record of Decision
NSF-IH, Indian Head, Maryland

COC	Medium	Facility-wide Background Concentration (mg/kg)[1,2]	Human Health Risk-Based PRGs (mg/kg)		Eco Risk-Based PRG (mg/kg)
			Residential	Industrial	
Mercury	Surface Soil	0.06	11[3]	**19**	NR
	Wetland Sediment	0.2	NR	NR	**1.06**
Arsenic	Wetland Sediment	10.6	**34**	NR	NR
Lead	Surface Soil	21.7	**400**	1,092	NR

Notes:
COC – constituent of concern
SRG – Site Remediation Goal
PRG – Preliminary Remediation Goal
mg/kg – milligram(s) per kilogram
NR – No Risk
Bold font indicates the proposed SRG
* - Subsurface soil present at the surface to be exposed to future receptors

1 The surface soil facility background concentrations were obtained from the *Background Soil Investigation Report for Indian Head and Stump Neck Annex, Naval Surface Warfare Center, Indian Head, Maryland* prepared by Tetratech NUS in February, 2002.

2 The wetland sediment facility background concentration was obtained from the *Background Investigation Report for Indian Head and Stump Neck Annex, Naval Surface Warfare Center, Indian Head, Maryland* prepared by Brown and Root Environmental in December, 1997.

3 Representing the lowest value among the adult and child residents and the adult and child recreators.

TABLE 2-3
COCs Requiring Removal
Lab Area Record of Decision
NSF-IH, Indian Head, Maryland

COC	Medium	Max Detect	FOD	Facility Background	# of Background Exceedances	Proposed SRG	Basis	# of SRG Exceedances	Require Remediation?
Mercury	Surface Soil	962	76/81	0.06	76/81	19	Non-carcinogenic risk to construction workers, THI = 1	21/81	Yes
	Wetland Sediment	24.5	2/2	0.2	2/2	1.06	Probable effect concentration for freshwater sediments	2/2	Yes
Arsenic	Wetland Sediment	20.2	2/2	10.6	1/2	34	Carcinogenic risk to future adult recreator, TR = 10^{-4}	0/2	No*
Lead	Surface Soil	31,200	82/82	21.7	75/82	400	Future child resident, IEUBK Model	23/82	Yes

Notes:
COC – constituent of concern
FOD – frequency of detection
SRG – Site Remediation Goal
THI – target hazard index
TR – target risk
IEUBK – Integrated Exposure Uptake Biokinetic
All concentrations are in milligrams per kilogram (mg/kg).
* Arsenic does not require remediation the maximum concentration (20.2 mg/kg) is less than the SRG (34 mg/kg). Figure 2-8 shows the two locations where arsenic is detected in the Wetland Area. As shown on Figure 2-9, these locations are contained within the removal area for mercury; so indirectly, arsenic will be removed.

TABLE 2-4
Comparative Analysis of Remedial Alternatives
Lab Area Record of Decision
NSF-IH, Indian Head, Maryland

Evaluation Criteria	**Alternative 1** **No Action**	**Alternative 2** **ICs**		**Alternative 3** **Excavation, Off-Site Dispsosal, Wetland Restoration, and ICs**	
Overall Protection of Human Health and the Environment	Not protective of human health and the environment.	Protective of human health, as land use restrictions would prevent or minimize future exposure to the contaminated soil. Not protective of the environment.		Alternative 3 is considered protective of human health and the environment. This alternative would remove the contaminatesd surface soil and sediment, thereby removing all FFS COCs. The RAOs, and therefore the SRGs, would be achieved.	
Compliance With ARARs	Not applicable.	In compliance with location-specific ARARs. No chemical- or action-specific ARARs apply to Alternative 2.		In compliance with location- and action-specific ARARs. No chemical-specific ARARs apply to Alternative 3.	
Long-Term Effectiveness and Permanence	There would be no reduction in risk to human or ecological receptors under this alternative.	The ICs in place are expected to be adequate and reliable, based on their continued implementation. Use restrictions, which prevent construction and other activities on the contaminated soil, must be enforced. However, the ICs would not be effective at mitigating contamination in the upland or wetland areas.		Dumping activities, the source of the mercury contamination, have long since ceased at the Lab Area. Excavation of sites contaminated with mercury above human health (upland) or ecological (wetland) SRGs would remove any risk of human or ecological exposure, taking into account ICs prohibiting excavation of potentially contaminated subsurface soil.	
Reduction of Toxicity, Mobility, or Volume Through Treatment	This alternative does not include treatment.	This alternative does not include treatment.		This alternative does not include treatment of contaminated soil.	
Short-Term Effectiveness	No impact to community, workers, and the environment from remedial activities because this alternative involves doing nothing. RAOs and SRGs cannot be achieved within a reasonable time frame.	There are no construction activities associated with this alternative, and thus the short-term impacts on workers, the community, or the environment are minimal. However, similar to Alternative 1, the RAOs and thus the SRGs cannot be achieved within a reasonable timeframe.		Facility operations may be impacted for 3 to 6 months because of excavation activities and transportation of the excavation material off-site. Increased truck traffic will inconvenience neighbors. Short-term impacts to remediation workers will be minimized through implementation of good health and safety practices.	
Implementability	Has no ability to monitor the effectiveness of this remedy and ability to obtain approvals from other agencies is unlikely.	Easily implemented but requires long-term administrative commitment.		Excavation and landfill disposal are technically and administratively feasible because the technologies have become standard practices. Similar to Alternative 2, this alternative requires long-term administrative commitment to maintain and enforce the ICs.	
Cost	$0	**Capital:**	**$0**	**Capital:**	**$378,155**
		Lifetime Present Worth O&M:	$95,962	Lifetime Present Worth O&M:	$19,361
		Total Present Worth:	$95,962	Total Present Worth:	$397,516
		Cost is based on 30-year time frame assumption.		Cost is based on 30-year time frame assumption.	

ICs - institutional controls
FFS - focused Feasibility Study
COCs - constituents of concern
RAOs - remedial action objectives
SRGs - site remediation goals
ARARs - applicable or relevant and appropriate requirements
O&M - operation and maintenance

TABLE 2-5
Cost Estimate of Remedial Alternative 3
Lab Area Record of Decision
NSF-IH, Indian Head, Maryland

Excavation, Off-site Disposal, and Wetland Creation	LOCATION: Lab Area NSF-IH, Indian Head, Maryland	MEDIA: Solid Waste and Contaminated Soil	Construction time: 3 weeks Operation time: N/A Post Remediation Monitoring: none

DESCRIPTION OF ALTERNATIVE:

Excavation of soil area of attainment containing contaminated soil; off-site disposal of the excavated material to a permitted landfill; and, creation of wetland.

ASSUMPTIONS:

	SF	CY	
1) The Upland AA is approx. (Fig 1 FS)	28700	1062.96	0.66 acres
2) The Wetland AA is approx. (Fig 1 FS)	15423.17	571.23	0.35 acres
		2,559	tons (assume bulk density of 1.85 kg/L)

	Wetland	Upland	
3) Total volume of top soil backfill (6" & 6", wetland & upland):	285.61	531.48	CY
4) Total volume of earthen material fill (6" and 6", wetland and upland):	285.61	531.48	CY

5) There are no munitions within the Lab Area

6) Swelling factor: 10%

7) Area requiring wetlands mitigation 15,423 SF 0.35 acres

8) Five-year reviews are required for replacement of signs, inspection, and reporting. O&M activities are limited to the care of the created wetland through biannual field inspections and vegetation replanting.

9) Sources of costs are 2007 RS Means Site Work & Landscape Cost Data, 2004 RS Means Environmental Remediation Cost Data - Unit Price, vendor quotes, and CH2M HILL rates based on similar projects.

10) Cost escalation factor to adjust 2007 cost to 2009 cost: 4% (applied to the individual cost of Env Rem)

Cost Component	Qty	Unit	Cost Source	Estimated Activity Duration (day)	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Material Unit Cost	Material Total Cost	Subcontractor	Total Cost
CAPITAL COSTS												
Site Preparation				**3**								**$3,330.70**
Site clearing (dozer light)	1.01	acre	M 31 11 10 10 0020	2	$1,278.69	$1,291.47	$1,073.00	$1,083.73	$0.00	$0.00	$0.00	$2,375.20
Survey	1	days	M02 21 13 13 0400	1	$897.50	$897.50	$58.00	$58.00	$0.00	$0.00	$0.00	$955.50
Excavation and Backfill				**10**								**$51,145.72**
Excavation, bulk, dozer, piled, 300 HP 50' haul common earth	1,634	CY	M 31 23 16 46 5020 adjusted (4.0 Multiplier per CCI)	1	$1.24	$2,026.40	$3.68	$6,013.82	$0.00	$0.00	$0.00	$8,040.22
Dewatering of Wetland excavated material (assumed - 75% of excavated material)	428	CY	CH2M HILL Estimate (stockpile passive dewatering, mix dry & wet, no free liquids)		$5.75	$2,463.42	$7.50	$3,213.16	$4.00	$1,713.69	$0.00	$7,390.27
Compaction - sheepsfoot, 12" lifts, 4 passes (compact natural soil before backfill)	1,634	CY	M 31 23 23 23 5720	1	$0.16	$261.47	$0.37	$604.65	$0.00	$0.00	$0.00	$866.12
Borrow, loading, and spreading - common earth, shovel, 1CY bucket (6" and 8" thick, wetland and upland)	817	CY	M 31 23 23 15 4000	1	$0.65	$531.11	$1.24	$1,013.20	$8.10	$6,618.48	$0.00	$8,162.79
Compaction - sheepsfoot, 6" lifts, 3 passes (Wetland 6" common earth)	286	CY	M 31 23 23 23 5620	1	$0.24	$68.55	$0.55	$157.09	$0.00	$0.00	$0.00	$225.64
Compaction - sheepsfoot, 12" lifts, 4 passes (Upland 8" common earth)	531	CY	M 31 23 23 23 5720	1	$0.16	$85.04	$0.37	$196.65	$0.00	$0.00	$0.00	$281.69
Borrow, loading, and spreading - top soil, shovel, 1CY bucket (6" and 4" thick, wetland and upland)	817	CY	M 31 23 23 15 7000	1	$0.65	$531.11	$1.24	$1,013.20	$22.00	$17,976.11	$0.00	$19,520.42
Grading - large area (Wetland)	1,714	SY	M 31 22 16 10 0100	1	$0.27	$462.70	$0.25	$428.42	$0.00	$0.00	$0.00	$891.12
Grading - small irregular area (Upland)	3,189	SY	M 31 22 16 10 1050	2	$0.81	$2,583.00	$0.85	$2,710.56	$0.00	$0.00	$0.00	$5,293.56
Compaction - sheepsfoot, 6" lifts, 2 passes (6" and 4" thick, wetland and upland)	817	CY	M 31 23 23 23 5600	1	$0.18	$147.08	$0.40	$326.84	$0.00	$0.00	$0.00	$473.92
Off-site Transportation and Disposal				**Concurrent w/ excavation**								**$227,897.48**
Landfill Fees	2,559	ton	E 33 19 7269		$0.00	$0.00	$0.00	$0.00	$85.80	$219,574.54	$0.00	$219,574.54
Dump Truck Transportation Minimum Charge (16.5 CY travel 23.5 miles)	2,517	miles	E 33 19 0218		$0.00	$0.00	$0.00	$0.00	$1.97	$4,957.81	$0.00	$4,957.81
Loading soil into truck	1,798	CY	E 33 19 0150		$0.67	$1,196.49	$1.21	$2,168.64	$0.00	$0.00	$0.00	$3,365.13
Site Restoration				**1**								**$2,241.46**
Hydroseeding	44	M.SF	M 32 92 19 13 2400	1	$9.65	$425.79	$5.65	$249.30	$35.50	$1,566.37	$0.00	$2,241.46
Wetlands Mitigation				**1**								**$8,750.00**
Planting of native wetland species	0.35	acre	Professional Judgment	1	$0.00	$0.00	$0.00	$0.00	$25,000.00	$8,750.00	$0.00	$8,750.00
Construction Oversight												**$26,400.96**
Engineer (P2)	3	weeks	CH2M HILL rates	15	$2,659.20	$7,977.60	$0.00	$0.00	$0.00	$0.00	$0.00	$7,977.60
Site Health and Safety (P2)	3	weeks	CH2M HILL rates	15	$2,659.20	$7,977.60	$0.00	$0.00	$0.00	$0.00	$0.00	$7,977.60
Superintendent (P3)	3	weeks	CH2M HILL rates	15	$3,481.92	$10,445.76	$0.00	$0.00	$0.00	$0.00	$0.00	$10,445.76
Preconstruction Submittals												**$3,928.07**
Preconstruction survey, design basis, pre-draft, draft, and final design, specifications, and H&S plans	1	lump sum	6% of total construction cost		$3,928.07	$3,928.07	$0.00	$0.00	$0.00	$0.00	$0.00	$3,928.07
General Conditions												**$9,820.18**
Decontamination, temp. facilities, sed. & erosion control, temp. fence, etc.	1	lump sum	15% of total construction cost		$9,820.18	$9,820.18	$0.00	$0.00	$0.00	$0.00	$0.00	$9,820.18
Contractor Overhead and Profit												**$9,820.18**
Home office cost, etc.	1	lump sum	15% of total construction cost		$9,820.18	$9,820.18	$0.00	$0.00	$0.00	$0.00	$0.00	$9,820.18
Mob/Demob												**$9,820.18**
Mob & demob of equip & personnel	1	lump sum	15% of total construction cost		$9,820.18	$9,820.18	$0.00	$0.00	$0.00	$0.00	$0.00	$9,820.18
Site Closure												**$25,000.00**
Report development	1	lump sum	Professional Judgment		$25,000.00	$25,000.00	$0.00		$0.00	$0.00	$0.00	$25,000.00
TOTAL CAPITAL COST						**$72,760.70**		**$19,237.25**		**$261,156.99**	**$0.00**	**$378,154.95**
OPERATION & MAINTENANCE AND PERIODIC ACTIVITIES - PER EVENT COST												
Wetlands Maintenance												**$1,175.00**
Biannual inspection	4	hrs	E 99 11 0403 CH2M HILL adjusted		$75.00	$300.00	$0.00	$0.00	$0.00	$0.00	$0.00	$300.00
Replanting												
Assume 10% of wetlands mitigation cost per inspection	1	lump sum	Professional Judgment		$875.00	$875.00	$0.00		$0.00	$0.00	$0.00	$875.00
Site Closure												**$15,000.00**
Report development	1	lump sum	Professional Judgment		$15,000.00	$15,000.00	$0.00		$0.00	$0.00	$0.00	$15,000.00

SF - square feet; CY - cubic yards; AA - area of attainment

TABLE 2-6
Present Worth for Remedial Alternative 3
Lab Area Record of Decision
NSF-IH, Indian Head, Maryland

PRESENT WORTH CALCULATION
REMEDIAL ALTERNATIVE 3 - EXCAVATION, OFF-SITE DISPOSAL, AND WETLAND CREATION

Location:	Lab Area, NSF-IH, Indian Head, Maryland	Construction time:	3 weeks
Media:	Soil and Solid Waste - Upland and Wetland Areas	Operation time:	30 years
		Discount Rate:	3.3%
		O&M Contingency:	Fixed-Price

Year	Real Cost Incurred	Cost Description	Cost Type	Discount Factor	Present Worth
0	$378,155	Cost associated with excavation and disposal and wetlands mitigation	Capital	1.00	$378,155
1	$2,350	Two biannual field inspections and replanting	O&M	1.03	$2,275
2	$2,350	Two biannual field inspections and replanting	O&M	1.07	$2,202
3	$2,350	Two biannual field inspections and replanting	O&M	1.10	$2,132
4	$0	NA	NA	1.14	$0
5	$15,000	Site Closure	Periodic	1.18	$12,752
CAPITAL COST	**$378,155**				
2009 Dollar LIFETIME O&M	**$22,050**		**Lifetime Present Worth O&M**		**$19,361**
TOTAL IMPLEMENTATION COST	**$400,205**		**TOTAL PRESENT WORTH**		**$397,516**

O&M - operation and maintenance
NA - not applicable

TABLE 2-7
Expected Outcomes of the Selected Remedy
Lab Area Record of Decision
NSF-IH, Indian Head, Maryland

Risk	RAO	Remedy Component	Metric/Cleanup Level	Expected Outcome
Lead and mercury in surface soil in the Upland Area	Reduce risks to human receptors from exposure to mercury and lead in the surface soil in the Upland Area to acceptable levels	Excavation of the Upland Area surface soil	Human health risk-based cleanup goals	Current land use (industrial)
Mercury in and around sewer pipes	Reduce risks to human receptors from exposure to mercury in the Upland Area subsurface soil to acceptable levels	Implementation of ICs on the subsurface soil AA (equivalent to the site boundary)	Human health risk-based cleanup goal	Current land use (industrial)
Mercury in sediment in the Wetland Area	Reduce risks to ecological receptors from exposures to mercury in the sediment in the Wetland Area to acceptable levels	Excavation of Wetland Area sediment	Ecological risk-based cleanup goal	Current land use (industrial)
Arsenic in sediment in the Wetland Area	Reduce risks to human receptors from exposure to arsenic in the sediment in the Wetland Area to acceptable levels	Excavation of Wetland Area sediment	Human health risk-based cleanup goal	Current land use (industrial)

RAO – remedial action objective
ICs – institutional controls
AA – area of attainment

Table 2-8
Chemical-Specific ARARs
Lab Area Record of Decision
NSF-IH, Indian Head, Maryland

Chemicals & Relevant Media	Requirement	Prerequisites	Citation	ARAR or TBC	Comments
No Federal or Maryland Chemical-Specific ARARs apply.					

Table 2-9
Location-Specific ARARs
Lab Area Record of Decision
NSF-IH, Indian Head, Maryland

Location	Requirement	Prerequisite	Citation	Applicability Determination	Comments
Federal Location-Specific ARARs					
Clean Water Act, Section 404					
Wetland	Activities conducted in wetlands must be avoided if practicable alternatives exist. If they cannot be avoided steps must be taken to minimize damage.	Operating in wetlands	40 CFR 230.10(a)(1)-(a)(3), (b)(1), (b)(2), (c),(d); .75(d)	Applicable	The response actions includes excavation in wetland areas. These areas will be backfilled and restored as wetlands. Steps will be taken to protect the ecosystem. Specific considerations referenced in 40 CFR 230, Subparts B through H that are applicable or relevant and appropriate to this action are included as action-specific ARARs.
Migratory Bird Treaty Act					
Migratory bird area	Protects almost all species of native birds in the United States from unregulated taking which can include poisoning at hazardous waste sites or harassment during remedial operations.	Presence of migratory birds or their nests or eggs.	*Migratory Bird Treaty Act* , 16 USC 703	Applicable	The site is located in the Atlantic Migratory Flyway. If migratory birds , or their nests or eggs, are identified at the site, operations will not destroy the birds, nests, or eggs.
No Maryland Location-Specific ARARs apply					

ARARs - Applicable or relevant and appropriate requirements.
RCRA - Resource Conservation and Recovery Act.
CFR - Code of Federal Regulations.
CWA- Clean Water Act.
DON - Department of Navy.
EO - Executive Order
FR - Federal Register.
HWCA - Hazardous Waste Control Act.
USC - United States Code.
TBC - To Be Considered.

Table 2-10
Action-Specific ARARs
Lab Area Record of Decision
NSF-IH, Indian Head, Maryland

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Federal Action-Specific ARARs					
Discharge of dredge-and-fill	No discharge of dredged or fill material will be allowed unless appropriate and practicable steps are taken that minimize potential adverse impacts of the discharge on the aquatic ecosystem.	Discharges of dredged or fill material to surface waters, including wetlands.	40 CFR 230.10(b)(1), (b)(2), (c), (d); .20; .31; .32; .41; .42; .53; .60; .70(f); .72(c); .74(a); (b); and (e); .75(b); and (d)	Applicable	A wetland is present within proposed boundary of the excavation and backfill. The wetland will be temporarily impacted for the removal of impacted soil, then restored as a wetland. Steps will be taken to minimize the impacts to the ecosystem. The citations include the portions of 40 CFR 230, Subparts B-H that are applicable to this action.
Maryland Action-Specific ARARs					
Maryland Hazardous Waste Regulations					
Identifcation of hazardous waste	It is the responsibility of the generator to determine if wastes generated meet the definition of hazardous waste.	Generation of waste that meets the regulatory definition of solid waste.	COMAR 26.13.03.02	Applicable	An onsite lab will be utilized for testing excavated soil to determine if it meets the definition of hazardous waste.
Onsite mangement of hazardous waste in containers	Hazardous wastes may be managed onsite in containers for 90 days or less provided that the containers are in good condition; compatible with the waste they contain; closed when not adding or removing waste; labeled with the words "Hazardous Waste", the accumulation start date, and any other information requried by DOT; inspected weekly, and provided with secondary containment as applicable.	Accumulation of hazardous wastes in containers	COMAR 26.13.03.05(E)(1)(a)-(g)	Applicable	All excavated wastes that could be hazardous will be managed in accordance with these requriements pending the outcome of analytical testing.
Onsite mangement of hazardous waste in stockpiles	Hazardous wastes may be managed temporarily onsite in stockpiles. No wastes containing free liquids or that will generate leachate may be placed in the piles and incompatible wastes may not be mixed together. Additionally the pile must be designed and operated to prevent exposure to precipiatation and surface water run-on and to prevent wind dispersion by a means other than wetting. The waste pile must be routinely inspected weekly and after storms. A contingency plan must be prepared that addresses emergency procedures relating to waste stored in this manner; however, it may be integrated into other emergency plans.	Accumulation of hazardous wastes in stockpiles	COMAR 26.13.05.03(E),(F); .04(C)-(G); .12(A)(2), (C), (E)(4);	Applicable	Hazardous soil may be generated during remedial activities and managed in piles.
Maryland Solid Waste Regulations					
Onsite management of non-hazardous waste in stockpiles	Solid waste may not be managed in a manner that will likely create a nuisance; be conducive to pest infestation; pollute the air or water; impair the qualityof the environment; or create other hazards to public health, safety or comfort.	Management of solid wastes	COMAR 26.04.07.03(A)	Applicable	Remdiation wastes meeting the definition of solid waste will be generated during remedial activity.
Water Pollution					
Discharge of storm water during construction activities	Requirements for construction activity include the development of a storm water mangement plan and an erosion and a storm water management plan.	Performing construction activities which disturb more than one acre of land	COMAR 26.08.04.09(A)(2), (5); 26.17.02.09 (E)(5)(a)-(e), (6)(a)-(p); 26.17.01.07B(2); (3)(a)-(h),(j)	Applicable	Noted plans will be prepared as requried and control measured implemented to prevent impacts to storm water from site activity.
Occupational, Industrial, and Residential Hazards					

Table 2-10
Action-Specific ARARs
Lab Area Record of Decision
NSF-IH, Indian Head, Maryland

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Construction activities generating noise	The maximum permitted levels for construction activities may not exceed 90 dBA during the day and 75 dBA during the night.	Conducting any construction activities that generate noise	COMAR 26.02.03.03(A)(2), (4)	Applicable	During site remediation work, the maximum allowable noise levels will not be exceeded.
Air Quality					
Construction activities generating dust	Reasonable precautions must be taken to prevent particulate matter from becoming airborne during construction activities. These include the application of water or appropriate chemicals to roads, materials, and stockpiles; covering open-bodied vehicles that are transporting materials or soil likely to create dust, maintenance of roadways including the removal of soil that has been tracked out by equipment.	Conducting any construction activity which could cause particulate matter to become airborne.	COMAR 26.11.06.03D(1), (2), (4), (6)	Applicable	Dust control measures will be taken implemented during remedial activies.

Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs. Specific potential ARARs are addressed in the table below each heading.
Acronyms used in the table:

ARAR - Applicable or relevant and appropriate requirement
CAA - Clean Air Act
RCRA - Resource Conservation and Recovery Act
CFR - Code for Federal Regulations
CWA - Clean Water Act
DOT - U.S. Department of Transportation
EPA - U.S. Environmental Protection Agency
NPDES - National Pollutant Discharge Elimination System.
OSHA - Occupational Safety and Health Administration
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
SDWA - Safe Drinking Water Act
SMCLs - Secondary Maximum Contaminant Levels
TBC - To be considered
USC - United States Code

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\359525INDIANHEAD\MAPFILES\314138_LAB_AREA_ROD\FIGURE 2-1 - SITE LAYOUT - NO AIR PHOTO.MXD BHATHAWA 6/27/2011 4:07:50 PM

Legend

- Manhole of Interest
- Sanitary Sewer
- Storm Sewer
- Railroad
- Contours (5ft)
- Contours (1ft)
- Wooded Area
- Road Area
- Buildings

N

0 37.5 75 Feet

Figure 2-1
Site Layout
Lab Area Record of Decision
NSF-IH, Indian Head, Maryland

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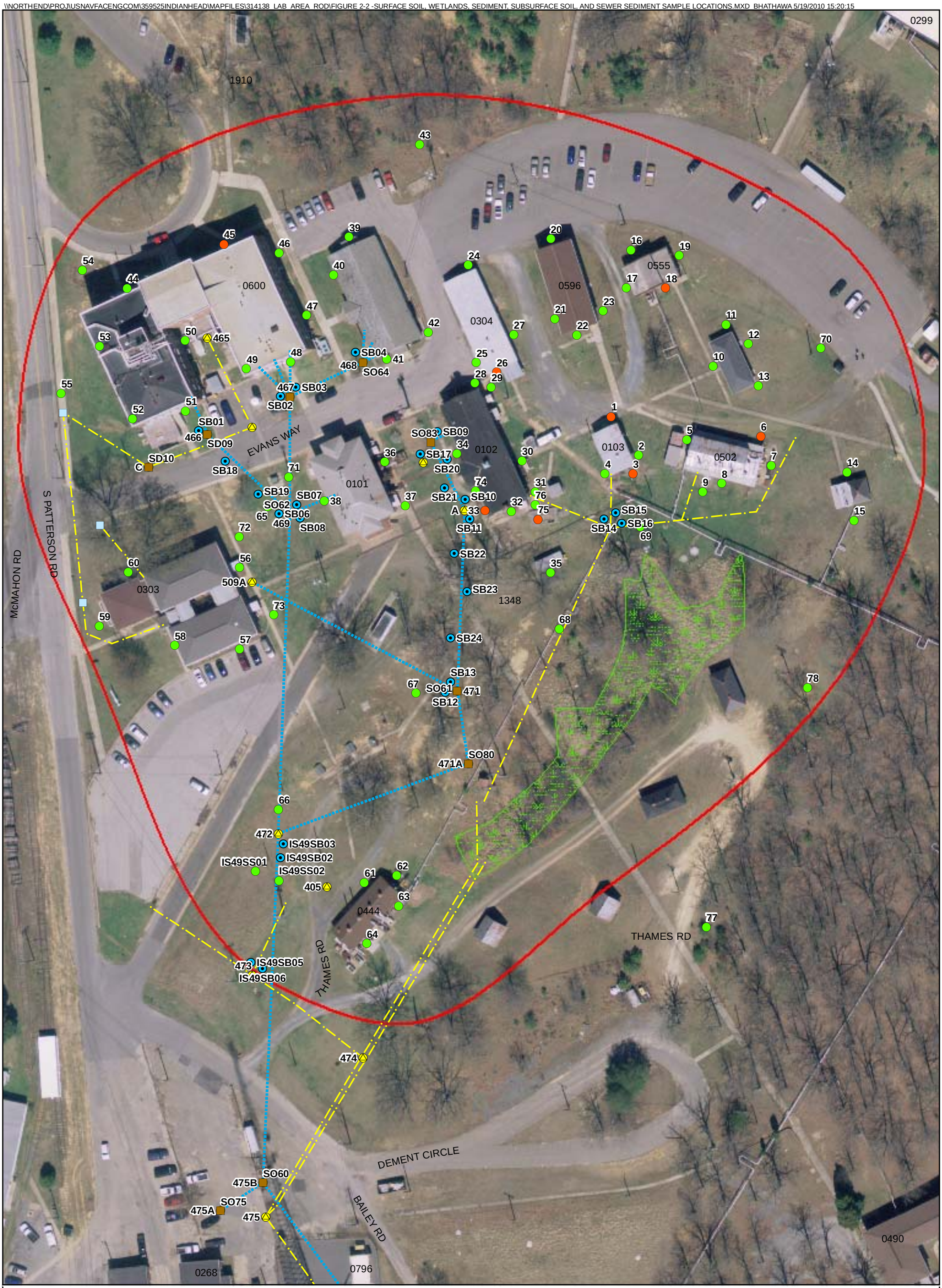
\\NORTHEND\PROJ\USNAVFACENGCOM\359525INDIANHEAD\MAPFILES\314138_LAB_AREA_ROD\FIGURE 2-2 -SURFACE SOIL, WETLANDS, SEDIMENT, SUBSURFACE SOIL, AND SEWER SEDIMENT SAMPLE LOCATIONS.MXD BHATHAWA 5/19/2010 15:20:15



Legend

- Subsurface Soil Sample Location
- Surface Soil Sample Location
- Surface Soil Sample Location for BERA
- Sediment Sample Location
- Manhole of interest
- Grate
- Storm Sewer
- Sanitary Sewer (Based on the 11/1/1991 Area Development Plan for Area 12 - Utilities, Sanitary Sewerage and Storm Drainage Systems)
- Wetland Extent (2006)
- Approximate Lab Area Site Boundary

N

0 37.5 75 150 Feet

Figure 2-2
Surface Soil, Wetlands, Sediment, Subsurface Soil, and Sewer Sediment Sample Locations
Lab Area Record of Decision
NSF-IH, Indian Head, Maryland

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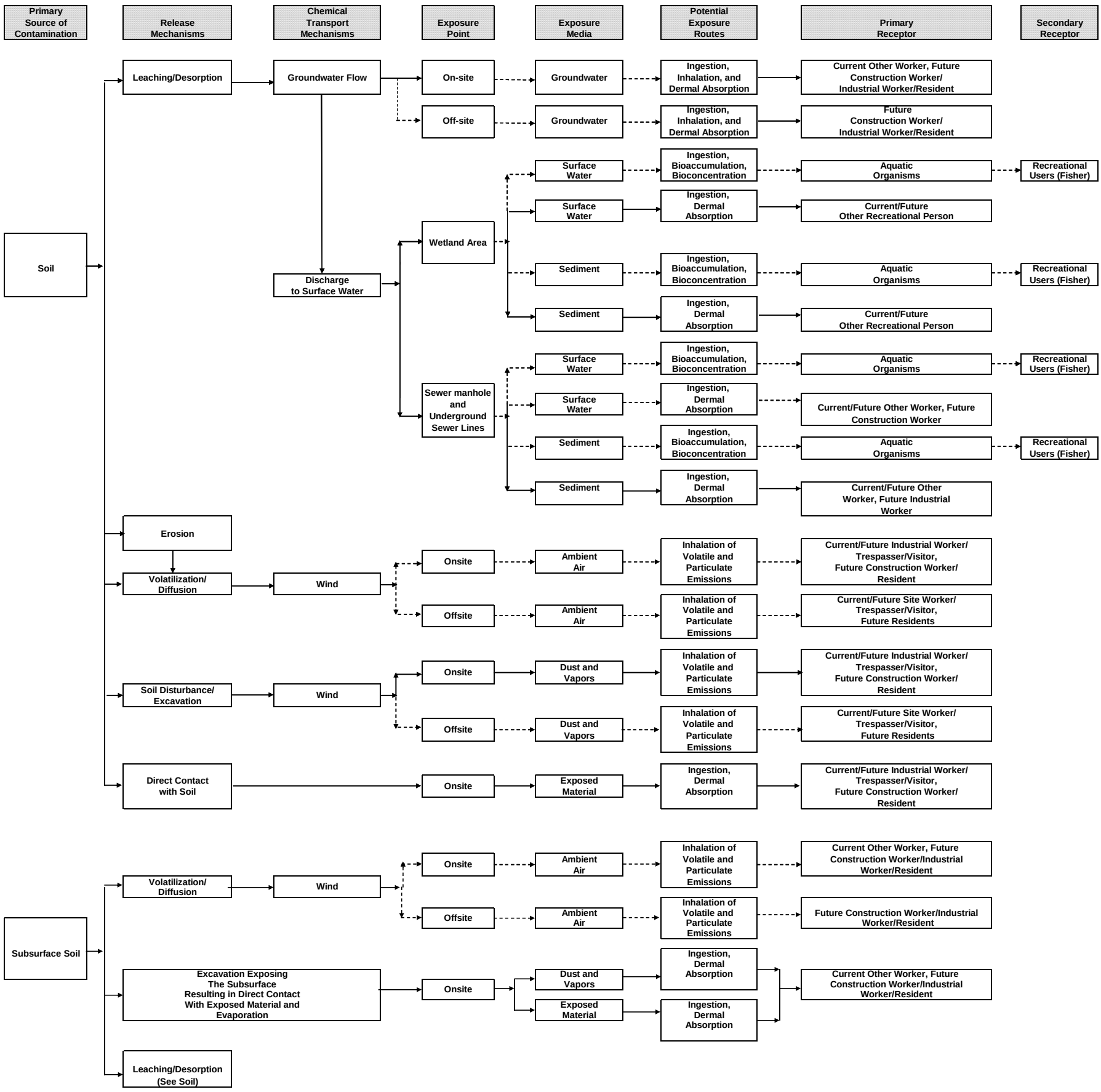
FIGURE 2-3
Conceptual Site Model for Human Health Risk Assessment
Lab Area Record of Decision
NSF-IH, Indian Head, Maryland



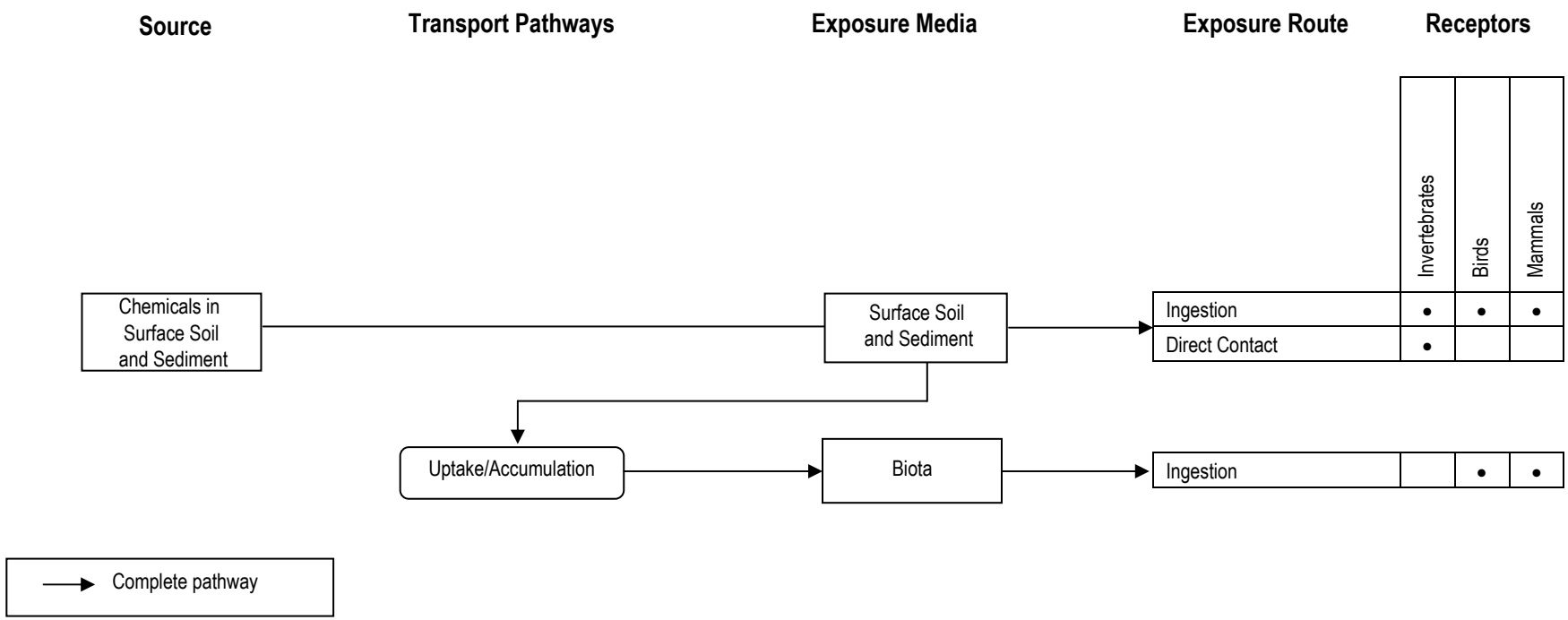


Figure 2-4
Ecological Conceptual Model
Record of Decision
NSF-IH, Indian Head, Maryland

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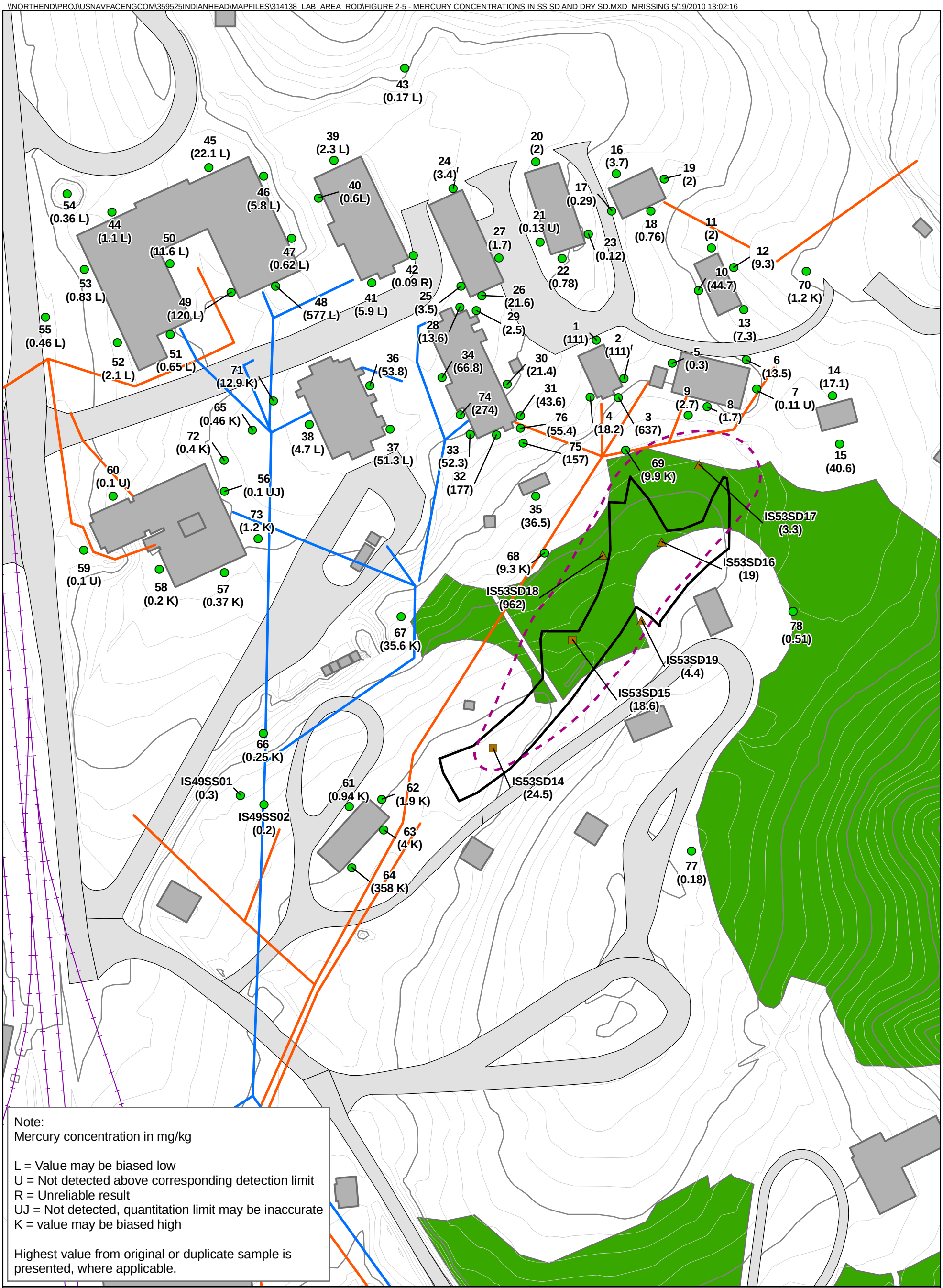
\\NORTHEND\PROJ\USNAVFACENGCOM\359525INDIANHEAD\MAPFILES\314138_LAB_AREA_ROD\FIGURE 2-5 - MERCURY CONCENTRATIONS IN SS SD AND DRY SD.MXD MRISSING 5/19/2010 13:02:16



Note:
Mercury concentration in mg/kg

L = Value may be biased low
U = Not detected above corresponding detection limit
R = Unreliable result
UJ = Not detected, quantitation limit may be inaccurate
K = value may be biased high

Highest value from original or duplicate sample is presented, where applicable.

Legend

- Dry Sediment Sample Location
- Sediment Sample Location
- Surface Soil Sample Location
- Sanitary Sewer
- Storm Drainage
- Railroad
- Contours (5ft)
- Contours (1ft)
- RI Wetland Extent (2004)
- Wetland Extent (2006)
- Wooded Area
- Road
- Buildings

N

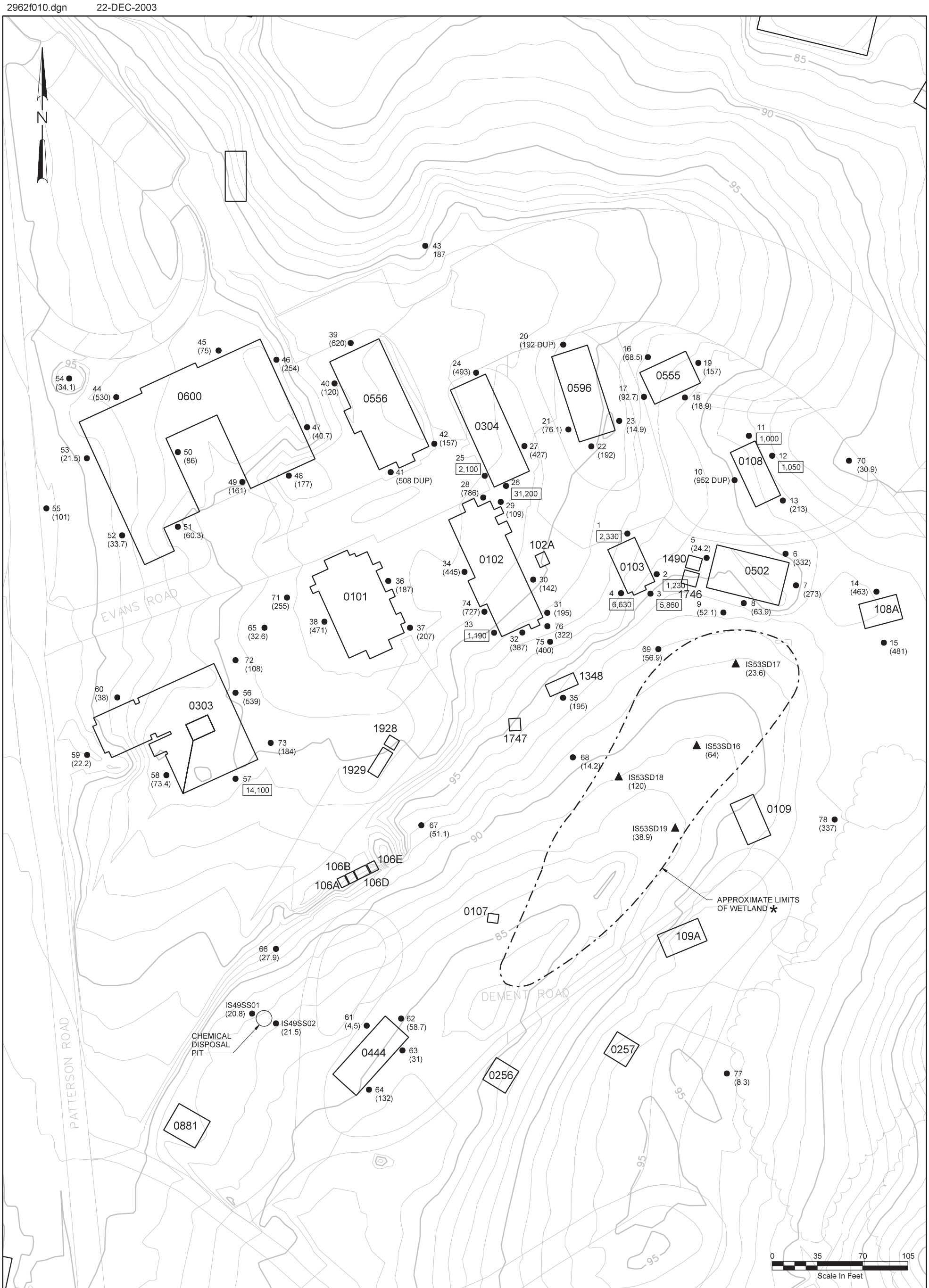
0 37.5 75 Feet

1 inch = 75 feet

Figure 2-5
Mercury Concentrations in Surface Soil, Sediment, and Dry Sediment
Lab Area Record of Decision
NSF-IH, Indian Head, Maryland

CH2MHILL

2962f010.dgn 22-DEC-2003



LEGEND

- ● SURFACE SOIL SAMPLE LOCATION (TRUNCATED SAMPLE ID SHOWN FOR SITE 53 CONGLOMERATE SURFACE SOIL SAMPLES. NOTE SAMPLE ID FORMAT WOULD BE IS53SS##0001)
- ▲ DRY SEDIMENT SAMPLE LOCATION
- (13.4) LEAD CONCENTRATION IN MG/KG
- [14,100] SELECT HIGHER LEAD CONCENTRATION IN MG/KG (ABOVE 1,000 MG/KG)
- * ESTIMATED LOCATION OF EMERGENT WETLAND IN MARCH 2001. WETTED AREA CHANGES DEPENDING ON PRECIPITATION AND SATURATION, AS WELL AS THE PRESENCE OF UNDERGROUND LEAKING FRESHWATER PIPES

NOTES:

HIGHEST VALUE FROM ORIGINAL OR DUPLICATE SAMPLE IS PRESENTED, WHERE APPLICABLE.

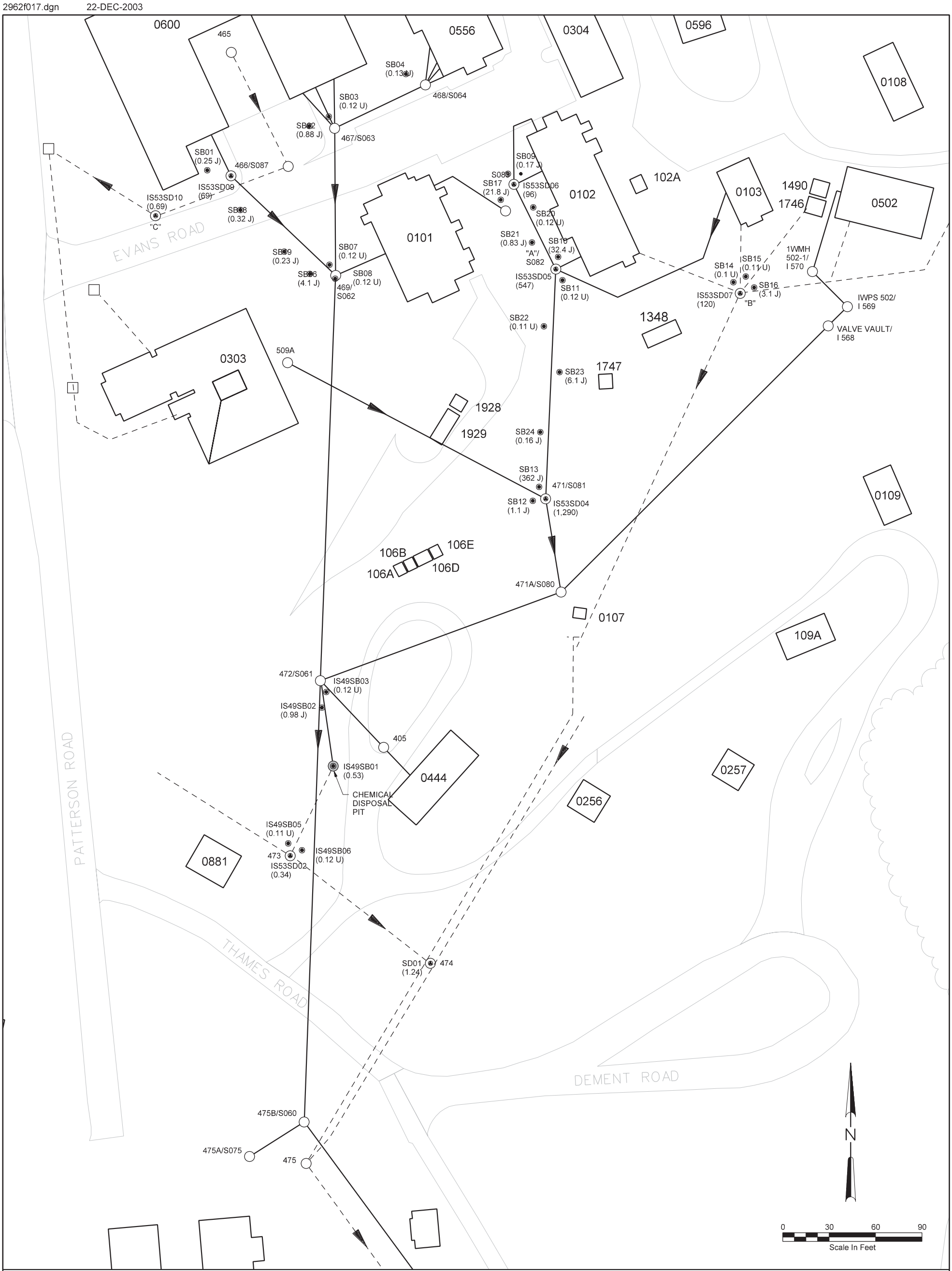
BASE-WIDE BACKGROUND 95% UCL = 21.7 MG/KG
BASE-WIDE BACKGROUND MEAN CONCENTRATION = 17.9 MG/KG

LAB AREA SURFACE SOIL MEAN CONCENTRATION = 987.36 MG/KG

Figure 2-6
Lead Concentrations in Surface Soil and Dry Sediment
Lab Area Record of Decision
NSF-IH, Indian Head, Maryland

CH2MHILL

2962f017.dgn 22-DEC-2003



LEGEND:

- SEDIMENT SAMPLE LOCATION
- SUBSURFACE SOIL SAMPLE LOCATION
- MANHOLE
- GRATE
- STORM SEWER
- SANITARY SEWER
- (0.34) MERCURY CONCENTRATION IN MG/KG

U = NOT DETECTED
J = ESTIMATED VALUE
UJ = NOT DETECTED, QUANTITATION LIMIT MAY BE INACCURATE

ALL CONCENTRATIONS IN MG/ KG

HIGHEST VALUE FROM ORIGINAL SAMPLE OR DUPLICATE SAMPLE IS PRESENTED, WHERE APPLICABLE.

SUBSURFACE SOIL BASE-WIDE BACKGROUND 95% UCL = 0.18 MG/KG
SUBSURFACE SOIL BASE-WIDE BACKGROUND MEAN CONCENTRATION = 0.06 MG/KG

LAB AREA SUBSURFACE SOIL MEAN CONCENTRATION = 15.56 MG/KG
LAB AREA SEWER SEDIMENT MEAN CONCENTRATION = 1,290 MG/KG

Figure 2-7
Mercury Concentrations in Subsurface Soil and Sewer Sediment
Lab Area Record of Decision
NSF-IH, Indian Head, Maryland

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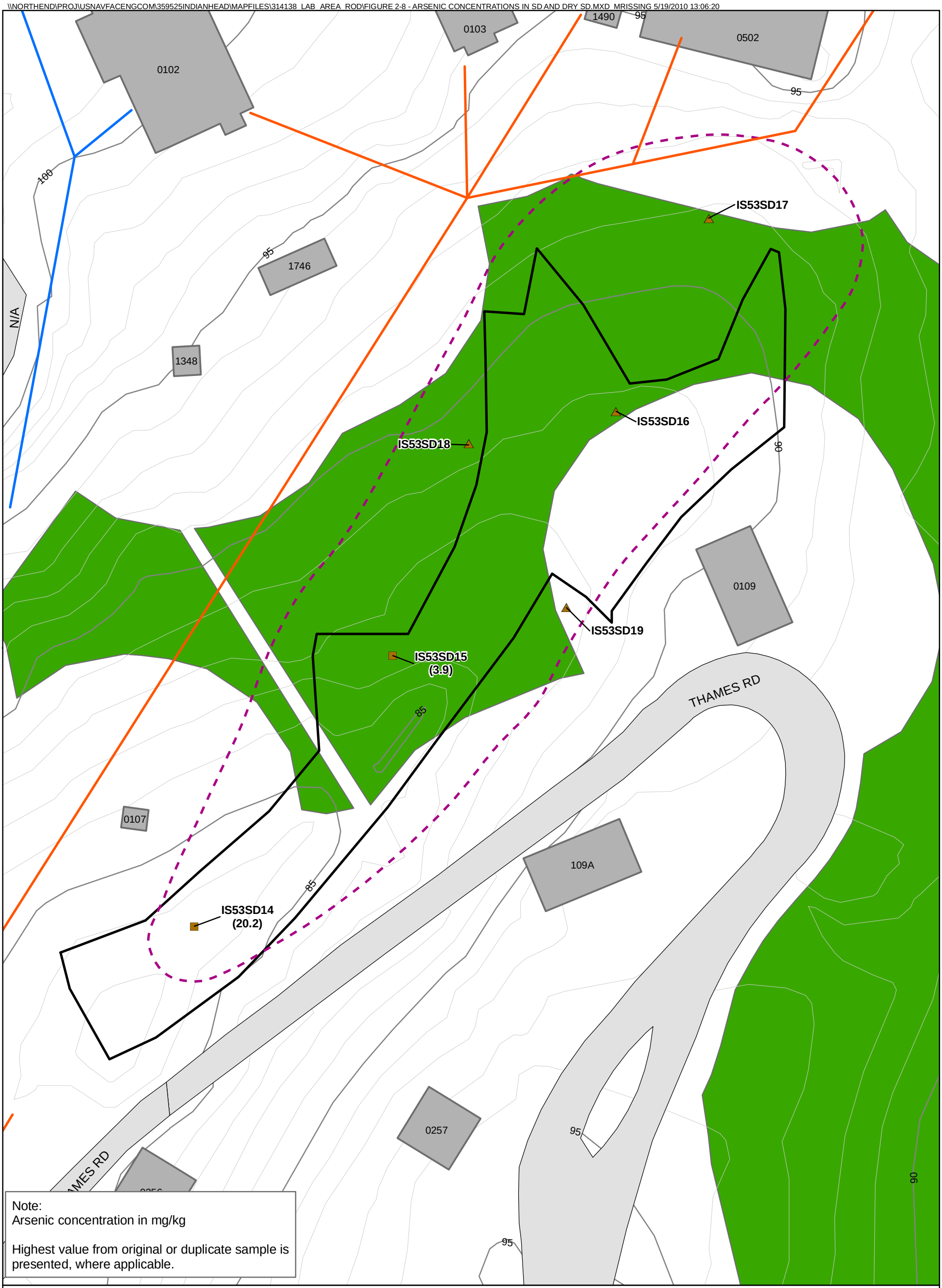
\\NORTHEND\PROJ\USNAVFACENGCOM\359525INDIANHEAD\MAPFILES\314138_LAB_AREA_ROD\FIGURE 2-8 - ARSENIC CONCENTRATIONS IN SD AND DRY SD.MXD MRISSING 5/19/2010 13:06:20



Legend

- Dry Sediment Sample Location
- Sediment Sample Location
- Sanitary Sewer
- Storm Drainage
- Railroad
- Contours (5ft)
- Contours (1ft)
- RI Wetland Extent (2004)
- Wetland Extent (2006)
- Wooded Area
- Road
- Buildings

N

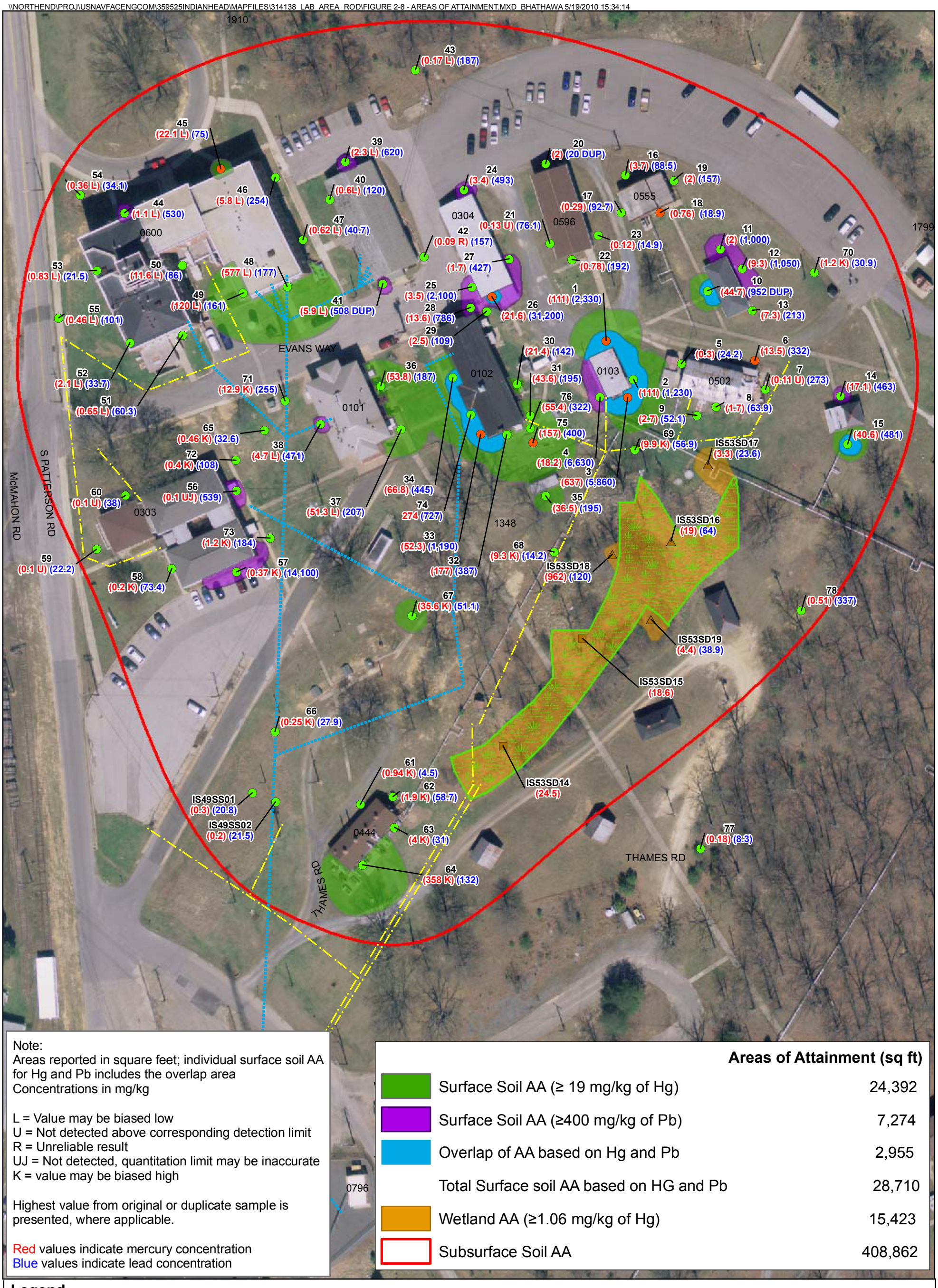
0 15 30 Feet

1 inch = 30 feet

Figure 2-8
Arsenic Concentrations in Sediment
Lab Area Record of Decision
NSF-IH, Indian Head, Maryland

CH2MHILL

\\NORTHEND\PROJ\USNAVFACENGCOM\359525INDIANHEAD\MAPFILES\314138_LAB_AREA_ROD\FIGURE 2-8 - AREAS OF ATTAINMENT.MXD BHATHAWA 5/19/2010 15:34:14



Note:
Areas reported in square feet; individual surface soil AA for Hg and Pb includes the overlap area
Concentrations in mg/kg

L = Value may be biased low
U = Not detected above corresponding detection limit
R = Unreliable result
UJ = Not detected, quantitation limit may be inaccurate
K = value may be biased high

Highest value from original or duplicate sample is presented, where applicable.

Red values indicate mercury concentration
Blue values indicate lead concentration

Areas of Attainment (sq ft)	
Surface Soil AA (≥ 19 mg/kg of Hg)	24,392
Surface Soil AA (≥400 mg/kg of Pb)	7,274
Overlap of AA based on Hg and Pb	2,955
Total Surface soil AA based on HG and Pb	28,710
Wetland AA (≥1.06 mg/kg of Hg)	15,423
Subsurface Soil AA	408,862

Legend

- Dry Sediment Sample Location
- Sediment Sample Location
- Surface Soil Sample Location
- Surface Soil Sample Location for BERA
- Storm Sewer
- Sanitary Sewer (Based on the 11/1/1991 Area Development Plan for Area 12 - Utilities, Sanitary Sewerage and Storm Drainage Systems)
- Approximate Lab Area Site Boundary
- Wetland Extent (2006)

N

0 37.5 75 150 Feet

Figure 2-9
Areas of Attainment
Lab Area Record of Decision
NSF-IH, Indian Head, Maryland

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SECTION 3

Responsiveness Summary

This Responsiveness Summary represents a concise and complete summary of significant comments received from the public on the Proposed Plan and includes responses to these comments. It was prepared after the public comment period ended on May 12, 2010, in accordance with guidance in *Community Relations in Superfund: A Handbook* (EPA, 1992). This Responsiveness Summary provides the decision maker with information about the views of the community. It also documents how the Navy, EPA, and MDE considered public comments during the decision making process and provides answers to major comments.

3.1 Stakeholder Comments and Lead Agency Responses

The 30-day public comment period for the preferred alternative in the Proposed Plan for the Lab Area began on April 12, 2010 and ended on May 12, 2010. A public meeting was held on April 15, 2010 at the Indian Head Senior Center, 100 Cornwallis Square, Indian Head, Maryland, to accept oral and written comments on the preferred alternative. No oral or written comments were received during the public comment period.

3.2 Technical and Legal Issues

No technical or legal issues have been identified for the Lab Area with respect to this ROD.

SECTION 4

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