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FINAL SITE INSPECTION REPORT SITE 7 OLD DUPONT DISPOSAL AREA FISC WILLIAMSBURG VA

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CH2M HILL

Final

Site Inspection Report
Site 7—Old DuPont Disposal Area

Naval Weapons Station Yorktown Cheatham Annex
Williamsburg, Virginia

Prepared for

Department of the Navy

Naval Facilities Engineering Command
Mid-Atlantic

Contract No.
N62470-08-D-1000
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June 2012

Prepared by

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CH2MHILL®

Virginia Beach, Virginia

Executive Summary

This Site Inspection (SI) report summarizes the data and findings obtained from January and February 2011 investigation activities conducted at Site 7, located at the Naval Weapons Station (WPNSTA) Yorktown Cheatham Annex (CAX) (**Figure ES-1**). The objectives of the SI are to determine whether a release of hazardous constituents has occurred from past Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-regulated activities, and, if so, determine whether a suspected release warrants further action.

Approximately 1 acre in size, Site 7, also known as the Old DuPont Disposal Area, is located along the York River, northeast of Chase Road in the north central part of CAX. According to the *Initial Assessment Study of Naval Supply Center (Norfolk) Cheatham Annex and Yorktown Fuels Division,* Site 7 was used as a disposal area for non-hazardous, inert wastes from the former City of Penniman and the former DuPont Company Penniman facility during the early 1900s (C.C. Johnson & Associates Inc. and CH2M HILL, 1984). The presence of ash, melted bottles, and charred metal indicate some of the waste may have been incinerated prior to disposal (Baker, 2004).

SI activities were conducted in accordance with the *Site 7 – Old DuPont Disposal Area Site Investigation Work Plan and Sampling and Analysis Plan*, *Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia* (CH2M HILL, 2011a).

A "CERCLA-regulated release" is a release of hazardous substances, pollutants, and contaminants eligible for CERCLA response, as defined in CERCLA Sections 101(14) and 101(33). Specifically, a "CERCLA-regulated release" is where past site-specific activities resulted in spilling, leaking, disposing, or similar discharging of hazardous substances, pollutants, or contaminants that are subject to CERCLA regulation into the environment.

To determine whether a CERCLA-regulated release occurred at Site 7 and/or whether any release warrants further action, samples of environmental media and related data were collected for evaluation. The environmental media data were evaluated via the three-step decision analysis process. The first evaluation of the data collected is the "release assessment" (Step 1). That is, a potential release is suspected where inorganic constituents above background concentrations or any other constituents are detected. It is important to note that identifying a "suspected release" does not necessarily mean a CERCLA-regulated release occurred. Nor does it mean that the potential release warrants further action. Additional evaluation (Steps 2 and 3), such as historical site information and comparison of site-specific data to regulatory screening criteria, is then used to refine the understanding of the "suspected release." Steps 2 and 3 consider such information as the CERCLA eligibility of the constituents identified and the presence of exposure pathways, along with conservative, and, where warranted, more realistic, risk-based and other screening values published by regulatory agencies. The additional evaluation also includes a holistic consideration of site-specific information (that is, historical information, media data, and so forth) to make a determination of whether the potential source area and the extent of

contamination at the site was sufficiently characterized, and whether the potential sources of contamination have been removed.

The outcome of the three-step decision analysis process is a conclusion of whether a CERCLA-regulated release likely occurred and, if so, whether the suspected release warrants further action. If no CERCLA-regulated release is suspected, or if the data suggest a release does not warrant further action (e.g., after source area elimination has occurred), then preparation of a no action (NA) or no further action (NFA) decision document is recommended. If a suspected CERCLA-regulated release warrants further action, a recommendation for the further action is made.

The site history, data collection activities, results of the data evaluation (including the three-step decision analysis), and conclusions and recommendations are summarized in **Table ES-1**. A Remedial Investigation (RI) is recommended to further characterize site related contamination and evaluate potential risk to human health and ecological receptors.

TABLE ES-1
Summary of Conclusions and Recommendations
Site 7 Site Inspection Report
Cheatham Annex
Williamsburg, Virginia

Site Name	Site Description	Site History	Potential Source(s)	Potential Release Mechanism(s)	Site Specific Data Collected	Results of 3-Step Decision Analysis	Conclusions	Recommendations
Site 7	Old DuPont Disposal Area	Unlined landfill where non-hazardous inert wastes from the City of Penniman and the former DuPont Company Penniman facility were disposed along the York River during the early 1900s. Information on the types and quantities of wastes received is not available; however, the presence of ash, melted bottles, and charred metal indicate some of the waste may have been incinerated prior to disposal. A removal action was completed between December 2007 and April 2008 to remove waste and waste-impacted soils. All visible debris and 2,998 cubic yards of soil was removed from	Former buried debris and ash	Leaching of constituents from buried debris into soil and groundwater	47 post removal soil samples, 5 onsite groundwater samples and 2 offsite background groundwater samples were collected from throughout the site	The data suggest exposure to thallium in surface soil and bromodichloromethane, chloroform, dibromochloromethane, PCE, TCE, VC, 2,4-dinitrotoluene, RDX, and arsenic in groundwater may result in unacceptable risk to human health.	The data suggest that additional soil and groundwater samples will need to be collected to further characterize the extent of consituents within these media. Further risk analysis is also recommended for inclusion in the RI.	Conduct an RI is to further characterize site related contamination and evaluate potential risk to human health and ecological receptors.

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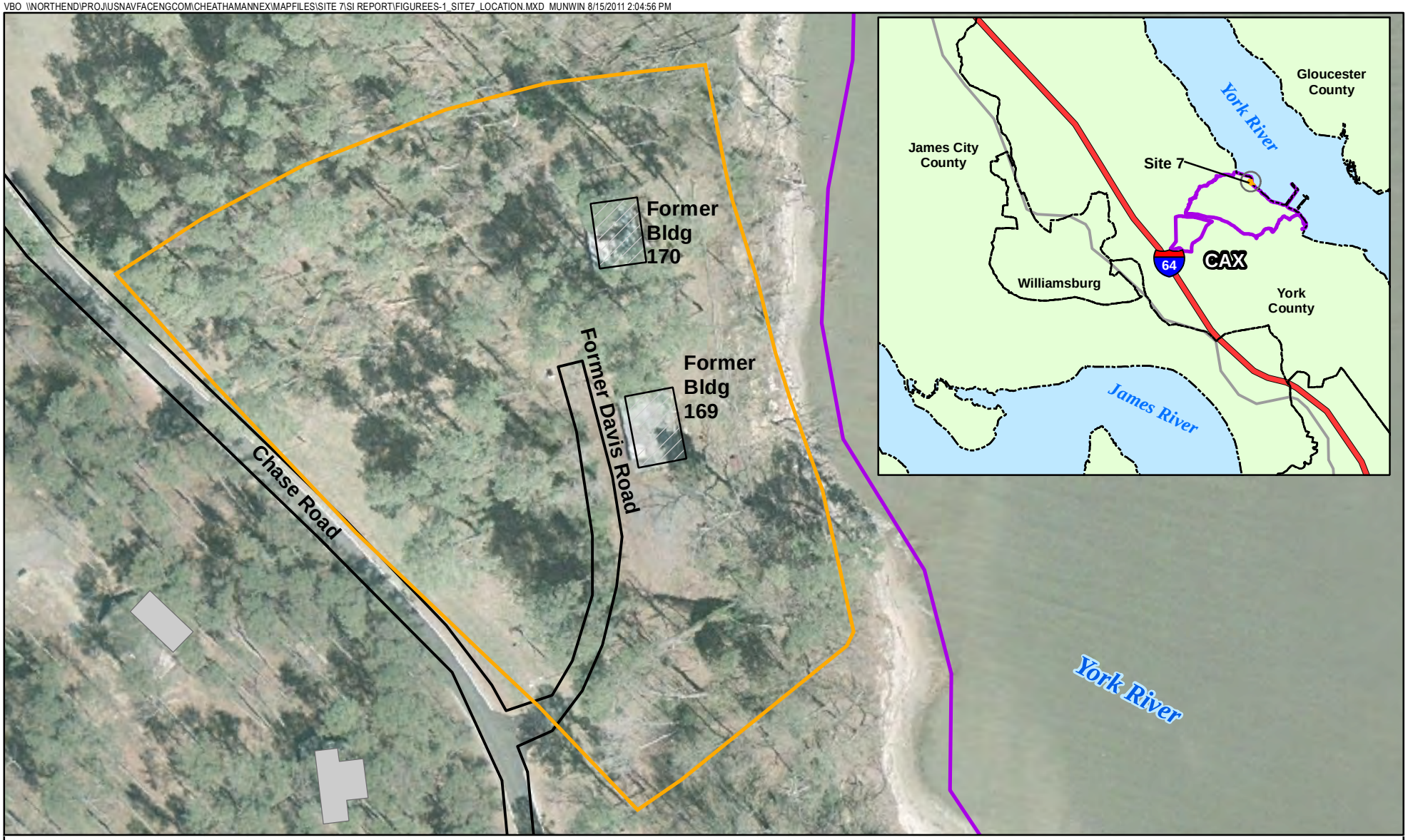

Legend

- Site Boundary
- Cheatham Annex Boundary
- Buildings
- Former Buildings
- Roads

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W E
S

0 40 80
Feet

Figure ES-1
Site 7 Location
Site 7 Site Inspection Report
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

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Acronyms and Abbreviations

AOC	area of concern
bgs	below ground surface
CAX	Cheatham Annex
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-term Environmental Action—Navy
COPC	constituent of potential concern
CSM	conceptual site model
CTO	Contract Task Order
cy	cubic yards
DDD	dichlorodiphenyldichloroethane
DL	detection limit
DO	dissolved oxygen
DoD	Department of Defense
EFH	Essential Fish Habitat
EPC	exposure point concentrations
ESV	ecological screening value
˚F	degrees Fahrenheit
FFA	Federal Facilities Agreement
FMETAL	Filtered or Dissolved Metals
ft/day	feet per day
GPS	global positioning system
HI	hazard index
HQ	hazard quotient
IAS	Initial Assessment Study
IDW	investigation-derived waste
LCS	Laboratory Control Sample
LOAEL	Lowest Observed Adverse Effect Level
LOD	limit of detection
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µm	micron
MATC	Maximum Acceptable Toxicant Concentration
MCL	Maximum Contaminant Level
MD	munitions debris

mg/kg	milligrams per kilogram
MS	matrix spike
MSD	matrix spike duplicate
msl	mean sea level
NA	no action
NAVD	North American Vertical Datum
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NFA	no further action
NOAEL	No Observed Adverse Effect Level
NPL	National Priorities List
ORP	oxidation reduction potential
PAH	polycyclic aromatic hydrocarbon
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
pg/g	picograms per gram
PPE	personal protective equipment
ppm	parts per million
ppt	parts per thousand
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
QL	quantitation limit
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RPD	relative percent differences
RSL	Regional Screening Level
RTK	Real-Time Kinematic
SAP	Sampling and Analysis Plan
SI	Site Inspection
SIM	selective ion monitoring
SOP	standard operating procedure
SSA	Site Screening Area
SSL	Soil Screening Level
SVOC	semivolatile organic compound
TAL	Target Analyte List
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCE	trichloroethene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TCRA	Time-critical Removal Action

U.S.	United States
UCL	upper confidence limit
UFP	Uniform Federal Policy
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
UTL	upper tolerance limit
UXO	unexploded ordnance
VC	vinyl chloride
VDCR	Virginia Department of Conservation and Recreation
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compound
WPNSTA	Naval Weapons Station

SECTION 1

Introduction

This Site Inspection (SI) report presents the data and findings obtained from field investigation activities conducted at Site 7, located at Naval Weapons Station (WPNSTA) Yorktown Cheatham Annex (CAX) in Williamsburg, Virginia (**Figures 1-1** and **1-2**).

This Report was prepared under the United States (U.S.) Department of the Navy (Navy), Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic Division, Comprehensive Long-term Environmental Action —Navy (CLEAN) N62470-08-D-1000, Contract Task Order (CTO) 0003, for submittal to NAVFAC, United States Environmental Protection Agency (USEPA) Region 3, and the Virginia Department of Environmental Quality (VDEQ). The Navy, USEPA, and VDEQ work jointly as the CAX Tier I Partnering Team.

According to the Initial Assessment Study (IAS), non-hazardous, inert wastes from the former City of Penniman and the former Penniman facility were disposed along the York River during the early 1900s (C.C. Johnson & Associates Inc. and CH2M HILL, 1984). Information on the types and quantities of wastes received is not available; however, the presence of ash, melted bottles, and charred metal indicate some of the waste may have been incinerated prior to disposal (Baker, 2004).

SI field activities were conducted at Site 7 to determine whether a release of hazardous constituents has occurred from past Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-regulated activities, and, if so, determine whether a suspected release warrants further action. Investigation activities were conducted in accordance with the Sampling and Analysis Plan (SAP) (CH2M HILL, 2011a).

1.1 Objectives and Approach

The overall objectives of the SI are to determine whether a CERCLA-regulated release to groundwater has occurred from waste or waste-impacted soil, assess site-specific hydrogeologic conditions, and determine if there are associated risks to human health and the environment from exposure to soil and groundwater. The specific objectives and approach of the SI are as follows:

- Further characterize the environmental media at Site 7.
- Determine whether a suspected release warrants further action for Site 7, where a release attributed to CERCLA-regulated activities is suspected (based on historical information, constituent-specific information, comparison of the detected concentrations to background levels and screening values, and, where warranted, evaluation of the screening value exceedances).

1.1.1 Decision Analysis

To achieve these objectives, a series of evaluations were conducted using the historical information and sample data for Site 7. This evaluation process consisted of three steps, as follows:

Step 1—Determination of Potential CERCLA Eligibility, and if CERCLA-eligible, if a CERCLA-regulated release occurred at the site

Step 1a—Visual Confirmation of CERCLA Eligibility

To have a standard evaluation process for Site 7, the first phase of Step 1 in the decision analysis is to determine if the site is potentially CERCLA-eligible by evaluating information included in historical records, aerial photographs, and site visit observations. If the site is determined to be CERCLA-eligible—that is, if it is reasonable to assume CERCLA-regulated hazardous substances may have been released at the site—site-specific analytical data are evaluated, if available.

Results of the IAS indicated that non-hazardous, inert wastes from the former City of Penniman and the former Penniman facility were disposed along the York River during the early 1900s. In September 2003, Hurricane Isabel eroded approximately 15 to 20 feet of shoreline, resulting in a large amount of debris covering the beach along the eastern boundary of Site 7. In addition, during trenching activities in 2004, an ash layer was identified west of the site's eastern fence line as well as within the exposed slope; therefore, Site 7 warrants sampling as part of an SI, and this site is considered potentially CERCLA-eligible.

Step 1b-Data analysis and comparison to Base Background criteria to determine if a CERCLA-regulated release occurred

The second phase of Step 1 is to determine if there has been a potential CERCLA-regulated release at the site. A "CERCLA-regulated release" is a release of hazardous substances, pollutants, and contaminants eligible for CERCLA response, as defined in CERCLA Sections 101(14) and 101(33).

A potential release is suspected if any inorganic constituents that are inconsistent with background concentrations are detected or if any organic constituents are detected. To help determine whether site-specific inorganic constituent concentrations are inconsistent with Site 7's background concentrations, at a minimum, discrete sample concentrations are compared to the basewide background concentrations for individual inorganic constituents. If it is determined that a release has occurred, the process continues to Step 2.

Step 2—Does the CERCLA Release Pose Potential Unacceptable Risks to Human Health and the Environment?

Step 2a—Comparison to Conservative Screening Values

If a CERCLA-regulated release is suspected, site-specific data (that exceed background concentrations, if available) are compared in Step 2a to the most conservative screening values, which comprise (as applicable) the following:

- USEPA Regional Soil Screening Levels (SSLs) for protection of groundwater (soil), (May 2011)

- USEPA Regional Screening Levels (RSLs) for Residential Soil Adjusted (soil), and Tapwater Adjusted (groundwater) (May 2011)
- Federal Safe Drinking Water Act (Title 40 of the Code of Federal Regulations [CFR], Part 141) Maximum Contaminant Levels (MCLs) and Secondary MCLs
- Literature-based ecological screening values (ESVs) (sources included in the ecological risk screening appendix)

In addition, on a site-specific basis, other screening criteria are used for data comparison. Toxicity Characteristic Leaching Procedure (TCLP) sample screening criteria used during the SI for evaluation of investigation-derived waste (IDW) disposal options are provided in USEPA SW-846, *Test Methods for Evaluating Solid Waste, physical/Chemical Methods.*

For the SI, it is appropriate to compare only those site-specific concentrations above background concentrations to risk-based screening criteria because the objectives of the SI are to not only determine whether a CERCLA-regulated release has occurred, but to also assess if the release warrants further investigation or action. Background concentrations must therefore be considered as part of this process. For the purposes of this SI Report, the 95 percent upper tolerance limits (UTLs) are used for initial comparison (CH2M HILL, 2011b). In addition, two site-specific background groundwater samples were collected from upgradient locations to determine site-specific upgradient groundwater conditions and supplement the background 95 percent UTLs. If concentrations exceed the 95 percent UTL, the maximum site-specific upgradient groundwater concentrations (both anthropogenic and naturally occurring) will be used for a secondary background comparison.

Step 2b—Conduct a Semi-quantitative Risk Evaluation Using More Realistic Assumptions

For constituents that are found above the conservative screening values during Step 2a, an additional evaluation using more realistic assumptions is conducted in Step 2b. This additional evaluation was conducted to help determine if further investigation or action is warranted. For the purposes of this SI, and as documented in the SAP (CH2M HILL, 2011a), this more realistic evaluation involves completing a semi-quantitative risk screening to determine if those constituents exceeding conservative screening values pose a potential risk to human health and the environment. This process allows a "look ahead" to see what the likely risk drivers (if any) will be at the site. If the recommended path forward for the site is an Expanded SI or RI, the entire SI data set would be carried forward for further quantitative risk assessment. Human health and ecological risk screenings were conducted for Site 7. Details regarding the steps and processes used to conduct the human health and ecological risk screenings are provided in **Appendixes A** and **B**, respectively.

Step 3—Is Further Investigation or Action Required?

For Step 3, the results of Step 2, the historical site information and spatial distribution of constituents and constituent concentrations are evaluated to ensure that the potential source area and the extent of contamination for a CERCLA-regulated release have been sufficiently characterized. If the characterization is completerecommendations for a path forward will be provided. If the recommended path forward is further investigation, the details regarding its implementation will be submitted under separate cover in a UFP-SAP.

1.2 Organization of the Site Inspection Report

The SI Report is organized as follows:

- **Section 1, Introduction,** provides the objectives and decision analysis process of the SI and describes the physical characteristics of CAX.
- **Section 2, Investigation Methodology,** summarizes the 2011 SI field investigation and data collection activities.
- **Section 3, Site 7 – Old DuPont Disposal Area,** includes the history of investigations, conceptual site model (CSM), including site history, the site physical setting, distribution of contamination and human health and ecological risk evaluations, and the decision analysis for Site 7. This section will also include the conclusions and recommendations for Site 7.
- **Section 4, References,** lists the documents used in preparation of this report.

Tables and figures are presented at the end of each section, as applicable.

1.3 Physical Characteristics of Cheatham Annex

This subsection summarizes the environmental setting of CAX, including a description and the history, land use, climate, topography, surface water, hydrogeology, and ecological resources. Site-specific information pertinent to the release assessment is included in Section 3.

1.3.1 Cheatham Annex Description and History

CAX consists of 2,300 acres of land on the York-James Peninsula in Virginia (Virginia Peninsula), northwest of WPNSTA Yorktown. The facility is divided into two separate parcels, with the larger parcel situated along the banks of the York River and the smaller parcel located south of the Colonial National Historic Parkway and encompassing Jones Mill Pond (**Figure 1-1**). The majority of CAX is undeveloped and heavily wooded. The major surface water features at CAX consist of Cheatham Pond, Jones Mill Pond, and Penniman Lake. CAX had been the location of the former Penniman Shell Loading Plant, a large powder and shell loading facility operated by DuPont during World War I. The facility closed in 1918, and the property was either used for farming or remained idle until CAX was commissioned in 1943 as a satellite unit of the Naval Supply Depot to provide bulk storage facilities and serve as an assembly and overseas shipping point throughout World War II. From 1943 to the present day, CAX has performed services in support of Naval ordnance missions that include packing and shipping materials, warehousing, inventory management, local delivery, fuel management and distribution, technical support, customer service, and care of sponsor-owned material. In 1987, CAX was designated the Hampton Roads Navy Recreational Complex. Today, CAX's mission also includes recreational opportunities to military and civilian personnel, with outdoor recreational facilities including cabins, camp sites, an 18-hole golf course, swimming pool, ball fields, freshwater and saltwater fishing areas, boating, wildlife watching, and hunting.

In October 1998, control of CAX was transferred from Fleet and Industrial Supply Center to WPNSTA Yorktown. On November 30, 2000, CAX was included on the National Priorities List (NPL). The CAX Federal Facilities Agreement (FFA) was signed in March 2005 and identified a total of twelve sites and seven areas of concern (AOCs) (Navy, 2005). Site 7 is depicted on **Figure 1-2**.

1.3.2 Current and Potential Future Land Use

Land use at CAX is categorized as Military Use according to the York County Planning Division 2025 Land Use Map (York County, Virginia, Planning Division, 2005). Land uses of surrounding areas include conservation and recreation, commercial, residential, industrial, public, and agricultural (Baker, 2003). The future land use at CAX is expected to remain unchanged. Potable water at CAX is provided by Newport News Waterworks (ASTDR, 2004).

1.3.3 Climate

The climate of the Virginia Peninsula is influenced by the moderating effects of the Atlantic Ocean, which results in mild winters and long, hot summers. The coastline is subject to high humidity year round, and levels drop farther inland. Freezing temperatures occur intermittently from October through March. Average monthly temperatures in the area range from approximately 38.8 degrees Fahrenheit (˚F) in January to 77.4˚F in July (Baker, 2003).

In this area, summer and early fall are characterized by high heat, humidity, and easterly storms that bring high tides and flooding. Winds are variable, prevailing usually from the south-southwest, but north-northeasterly winds are common in some months (Baker, 2003). Intense hurricanes occasionally sweep the coast.

Winter is periodically characterized by storms that move along the eastern seaboard and bring high winds and precipitation, occasionally in the form of rain, sleet, or snow. The average annual precipitation is 44 inches, with the summer months being the wettest and the winter months being the driest (Baker, 2003).

Spring is a period of contrasting weather, particularly during March. Spring and autumn are periods of frost. Autumn is a season of comfortable temperatures (average temperature, 60˚F to 81˚F) and generally pleasant weather (Baker, 2003).

1.3.4 Topography and Surface Water

The topography at CAX is characterized by gently rolling terrain dissected by ravines and stream valleys trending predominantly northeastward toward the York River. The maximum ground elevation of CAX, found on the western boundary, is approximately 50 feet above mean sea level (msl). Valleys consisting of 40- to 60-foot ravines with steep slopes (slopes exceeding 1:1) occur along the major creeks draining CAX (Baker, 2003).

Cheatham Pond is along CAX's western border, while the mouth of Queen Creek is to the north, with the York River to the east, and King Creek to the south. In 1943, dams were constructed to create the 108-acre Cheatham Pond from Queen Creek, as well as the 43-acre Penniman Lake from King Creek. While both creeks are tidal, Cheatham Pond and Penniman Lake are not. Damming a portion of the Cub Creek watershed formed Jones Mill

Pond, a 69-acre freshwater, non-tidal pond enclosed by several wooded ravines and located on the smaller of the two CAX parcels, southwest of the larger, main CAX parcel. Numerous small creeks flow through wooded ravines throughout the CAX boundary and drain into tidal creeks that join the York River. In most areas, forests extend to the marsh and lake margins. The tributaries of CAX all drain into the York River (Baker, 2003). Additionally, the 2-acre Walt Feurer Youth Pond and the 1-acre Cat Fish Pond are shallow, warm water, man-made ponds (Navy, 1998).

1.3.5 Geology

CAX is located in the Atlantic Coastal Plain Physiographic Province, which is underlain by multiple layers of unconsolidated sediments of Quaternary, Tertiary, and Cretaceous ages (**Figure 1-3**). The granitic rock formations of the Appalachian Mountains to the west were eroded, and sediment was transported from the mountains by rivers and streams to the coast, building up layers of sediment that fanned out onto the Atlantic continental shelf. Successive sea level rises deposited fluvial estuarine and marine sediment further, building the Coastal Plain. Widely fluctuating sea levels split the Coastal Plain into river terraces of different elevations bounded by scarp features that resulted from shoreline erosion. The Coastal Plain includes four terraces: Lackey Plain, Croaker Flat, Huntington Flat, and Grafton Plain (from highest to lowest); and three scarps: Kingsmill, Lee Hall, and Camp Peary. As shown on **Figure 1-4**, CAX is located within the Lackey Plain and Croaker Flat terraces, separated by the Camp Peary scarp located along the York River (Brockman et al., 1997).

A total of 10 geologic formations have been identified (Brockman et al., 1997) beneath CAX. The uppermost geologic formations consists of alluvial, colluvial, and marsh deposits composed of silt, sand, and pebbles with some clay.

In terms of the uppermost soils, Site 7 is located within Soil Association Group 2, one of the four soil association groups identified at CAX during a 1985 soil survey report for CAX prepared by the Soil Conservation Service (USDA, 1985). Soils in Soil Association Group 2, the Dogue, Pamunkey, and Uchee Association (**Figure 1-5**), were formed on river terraces and are deep, moderately to well- and poorly drained soils with clayey and loamy subsoils (Baker, 2003). A more-detailed description of the soils within Soil Association Group 2 can be found in the soil survey (USDA, 1985) or the Background Study Report (CH2M HILL, 2011b).

1.3.6 Hydrogeology

The 10 geologic units beneath CAX are grouped into hydrostratigraphic units based on hydraulic characteristics. The aquifers separated by confining or semi-confining units relevant to CERCLA investigations at CAX are, from youngest to oldest, the Columbia aquifer, the Cornwallis Cave aquifer, and the Yorktown-Eastover aquifer. Groundwater flow is locally controlled by topography with discharge to nearby surface water bodies and a primary flow and discharge direction toward the York River.

Where present, the Columbia aquifer ranges in thickness from 5 to 10 feet, with horizontal hydraulic conductivity between about 0.4 to 8 feet per day (ft/day) and vertical hydraulic conductivity between 1.7×10^{-4} to 1.7×10^{-1} ft/day (Brockman et al., 1997). The hydraulic properties of the Cornwallis Cave aquifer are highly variable due to depositional effects and

physical and geochemical weathering. In general, horizontal hydraulic conductivity ranges from 0.3 to 9 ft/day and vertical conductivity ranges from 6.2×10^{-4} to 2.4×10^{-1} ft/day (Speiran and Hughes, 2001). Finally, the thickness of the Yorktown-Eastover aquifer across CAX ranges from 60 to 100 feet. Horizontal hydraulic conductivity ranges from 0.004 to 3 ft/day and vertical hydraulic conductivity ranges from 1.7×10^{-5} to 4.8×10^{-1} ft/day.

1.3.7 Ecological Resources

Terrestrial flora on CAX consists predominantly of woodland species (Baker, 2005a). The following three types of forest are present:

- Pine stands composed primarily of loblolly and Virginia pines
- Mixed pine and hardwood stands
- Hardwood stands

Elevated areas are the predominant locations of pine stands, while hardwood stands are found on slopes and ravines. Native tree species found at CAX include beech, black cherry, red maple, sweet gum, various pines, white ash, and white oak. The woodland's understory is composed of various seedling trees and vine species, such as Virginia creeper, briars, and honeysuckle. Ferns are found in many moist, shaded areas. Ornamental trees and shrubs have been planted in the improved areas and along major roadways. None of the plant species that occur on CAX are listed on the federal or Commonwealth endangered lists (Baker, 2005a).

Small, undeveloped tracts of land at CAX support a variety of indigenous wildlife species. Whitetail deer, beaver, skunk, bobcat, red and gray fox, squirrel, raccoon, opossum, and rabbit are present. Game birds, such as wild turkey, quail, duck, and pheasant, are also resident. Songbirds common to the eastern Virginia area are in abundance at CAX, along with a raptor population consisting of small hawks, owls, and osprey. Carrion-feeding birds such as crows and turkey vultures are also common. The southern bald eagle (federally and state protected) is known to nest nearby at WPNSTA Yorktown. Suitable habitat exists for roosting and perching in the area, but only occasional sightings of eagles have been made (Baker, 2005a).

Wetlands are mainly found along principal tributaries to the York River and along the York River shoreline at CAX. The following four major marsh types exist along these margins:

- Saltmarsh cordgrass communities
- Big cordgrass communities
- Cattail communities
- Brackish water mixed communities

Freshwater wetlands are also present within the interior, nontidal areas of the installation.

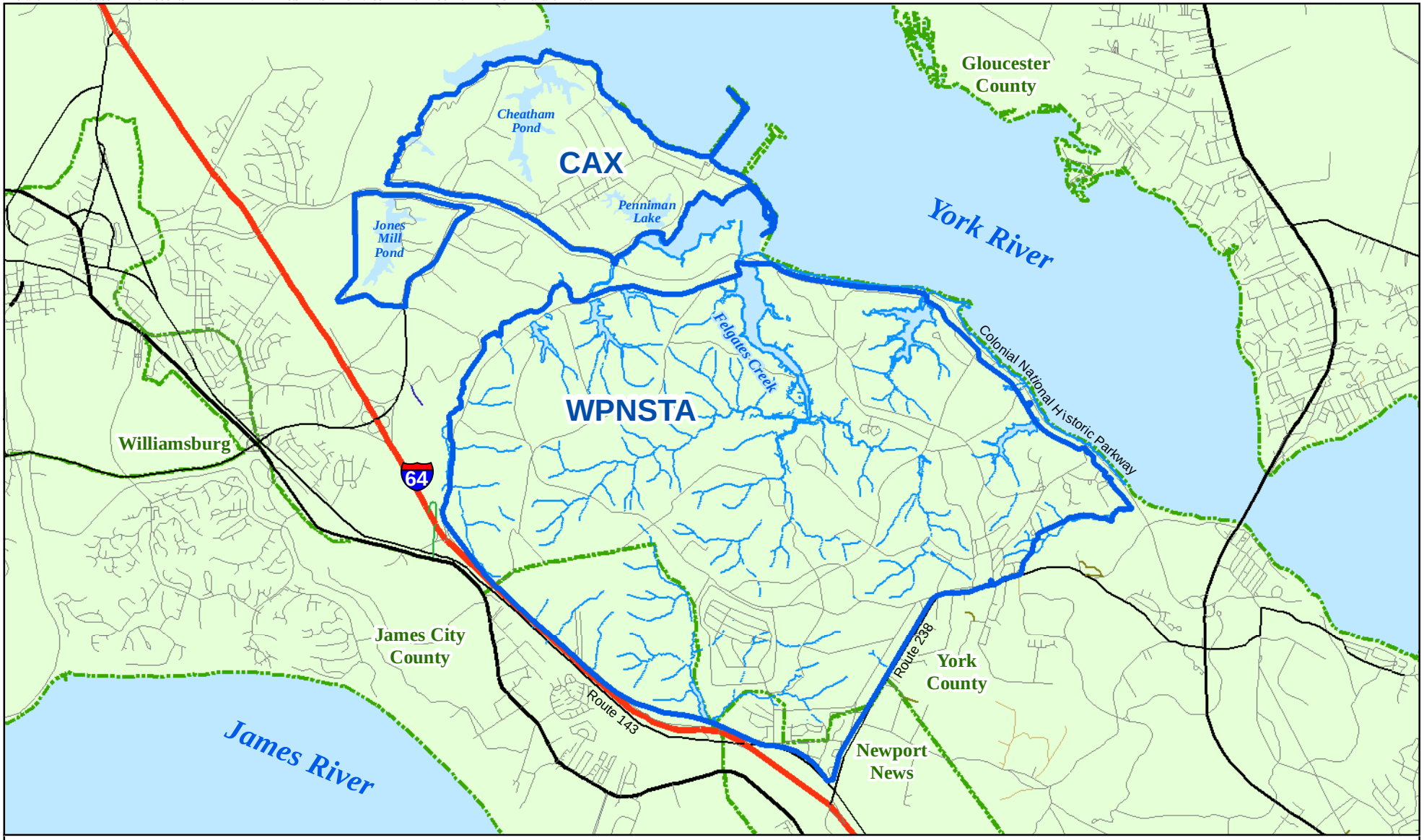
Salinities in the York River estuary bordering CAX can be characterized as mesohaline (from 15 to 20 parts per thousand [ppt]), and can fluctuate depending on seasonal impacts, runoff, and rainfall. Of the 295 fish species known from the Chesapeake Bay, only 32 are year-round residents. Nursery areas, foraging areas, and spawning ground attract the remaining species from the Atlantic Ocean and freshwater tributaries each year. In the York River, resident fish include hogchoker, weakfish, and oyster toadfish. Spot and croaker are common in nursery and foraging areas in the summer, and numerous anadromous and catadromous

fish use the area during migration, including the alewife, American eel, American shad, blueback herring, striped bass, and white perch. Commercially and recreationally important species from the York River include American shad, bay anchovy, blue crab, bluefish, croaker, spot, striped bass, summer flounder, and weakfish. The York River in the vicinity of CAX is a designated crab pot fishery from March through November of each year; immediately north of CAX is a spawning and nursery ground for blue crabs. Several species of endangered sea turtles (namely the green, hawksbill, leatherback, loggerhead, and Kemp's Ridley) are known to feed in the Chesapeake Bay and occasionally forage in the York River, including in the vicinity of CAX during the summer.

The York River is designated as Essential Fish Habitat (EFH) for three species of fish managed by the Mid-Atlantic Fishery Management Council—summer flounder, bluefish, and butterfish. Though both the bluefish and butterfish use the more open, pelagic waters characteristic of the river, juvenile summer flounder often use unvegetated, near-shore sandy bottoms and salt marsh creeks as nursery areas. Other species likely to use salt marsh creeks include anchovies, blue crabs, juveniles of migratory species, hard- and soft-shell clams, killifish, minnows, mummichogs, oysters, silversides, and weakfish.

No known federally or state-listed endangered or threatened species are currently using CAX habitats. Suitable habitat exists on CAX for both the red-cockaded woodpecker (federally endangered) and the bald eagle (formerly federally threatened and still protected by the Bald and Golden Eagle Protection Act and state threatened and endangered). Bordering the CAX property is the York River, which provides seasonal habitat for federally and state endangered Kemp's Ridley sea turtles and federally threatened loggerhead sea turtles. The shoreline along the York River may also provide habitat for federally threatened piping plovers. Rare resources and communities identified from CAX in the Virginia Department of Conservation and Recreation (VDCR) Natural Heritage Program database and the CAX Natural Heritage Inventory include a significant great blue heron colony, low salt marsh and salt scrub habitats, coastal plain depression ponds, nonriverine wet hardwood forests, and coastal plain calcareous seepage swamps (Baker, 2005a).

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\SITE 7\SI REPORT\FIGURE1-1 - CAX LOCATION.MXD MUNWIN 8/15/2011 12:00:31 PM



Legend
Activity Boundaries
City/County Boundaries

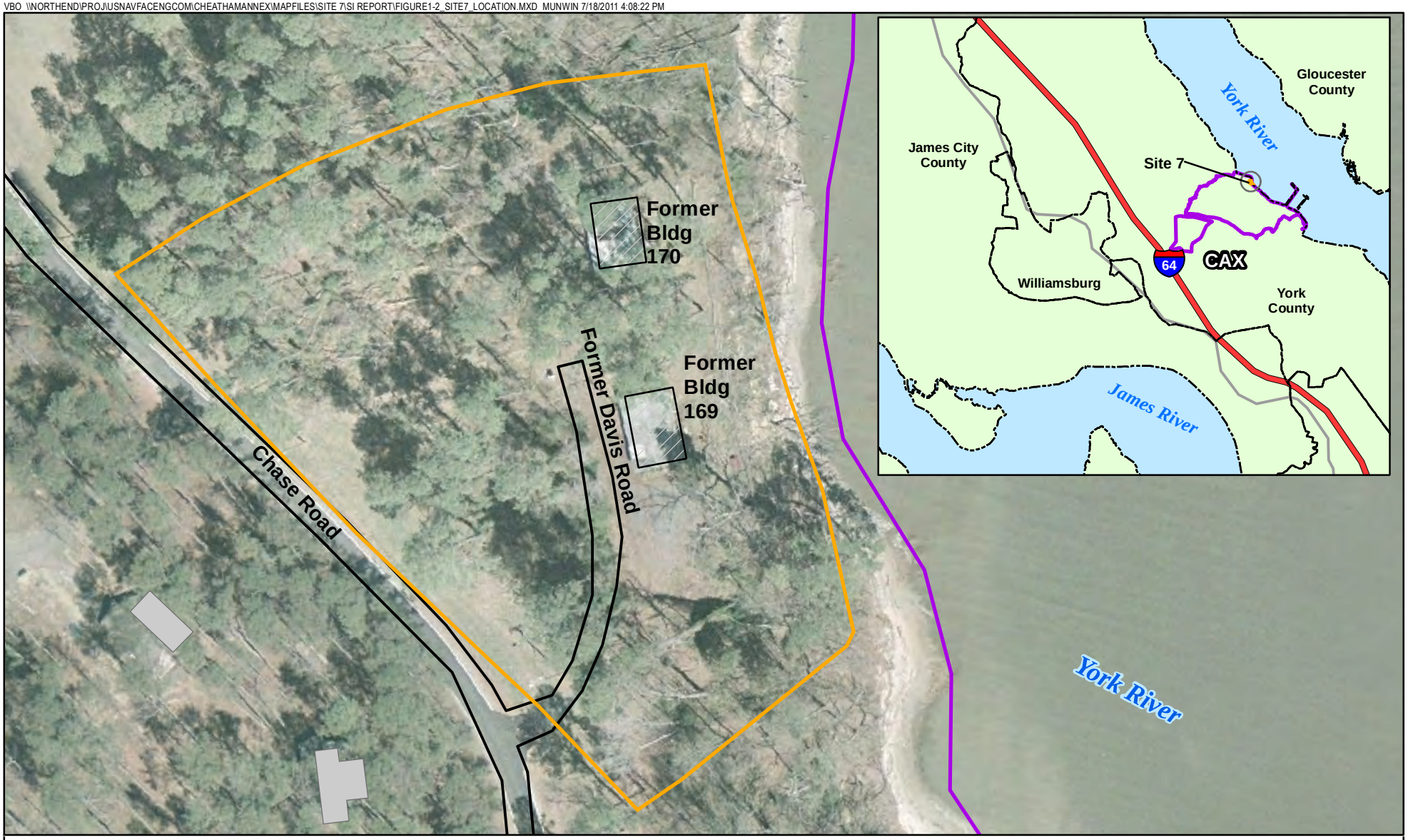
N
W E
S

0 0.6 1.2 Miles

Figure 1-1
CAX Location
Site 7 Site Inspection Report
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\SITE 7\SI REPORT\FIGURE1-2_SITE7_LOCATION.MXD MUNWIN 7/18/2011 4:08:22 PM



Legend

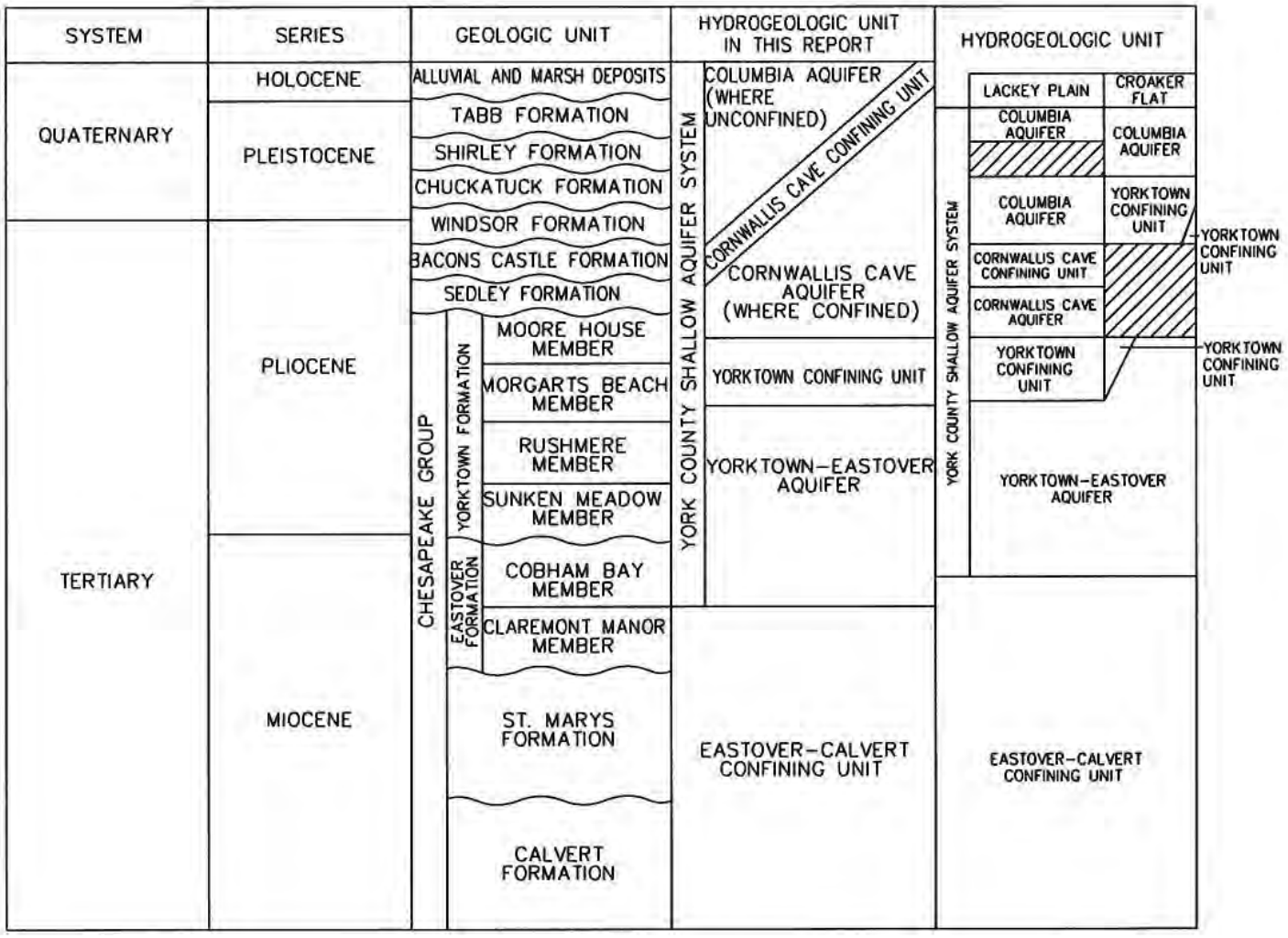
- Site Boundary
- Cheatham Annex Boundary
- Buildings
- Former Buildings
- Roads

N
W E
S

0 40 80
Feet

Figure 1-2
Site 7 Location
Site 7 Site Inspection Report
Cheatham Annex
Williamsburg, Virginia

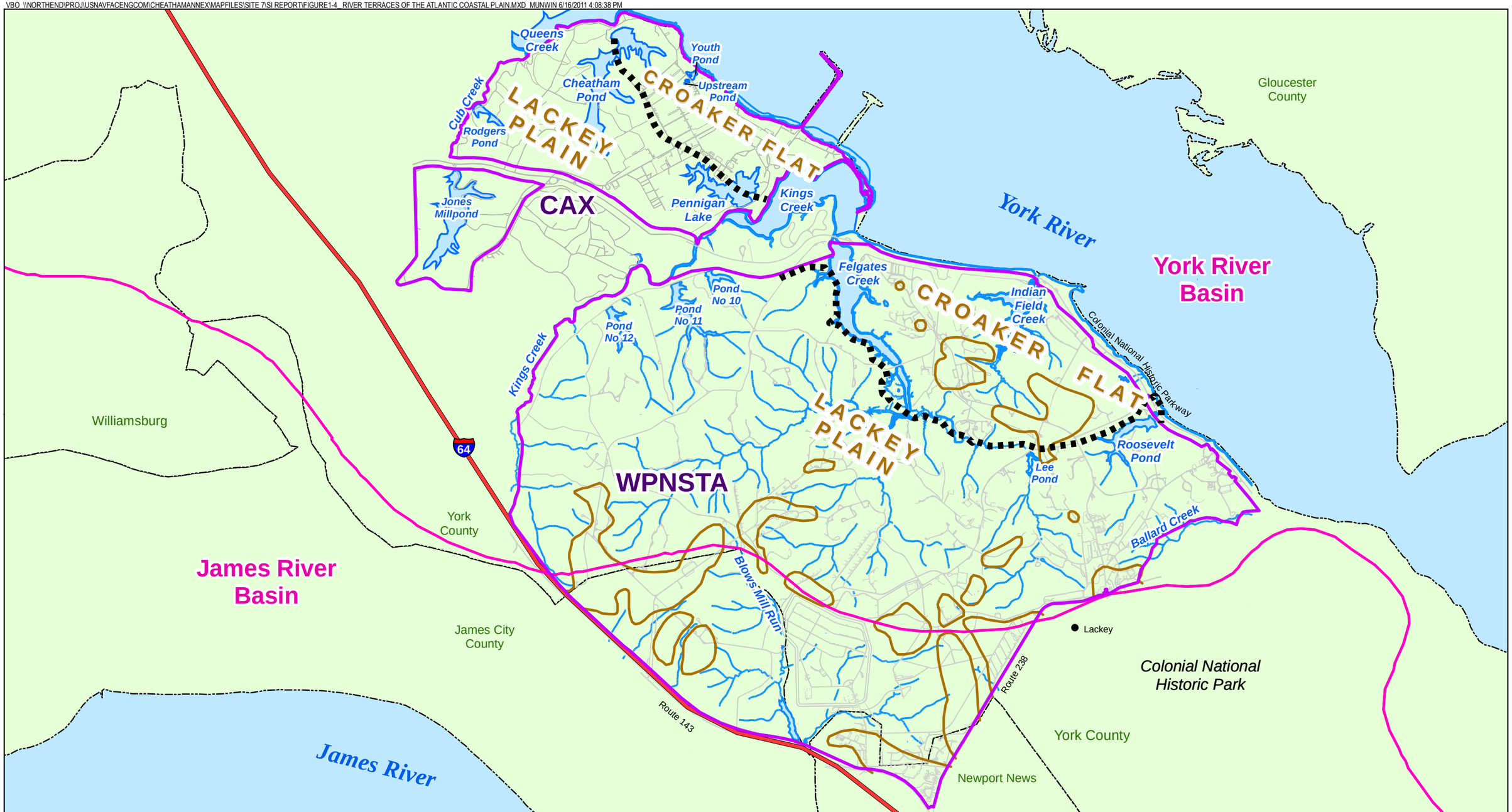
CH2MHILL



Source: Brockman, ET AL 1997 GEOHYDROLOGY OF THE SHALLOW AQUIFER SYSTEM, NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Figure 1-3
Geologic Units in York County
Site 7 Site Inspection Report
Cheatham Annex
Williamsburg, Virginia

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\SITE 7\SI REPORT\FIGURE1-4_RIVER TERRACES OF THE ATLANTIC COASTAL PLAIN.MXD MUNWIN 6/16/2011 4:08:38 PM



Legend

- Activity Boundaries
- Camp Peary Scarp
- Watershed Boundaries
- Interstate 64
- Approximate Boundary of Columbia Aquifer, February 3, 1997
- Roads
- Shoreline and Water Bodies
- City / County Boundaries

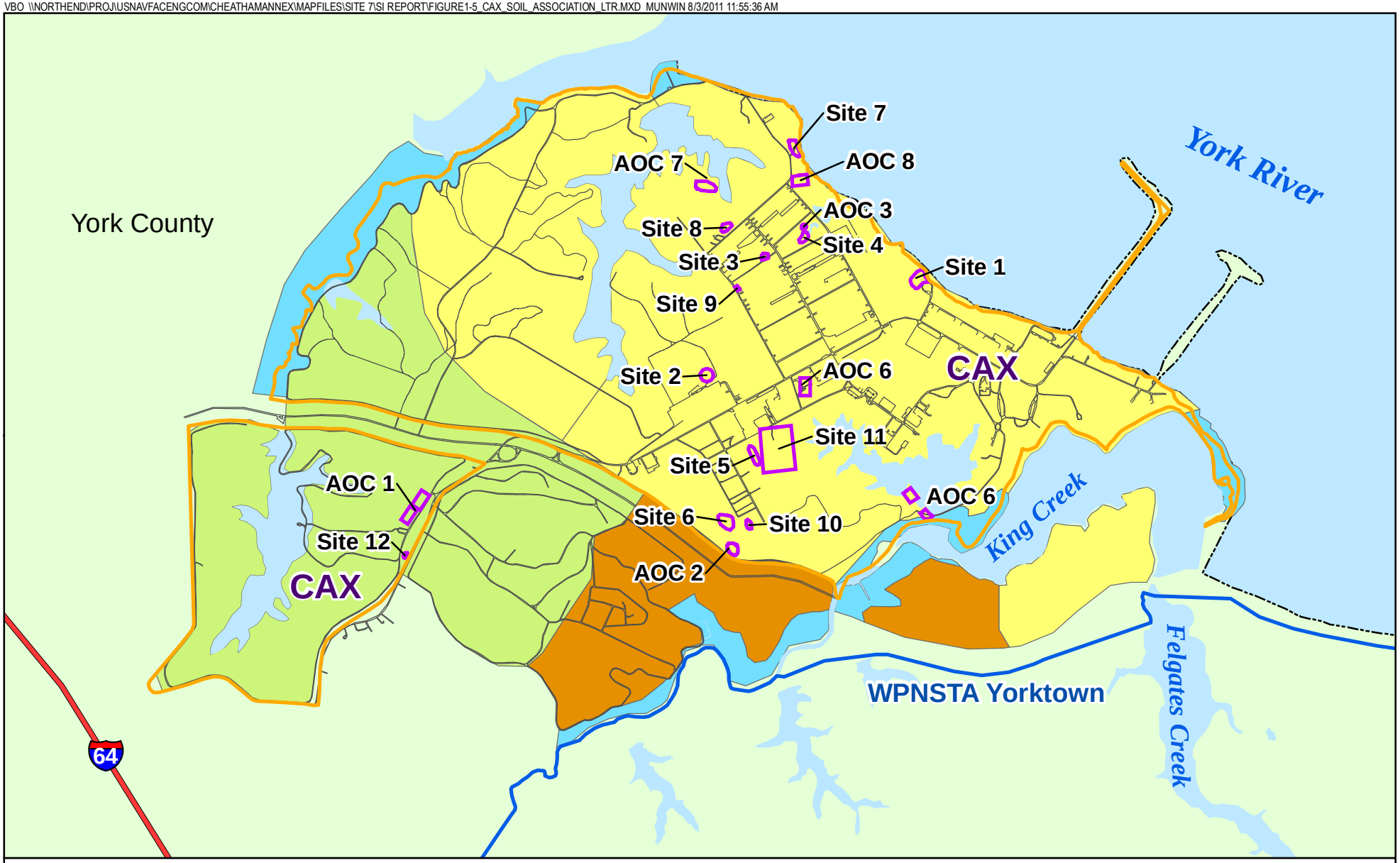
N
W E
S

0 4,000 8,000
Feet

Figure 1-4
River Terraces of the Atlantic Coastal Plain
Site 7 Site Inspection Report
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\SITE 7\SI REPORT\FIGURE1-5_CAX_SOIL_ASSOCIATION_LTR.MXD MUNWIN 8/3/2011 11:55:36 AM



Legend

Cheatham Annex Soil Associations

- Bohicket, Johnson, and Axis (1)
- Dogue, Pamunkey, and Uchee (2)
- Slagle, Emporia, and Craven-Uchee Complex (3)
- Emporia, Emporia Complex, Kempsville, and Craven-Uchee Complex (4)

- Site Boundaries
- CAX Boundary
- WPNSTA Yorktown Boundary

N W E S

0 1,250 2,500 Feet

Figure 1-5
General Soil Association Map
Site 7
Site Inspection Report
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

SECTION 2

Investigation Methodology

This section summarizes the field investigation procedures for the SI conducted at Site 7 between January and February 2011. The field activities were conducted in accordance with the SAP (CH2M HILL, 2011a) and the *Master Project Plan, Naval Weapons Station Yorktown, Yorktown, Virginia and Cheatham Annex Williamsburg, Virginia* (Baker, 2005b).

Table 2-1 summarizes the environmental data for existing site conditions collected by matrix, analyses performed, sample nomenclature, and sample depth during both the 2008 removal action soil sampling (Shaw, 2009) and the 2011 SI field activities at Site 7. Environmental data collected during the 2011 SI field activities include soil sampling, monitoring well installation, and groundwater sampling (**Figure 2-1).**

2.1 Pre-Investigation Activities

Prior to the 2011 SI field investigation activities, an underground utility clearance was conducted at Site 7 by Accumark of Chesapeake, Virginia.

2.2 Soil Sampling

Surface soil samples were collected for pH analysis from five locations at Site 7 on January 25, 2011, in order to evaluate the toxicity and bioavailability of certain metals in soils (**Figure 2-1**). The soil samples were not analyzed for any other constituents (i.e., VOCs, SVOCs, etc.) because of the extensive soil sampling conducted by Shaw in 2008. Preliminary sample locations were agreed upon by the Partnering Team prior to mobilization; however, exact sample locations were field-determined based on observed site conditions. All soil sampling activities were conducted in accordance with standard operating procedure (SOP)-017 entitled *Shallow Soil Sampling* (CH2M HILL, 2011a).

Surface soil samples were collected from 0 to 24[1] inches below ground surface (bgs) using a hand auger. All soil samples were analyzed for pH using method 9045C (**Table 2-1**).

Directly following the collection of the soil core by the hand auger, the collected soil was homogenized in a stainless steel bowl and then transferred to the appropriate laboratory-provided sample containers for the pH analysis. Samples were packed on ice and shipped to the laboratory for analysis, in accordance with the CH2M HILL SOP entitled *Sample Preservation*. A summary of the surface soil samples collected 2011 is provided in the sample summary table (**Table 2-1**).

2.3 Groundwater Sampling

Monitoring wells were installed and sampled at five locations within Site 7 between January 21 and January 28, 2011, in order to determine if a CERCLA-regulated release to groundwater has occurred, and, if so, evaluate potential human health and ecological risks

[1] The 0-24 inch interval was sampled because this is the same interval used in evaluating ecological receptors in Section 3.2.4

(**Figure 2-1**). In addition, two monitoring wells were installed to determine upgradient groundwater conditions and provide a background data set to supplement the background 95 percent UTLs. Since no groundwater samples had previously been collected from Site 7, the onsite monitoring well locations were chosen by placing locations within 2008 excavation area with some biasing toward those areas where post-removal soil concentrations exceeded residential RSLs and ESVs. By the same reasoning, the background monitoring wells were chosen by placing locations outside the site boundary (**Figure 2-1**). Preliminary monitoring well locations were agreed upon by the Partnering Team prior to mobilization; however, actual locations were field-determined based on observed site conditions. Well installation and sampling activities were conducted in accordance with applicable SOPs, listed as follows.

2.3.1 Monitoring Well Installation

A track mounted CME-55 drill rig was used to collect continuous macro core soil cores in a 4-foot acetate sleeve. Soil borings were characterized and logged in accordance with the Unified Soil Classification System (USCS) by a qualified geologist (**Appendix C**). The soil borings were then converted to permanent groundwater monitoring wells. The monitoring well construction details are summarized in **Appendix D**.

The five onsite and two background (upgradient) monitoring wells were installed to 30 feet bgs and screened between 20 and 30 feet bgs. Monitoring wells were constructed with 5-foot segments of 2-inch diameter schedule 40 polyvinyl chloride (PVC) with 10 feet of 0.010-inch machine slotted stainless steel and packed with 20/40 silica sand to a minimum of 2 feet above the top of the screen. A minimum 3-foot thick bentonite seal was placed above the sand and then allowed to hydrate a minimum of 2 hours. The remaining annular space was backfilled with a standard mix of cement and bentonite grout.

Well installation activities were conducted in accordance with SOP-006, entitled *General Guidance for Monitoring Well Installation* (CH2M HILL, 2011a).

2.3.2 Water-Level Measurements

Depth-to-water measurements from all monitoring wells at Sites 7 were collected on January 24, 2011, after all monitoring wells had been installed and water levels had been allowed to equilibrate for at least 24 hours. An electronic water-level meter was used to measure the depth-to-water from ground surface at each monitoring well. All groundwater elevation measurements were acquired in accordance with SOP-008, entitled *Water-Level Measurement* (CH2M HILL, 2011a). Water-level measurements are presented in **Table 2-2**.

2.3.3 Monitoring Well Development

Prior to sampling, all monitoring wells were developed in order to restore the permeability of the saturated soil surrounding the well, which may have been reduced by the drilling operations, and to remove fine-grained materials that may have entered the well during installation. Development was completed using a submersible Whale® Pump and disposable Teflon® lined polyethylene tubing placed at the bottom of the monitoring well. The tubing was lifted and lowered, similar to a surging technique, in order to suspend and remove any excess sediment that may have accumulated at the bottom of the monitoring well.

Well development continued until water quality parameters (pH, oxidation reduction potential [ORP], temperature, conductivity, turbidity, and dissolved oxygen [DO]) measured by a Horiba U-22 meter stabilized for at least three consecutive readings or three well volumes had been removed and turbidity had been reduced to the extent practicable. All well development activities were conducted in accordance with SOP-004, entitled *Field Measurement Using the Horiba U-22 with Flow-through Cell,* and SOP-006, entitled *General Guidance for Monitoring Well Installation* (CH2M HILL, 2011a).

2.3.4 Groundwater Sampling

Groundwater samples were collected from the five onsite and two background monitoring wells in accordance with SOP-005, entitled *Low-Flow Groundwater Sampling from Monitoring Wells* (CH2M HILL, 2011a), in order to minimize drawdown and to obtain a sample representative of groundwater conditions in the surrounding geologic formation. Prior to groundwater sample preparation, monitoring wells were purged in order to remove any stagnant water that may have accumulated within the well. Purging was completed using a Monsoon® pump and Teflon® lined polyethylene tubing placed at the middle of the screened interval. Well purging continued until water quality parameters measured by a Horiba U-22 stabilized or three well volumes had been removed and turbidity had been reduced to the extent practicable. Following parameter stabilization, a CHEMets kit was used to confirm DO readings measured by the Horiba meter. Once DO confirmation was recorded, a groundwater sample was collected at the monitoring well. The final set of groundwater quality measurements obtained before sample collection for each monitoring well is presented in **Table 2-3**.

Groundwater for the analytical samples was pumped through the tubing directly into the appropriate laboratory provided bottleware, with the exception of dissolved metals. Groundwater collected for dissolved metals analyses was pumped through a dedicated, disposable 0.45-micron (µm) filter and then directly into the sample bottleware. After preparation, samples were packed on ice and shipped to the laboratory for analysis at the end of each day, in accordance with the CH2M HILL SOP entitled *Sample Preservation*. All groundwater samples were analyzed for the following:

- Volatile organic compounds (VOCs), in accordance with USEPA Method 8260
- Semivolatile organic compounds (SVOCs), in accordance with USEPA Method 8270
- Pesticides, in accordance with USEPA Method 8081
- Polychlorinated biphenyls (PCBs), in accordance with USEPA Method 8082
- Total and dissolved metals, including mercury and cyanide, in accordance with USEPA Methods 6020, 7470, and 9012 (as appropriate)
- Dioxin, in accordance with USEPA Method 8290
- Explosives, in accordance with USEPA Method 8330

A summary of the samples collected is provided in the sample summary table (**Table 2-1**).

2.4 Surveying Activities

Following the completion of all sampling activities, the soil sample, five onsite and two background monitoring well locations were surveyed using a Real-Time Kinematic (RTK) global positioning system (GPS) by the surveying subcontractor, Michael Surveying and Mapping. The RTK GPS method has an expected horizontal and vertical accuracy of ±0.03 feet. Relative horizontal accuracy for the GPS surveys conformed to the *Federal Geodetic Control Subcommittee Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy* (FGDC, 1998), assuring accuracy at the 95 percent confidence level of the horizontal coordinates to the nearest 1 foot. Horizontal Northing and Easting coordinate values were recorded in Virginia State Plane Coordinate System, South Zone (North American Vertical Datum [NAVD] 88 datum), with units expressed in United States Survey Feet. All survey data for sample locations for Site 7 are located in **Table 2-4**.

2.5 Decontamination Procedures

All decontamination activities were conducted in accordance with SOP-002, entitled *Decontamination of Drilling Rigs and Equipment,* and SOP-001, entitled *Decontamination of Personnel and Equipment*, as applicable (CH2M HILL, 2011a). Disposable sampling equipment and personal protective equipment (PPE), such as Masterflex tubing and nitrile gloves, were treated as non-hazardous solid waste. After use, equipment was placed in plastic contractor bags and disposed of in an onsite trash dumpster. Non-disposable sampling equipment, such as a hand auger, was decontaminated prior to each use.

Reusable, heavy equipment (such as drilling rods and augers) was decontaminated before and in between the collection of each sample using a high-pressure steam cleaner with potable grade water. Pressure washing was conducted at the temporary decontamination pad, which had been constructed at the site prior to mobilization. The decontamination pad consisted of a raised wood-frame lined with a high-density polyethylene tarp, which acted as a basin to collect fluids. These fluids were then pumped into a 55-gallon drum to await characterization and disposal. All heavy equipment decontamination procedures were conducted in accordance with SOP-002, *Decontamination of Drilling Rigs and Equipment* (CH2M HILL, 2011a).

Reusable sampling equipment (such as split-spoons, sampling trowels, a Monsoon pump, and so forth) was decontaminated prior to each use by the following procedure:

1. Rinse equipment with potable water
2. Wash equipment with distilled water and 2.5 percent Liquinox™ solution using a brush to remove any particulate matter or surface film
3. Rinse equipment with potable water
4. Rinse with distilled or potable water and 10 percent methanol solution
5. Rinse equipment with distilled water and allow to air dry
6. Wrap exposed areas with aluminum foil for transport and handling if not used immediately following decontamination

Water generated during decontamination of sampling equipment was collected and transferred to a 55-gallon drum to await characterization and disposal.

2.6 Investigation-Derived Waste Management

The IDW generated during the field activities included soil cuttings from monitoring well installation activities and well development groundwater and groundwater sampling purge water, as well as decontamination rinse water from non-disposable sampling equipment and heavy equipment. The IDW was containerized in approved 55-gallon drums, stored within secondary containment at the site, and properly labeled. In total, fifteen 55-gallon drums of solid IDW (soil cuttings) and twelve 55-gallon drums of aqueous IDW were generated during investigation activities.

Prior to disposal, the CH2M HILL field staff collected one composite sample from the aqueous drums and one composite sample from the solid drums. The IDW samples were analyzed for full TCLP analysis, ignitability, reactive cyanide, reactive sulfide, and corrosivity. Based on the analytical results, the solid and aqueous IDW was identified as non-hazardous and was disposed by Soilex Corporation at the company's approved disposal facility located in Chesapeake, Virginia, within 90 days of generation. All IDW management activities were conducted in accordance with the IDW Management Plan (Baker, 2005b). The laboratory analytical data for the IDW samples are presented in **Appendix E**. The IDW handling and disposal information is included in **Appendix F**.

2.7 Data Quality Evaluation

2.7.1 Data Quality Assessment

This data quality summary assesses the effect of the overall analytical process on the availability of the analytical data for use by the project team.

The three major categories of data evaluation are laboratory performance, field collection performance (such as blank contamination and field duplicate reproducibility), and matrix interference. Evaluation of laboratory performance is a check for the laboratory's compliance with the method requirements. Additionally, a validator conducts a review of the laboratory data to assess whether the analytical methods were within required control limits. Evaluation of field collection performance, such as blank contamination and field duplicates, involves the review of field quality control (QC) samples and the determination of their effect on the sample results. Evaluation of potential matrix interferences involves the review of several areas of results, including surrogate spike recoveries and matrix spike/ matrix spike duplicate (MS/MSD) sample results.

2.7.2 Laboratory Internal Quality Control Review

Prior to releasing the analytical data, the laboratory reviewed both the sample and QC data to verify sample identity, instrument calibration, quantitation limits (QLs), dilution factors, numerical computations, accuracy of transcriptions, and chemical interpretations. To define a laboratory QC exceedance and the appropriate corrective action, the laboratory referred to its in-house SOPs and the limits agreed to in the SAP (CH2M HILL, 2011a). The SOPs were based on Department of Defense (DoD) requirements, the analytical method, and accumulated laboratory experience. If a laboratory QC exceedance occurred, the situation

was reviewed by the appropriate personnel to determine whether it was acceptable or whether it would require corrective action by the laboratory.

In addition, the QC data were tabulated and the results reviewed to determine whether they were within the contract-required limits for accuracy and precision. Any non-conforming data were discussed in the data package cover letter and case narrative.

2.7.3 Data Validation

An internal data validator reviewed all data packages using the validation criteria outlined in the SAP (CH2M HILL, 2011a). If adherence to quality assurance/quality control (QA/QC) criteria yielded deficiencies, data were considered for qualification. The data qualifiers were those presented in *EPA CLP Region III Modifications to National Functional Guidelines for Organic Data Review: Multi-Media, Multi-Concentration* (Sept. 1994), *EPA CLP Region III Modifications to National Functional Guidelines for Inorganic Data Review* (April 1993), and *EPA Region III Dioxin/ Furan Data Validation Guidance* (March 1999). These guidelines were not used for data validation; however, the specific qualifiers listed therein may have been applied to data should non-conformances against the QA/QC criteria be identified.

The data validation process was focused on the effects of the laboratory's performance and the sample matrixes' effects on the analytical results. Additionally, the analytical spectrum and raw data output were reviewed, and 10 percent of the laboratory results were recalculated from the raw data to verify final laboratory identification and quantitation.

2.7.4 General Data Qualifiers and Usability

In general, the data validator examines each data point and determines any effects that QC exceedances may have had. The following qualifiers may be applied to the results:

- **J** - Concentration estimated. The analyte was positively identified and the associated numerical value is the approximate concentration of the parameter in the sample. Often, a J-qualifier is applied when the result was less than the limit of quantitation but higher than the detection limit (DL).
- **U** - Not detected. The sample was analyzed for this analyte, but it was not detected at greater than the DL.
- **UJ** – Not detected, limit of detection (LOD) estimated. The sample was analyzed for this analyte, but it was not detected above the DL. The LOD for this parameter is estimated on account of a QC exceedance.
- **R** – Rejected and unreliable. The result was rejected because QC limits were exceeded. The presence or absence of the parameter cannot be verified, and the result is not usable.
- **K -** Detected. Analyte is present, but the result may be biased high. The actual result may be lower than the reported result.
- **L -** Detected. Analyte is present, but the result may be biased low. The actual result may be higher than the reported result.
- **UL –** Not detected. The LOD is probably higher than what was reported.
- **[No qualifier present] -** Detected. Qualification was not warranted.

See **Table 2-5** for a description of data validation qualifiers that were applied to one or more analytical results.

2.7.5 Impacts on Precision, Accuracy, Representativeness, Completeness, and Comparability (PARCC)

Precision

Precision is defined as the agreement between duplicate results and was characterized by comparing MS/MSD relative percent differences (RPDs), serial dilutions, laboratory replicates, and field duplicate sample results. For this data set, precision was also assessed by examining dual-column reproducibility (percent difference between instrument columns) for pesticides and PCBs. Although results may have been qualified due to QC exceedances that may suggest an impact on precision, there is no actual significant negative impact on precision unless a data point is deemed unusable (rejected) due to precision exceedances. No data were rejected due to precision issues.

Accuracy/Bias

Accuracy/bias is a measure of the agreement between an analytical determination and the true value of the parameter being measured. For organic analyses, each sample was spiked with surrogate compounds, and for organic and inorganic analyses, an MS/MSD and laboratory control sample (LCS) were spiked with a known parameter concentration before preparation. Internal standards, surrogates, and MS/MSDs provide a measure of the matrix effects on the analytical accuracy. The LCS demonstrates accuracy of the method and the laboratory's ability to meet the method criteria. Accuracy/bias is also assessed by calibration recoveries. No data were rejected due to accuracy/bias issues.

Representativeness

Representativeness is a qualitative measure of the degree to which sample data accurately and precisely represent a characteristic environmental condition (in this case, the nature and extent of contamination). Representativeness is a subjective parameter and is used to evaluate the efficacy of the sample planning design. In terms of data quality, representativeness was assured because the sampling team followed approved SOPs for sample collection and handling and the laboratory-followed approved SOPs for sample handling, preparation, and analysis. No data were rejected due to SOP non-conformances.

Completeness

Completeness will be calculated as the number of analytically sound results that are available for use compared to the total number of measurements made. All results except those R-qualified as "rejected" are available for use as analytically sound results. The R-qualifier is the only qualifier that negatively affects a data point's availability. A completeness goal was not specified in the Uniform Federal Policy (UFP)-SAP; therefore, a general 95 percent completeness goal was applied. Overall, the entire data set was 100 percent complete and the goal was met.

Comparability

Comparability is a qualitative measure designed to express the confidence with which one data set may be compared to another. Factors that affect comparability are sample collection and handling techniques, sample matrix, and analytical methods. In this case, because

approved SOPs were followed for sample collection and handling (common sample matrixes were evaluated [surface water, sediment, soil, and groundwater] and EPA methods were utilized, the data user may express confidence in the fact that this data set is comparable to others of acceptable data quality. In addition, comparability is controlled by the other PARCC parameters because data sets can be compared with confidence only when precision and accuracy are known. Precision and accuracy were demonstrated to be acceptable, and the data user may be confident that this data set is comparable to others of high data quality.

2.7.6 Data Quality Evaluation

The purpose of this data quality evaluation is to summarize the findings of the data validation concerning the availability of the data for the investigation at CAX Site 7.

Groundwater Volatile Organics Data

Volatile organics were analyzed by SW-846 method 8260B. Excluding field QC samples, 400 distinct data points were generated. The VOC data set is 100 percent complete. The validation process issued the following qualifiers for results in the VOCs fraction:

Analysis Group	Validator Qualifier	QC Narrative	Count	Percent
VOC	U	NULL	381	95.25%
VOC	J	BRL	12	3.00%
VOC	J	SSH	3	0.75%
VOC	J	BSH	2	0.50%
VOC	NULL	NULL	2	0.50%
			400	100.00%

QC = Quality Control
100.00% not R-flagged and available for use

Refer to **Table 2-5** for an explanation of qualifications and their impact on data usability.

Groundwater Semivolatile Organics Data

Semivolatile organics were analyzed by SW-846 method 8270C. Excluding field QC samples, 496 distinct data points were generated. The SVOC data set is 100 percent complete. The validation process issued the following qualifiers for results in the SVOCs fraction:

Analysis Group	Validator Qualifier	QC Narrative	Count	Percent
SVOC	U	NULL	471	94.96%
SVOC	UJ	CCL	11	2.22%
SVOC	UL	BSL	7	1.41%
SVOC	UL	BD	6	1.21%
SVOC	UL	MSL	1	0.20%
			496	100.00%

QC = Quality Control

100.00% not R-flagged and available for use

Refer to **Table 2-5** for an explanation of qualifications and their impact on data usability.

Groundwater Explosives Data

Explosives were analyzed by SW-846 method 8330A. Excluding field QC samples, 128 distinct data points were generated. The explosives data set is 100 percent complete. The validation process issued the following qualifiers for results in the explosives fraction:

Analysis Group	Validator Qualifier	QC Narrative	Count	Percent
EXPLO	U	NULL	81	63.28%
EXPLO	J	2C	21	16.41%
EXPLO	B	FBL	11	8.59%
EXPLO	B	EBL	6	4.69%
EXPLO	NULL	NULL	5	3.91%
EXPLO	J	BRL	4	3.13%
			128	100.00%

QC = Quality Control
100.00% not R-flagged and available for use

Refer to **Table 2-5** for an explanation of qualifications and their impact on data usability.

Groundwater Pesticides and PCBs Data

Pesticides and PCBs were analyzed by SW-846 methods 8081A and 8082. Excluding field QC samples, 224 distinct data points were generated. The pesticides and PCBs data set is 100 percent complete. The validation process issued the following qualifiers for results in these fractions:

Analysis Group	Validator Qualifier	QC Narrative	Count	Percent
PEST_PCB	U	NULL	121	54.02%
PEST_PCB	UJ	SSL	94	41.96%
PEST_PCB	J	SSL	4	1.79%
PEST_PCB	J	BRL	3	1.34%
PEST_PCB	J	2C	2	0.89%
			224	100.00%

QC = Quality Control
100.00% not R-flagged and available for use

Refer to **Table 2-5** for an explanation of qualifications and their impact on data usability.

Groundwater Metals Data

Total and dissolved metals were analyzed by SW-846 methods 6010B, 7470A, and 9012B (total cyanide only). Excluding field QC samples, 192 distinct data points were generated for total metals and 184 were generated for dissolved metals. The data set is 100 percent complete. The validation process issued the following qualifiers for results in these fractions:

Analysis Group	Validator Qualifier	QC Narrative	Count	Percent
METAL	U	NULL	87	45.31%
METAL	NULL	NULL	67	34.90%
METAL	J	BRL	35	18.23%
METAL	B	MBL	3	1.56%
			192	100.00%

QC = Quality Control
100.00% not R-flagged and available for use

Analysis Group	Validator Qualifier	QC Narrative	Count	Percent
FMETAL	U	NULL	93	50.54%
FMETAL	NULL	NULL	54	29.35%
FMETAL	J	BRL	34	18.48%
FMETAL	B	MBL	3	1.63%
			184	100.00%

QC = Quality Control
FMETAL = Filtered or Dissolved Metals
100.00% not R-flagged and available for use

Refer to **Table 2-5** for an explanation of qualifications and their impact on data usability.

Groundwater Dioxins and Furans Data

Dioxins and Furans were analyzed by SW-846 method 8290. Excluding field QC samples, 136 distinct data points were generated. The data set is 100 percent complete. The validation process issued the following qualifiers for results in the dioxins and furans fraction:

Analysis Group	Validator Qualifier	QC Narrative	Count	Percent
DIOXIN	U	NULL	125	91.91%
DIOXIN	J	EBL	4	2.94%
DIOXIN	J	BRL	4	2.94%
DIOXIN	J	MBL	1	0.74%
DIOXIN	J	IR15	1	0.74%
DIOXIN	J	EMPC	1	0.74%

	136	100.00%

QC = Quality Control
100.00% not R-flagged and available for use

Refer to **Table 2-5** for an explanation of qualifications and their impact on data usability.

2.7.7 Data Usability

Blank contamination present in laboratory and field-associated blanks resulted in B-qualification of 1.31 percent of the data and J-qualification of 0.29 percent of the data. Blank contamination was most prevalent in explosives results. The remaining qualifications can be attributed to field blanks and equipment rinseate blanks. Blank contamination was also present for dioxins and furans and total and dissolved metals analyses. Twenty-five percent of all qualifications can be attributed to contamination in laboratory blanks (method blanks, calibration blanks, and so forth). It should be noted, however, that although the qualifications were made based on the laboratory blank's concentration (or vice-versa), there may have been field blank contamination that was associated with that sample as well, but at a lower concentration. Results that were B-qualified are available for use by the project team as non-detects at the reported concentrations, and results that were J-qualified are available for use as estimated at the reported concentrations. All blank qualifications are listed in **Table 2-6**.

2.7.8 Unvalidated Data

Soil samples were analyzed for pH by SW-846 method 9045C. Excluding field QC samples, six distinct data points were generated. Although pH data were not validated, the data were still subject to many of the verification and validation steps outlined in Worksheet 34 and 35 of the UFP-SAP. No qualifiers were applied and the pH data set is 100percent complete.

2.7.9 Overall Assessment

All data collected during the CAX Site 7 are found to be of exceptional quality. The data completeness goal was met with respect to the amount of data that is available for use by the project team. The project team can use these data as reported and qualified with the exception of data that were rejected due to QA/QC deficiencies.

TABLE 2-1
Sample Summary Table
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Sample ID	Investigation	Matrix	VOC	SVOC	Pesticides	PCBs	Dioxin/ Furans	Explosives	Total Metals	Dissolved Metals	pH	Collection Method
			SW846 8260B	SW846 8270C	SW846 8081A	SW846 8082	8290	8330	SW846 6020/7470A/ 7471A/9012	SW846 6020/ 7470A/9012	9045C	
NWSY-90-7-SC-PER-183	Shaw 2008 Removal Action	Soil	x	x	x	x	x	x	x			Hand Auger
NWSY-90-7-SC-PER-184			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-185			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-148			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-150			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-153			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-187			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-175			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-177			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-132			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-135			x	x	x	x	x	x	x			
NWSY-90-7-SC-FLR-138			x	x	x	x	x	x	x			
NWSY-90-7-SC-FLR-139			x	x	x	x	x	x	x			
NWSY-90-7-SC-FLR-140			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-143			x	x	x	x	x	x	x			
NWSY-90-7-SC-FLR-144			x	x	x	x	x	x	x			
NWSY-90-7-SC-FLR-145			x	x	x	x	x	x	x			
NWSY-90-7-SC-FLR-146			x	x	x	x	x	x	x			
NWSY-90-7-SC-FLR-147			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-149			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-151			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-152			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-154			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-159			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-162			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-164			x	x	x	x	x	x	x			
NWSY-90-7-SC-FLR-166			x	x	x	x	x	x	x			
NWSY-90-7-SC-FLR-167			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-169			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-170			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-172			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-188			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-193			x	x	x	x	x	x	x			
NWSY-90-7-SC-FLR-173			x	x	x	x	x	x	x			
NWSY-90-7-SC-FLR-174			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-176			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-178			x	x	x	x	x	x	x			
NWSY-90-7-SC-PER-179			x	x	x	x	x	x	x			

TABLE 2-1
Sample Summary Table
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Sample ID	Investigation	Matrix	VOC	SVOC	Pesticides	PCBs	Dioxin/ Furans	Explosives	Total Metals	Dissolved Metals	pH	Collection Method
			SW846 8260B	SW846 8270C	SW846 8081A	SW846 8082	8290	8330	SW846 6020/7470A/ 7471A/9012	SW846 6020/ 7470A/9012	9045C	
NWSY-90-7-SC-PER-133	Shaw 2008 Field Investigation	Soil	x	x	x	x	x	x	x			Hand Auger
NWSY-90-7-SC-FLR-136			x	x	x	x	x	x	x			
NWSY-90-7-SC-FLR-137			x	x	x	x	x	x	x			
NWSY-90-7-SC-FLR-160			x	x	x	x	x	x	x			
NWSY-90-7-SC-FLR-165			x	x	x	x	x	x	x			
NWSY-90-7-SC-FLR-189			x	x	x	x	x	x	x			
NWSY-90-7-SC-FLR-190			x	x	x	x	x	x	x			
NWSY-90-7-SC-FLR-191			x	x	x	x	x	x	x			
NWSY-90-7-SC-FLR-192			x	x	x	x	x	x	x			
CAS07-SS01-0024-0111	2011 SI Field Activities	Surface Soil									x	Hand Auger
CAS07-SS02-0024-0111											x	
CAS07-SS03-0024-0111											x	
CAS07-SS04-0024-0111											x	
CAS07-SS05-0024-0111											x	
CAS07-SS05P-0024-0111											x	
CAS07-MW01-0111	2011 SI Field Activities	Groundwater	x	x	x	x	x	x	x	x		Monsoon Pump and tubing
CAS07-MW02-0111			x	x	x	x	x	x	x	x		
CAS07-MW03-0111			x	x	x	x	x	x	x	x		
CAS07-MW04-0111			x	x	x	x	x	x	x	x		
CAS07-MW05-0111			x	x	x	x	x	x	x	x		
CAS07-MW06-0111			x	x	x	x	x	x	x	x		
CAS07-MW06P-0111			x	x	x	x	x	x	x	x		
CAS07-MW07-0111			x	x	x	x	x	x	x	x		

TABLE 2-2
Water Level Measurements
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Monitoring Well	Northing	Easting	Casing Elevation (msl)	Depth to Water (bgs)	Groundwater Elevation (msl)
CAS07-MW01	3636952.8	12032809.33	23.87	20.79	3.08
CAS07-MW02	3636757.1	12032862.10	21.11	17.73	3.38
CAS07-MW03	3636960.4	12032939.02	23.96	21.47	2.49
CAS07-MW04	3636846.6	12033007.59	23.38	21.04	2.34
CAS07-MW05	3637060	12033052.34	24.59	23.21	1.38
CAS07-MW06	3636932.9	12033080.70	23.75	22.15	1.60
CAS07-MW07	3636780.7	12033102.19	24.11	22.12	1.99

Notes:
msl - mean sea level
bgs - below ground surface

TABLE 2-3
Groundwater Quality Parameter Readings
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Location ID	CAS07-MW01-0111	CAS07-MW02-0111	CAS07-MW03-0111	CAS07-MW04-0111	CAS07-MW05-0111	CAS07-MW06-0111	CAS07-MW07-0111
Sample Date	01/28/11	01/28/11	01/25/11	01/28/11	01/25/11	01/24/11	01/24/11
Field Parameter[1]							
Depth to Water (ft)	20.77	17.65	21.54	21.27	23.36	22.16	22.26
Temperature (^{o}C)	13.07	11.3	15.08	11.92	15.36	12.17	12.99
pH	6.86	6.9	7.22	7.73	7.66	7.02	7.35
Oxidation Reduction Potential (mV)	115	110	125	10	127	110	123
Specific Conductivity (mS/cm)	0.456	0.367	0.559	0.634	0.882	0.591	0.699
Dissolved Oxygen (mg/L)	0	0	0	0	1.16	0	1.17
Turbidity (NTU)	11.3	10.45	14.5	16.7	12.3	13.8	15
Total Purged (L)	11	6.75	12	8.75	9	11.5	12.75
Dissolved Oxygen by CHEMets (mg/L)	1.5	3	1.5	1.5	4	1	1.5

Notes:

[1] - Field parameters presented are the final parameter readings collected before groundwater sample collection
ft - feet
^{o}C - degrees Celsius
pH - Standard pH units
mV - millivolts
mS/cm - millisiemens per centimeter
mg/L - milligrams per liter
NTU - nephlometeric turbidity units
L - liters

TABLE 2-4
Site 7 Survey Data
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Sample Location	Northing	Easting	Elevation
CAS07-SS01	3636947.35	12032817.17	21.12
CAS07-SS02	3636765.41	12032850.59	17.84
CAS07-SS03	3636930.78	12032921.09	20.63
CAS07-SS04	3636667.41	12033094.92	19.68
CAS07-SS05P	3637099.32	12033062.01	22.26
CAS07-MW01	3636952.78	12032809.33	23.87
CAS07-MW02	3636757.08	12032862.10	21.11
CAS07-MW03	3636960.36	12032939.02	23.96
CAS07-MW04	3636846.55	12033007.59	23.38
CAS07-MW05	3637060.02	12033052.34	24.59
CAS07-MW06	3636932.87	12033080.70	23.75
CAS07-MW07	3636780.68	12033102.19	24.11

TABLE 2-5
Data Qualification and Availability Summary
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

DV Qualifier	DV Qualification Code	Meaning of Code	Analyte Count[1]	Percent	Available as Reported	Available as Qualified	Not Available	Impact on PARCC[2]
B	EBL	Equipment Blank Contamination; Not detected substantially above the level reported in associated equipment blanks	6	0.34%		X		
B	FBL	Field Blank Contamination; Not detected substantially above the level reported in associated field blanks	11	0.63%		X		
B	MBL	Method Blank Contamination; Not detected substantially above the level reported in associated laboratory blanks	6	0.34%		X		
CLEAR	CLEAR	Detected	128	7.27%	X			
J	2C	Second Column – Poor Dual Column Reproducibility	23	1.31%		X		
J	BRL	Detected; Below Reporting Limit	92	5.23%	X			
J	BSH	Detected, but Estimated; Blank Spike – Blank Spike/LCS – High Recovery	2	0.11%		X		
J	EBL	Equipment Blank Contamination; Not detected substantially above the level reported in associated equipment blanks	4	0.23%		X		
J	EMPC	Detected, but Estimated; Estimated Possible Maximum Concentration	1	0.06%		X		
J	IR15	Detected, but Estimated; Ion ratio exceeds +/- 15% difference	1	0.06%		X		
J	MBL	Method Blank Contamination; Not detected substantially above the level reported in associated method blanks	1	0.06%		X		
J	SSH	Detected, but Estimated; Spiked Surrogate – High Recovery	3	0.17%		X		
J	SSL	Detected, but Estimated; Spiked Surrogate – Low Recovery	4	0.23%		X		
U	CLEAR	Not detected	1,359	77.22%	X			
UJ	CCL	Not detected, LOD may be inaccurate or imprecise; Continuing Calibration Verification – Low Recovery	11	0.63%		X		
UJ	SSL	Not detected, LOD may be inaccurate or imprecise; Spiked Surrogate – Low Recovery	94	5.34%		X		
UL	BD	Not detected, LOD may be Biased Low; Blank Spike/Duplicate	6	0.34%		X		
UL	BSL	Not detected, LOD may be Biased Low; Blank Spike/LCS – Low Recovery	7	0.40%		X		
UL	MSL	Not detected, LOD may be Biased Low; Matrix Spike and/or Matrix Spike Duplicate – Low Recovery	1	0.06%		X		
		TOTAL:	**1,760**	**100.00%**	**89.72%**	**10.28%**	**0.00%**	**Not applicable**
					99.45% available for use, qualified as applicable (completeness goal of 95% available data met)		**Unavailable for use**	

[1] Note: Analyte Count does not include unvalidated data or laboratory-calculated totals (toxicity equivalent factors or totals by homologues)
[2] PARCC is an acronym for "Precision, Accuracy, Representativeness, Completeness and Comparability." These are basic data quality indicators. See Section 2.2.2 for more details about PARCC.

TABLE 2-6

Data Summary Table: Blank Qualified Data

Site 7 Site Inspection

Cheatham Annex

Williamsburg, Virginia

Analysis Group	Sample ID	Analyte Name	CAS Number	Analytical Value	Units	Lab Qualifier	DV Qualifier	DV Qualification Code
DIOXIN	CAS07-MW06P-0111	Octachlorodibenzo-p-dioxin	3268-87-9	3.11	PG_L	J	J	EBL
DIOXIN	CAS07-MW03-0111	Octachlorodibenzo-p-dioxin	3268-87-9	8.17	PG_L	J	J	EBL
DIOXIN	CAS07-MW03-0111	2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	0.425	PG_L	J	J	MBL
DIOXIN	CAS07-MW06-0111	Octachlorodibenzo-p-dioxin	3268-87-9	2.04	PG_L	J	J	EBL
DIOXIN	CAS07-MW02-0111	Octachlorodibenzo-p-dioxin	3268-87-9	12.9	PG_L	J	J	EBL
EXPLO	CAS07-MW06-0111	Nitrobenzene	98-95-3	0.0934	UG_L	JPM	B	FBL
EXPLO	CAS07-MW07-0111	2-Nitrotoluene	88-72-2	0.0953	UG_L	JP	B	FBL
EXPLO	CAS07-MW03-0111	2-Nitrotoluene	88-72-2	0.220	UG_L	JP	B	FBL
EXPLO	CAS07-MW02-0111	Nitrobenzene	98-95-3	0.156	UG_L	JPM	B	FBL
EXPLO	CAS07-MW02-0111	2,4-Dinitrotoluene	121-14-2	0.0961	UG_L	JPXM	B	EBL
EXPLO	CAS07-MW02-0111	1,3,5-Trinitrobenzene	99-35-4	0.129	UG_L	JP	B	FBL
EXPLO	CAS07-MW02-0111	3-Nitrotoluene	99-08-1	0.220	UG_L	JP	B	EBL
EXPLO	CAS07-MW02-0111	Tetryl	479-45-8	0.791	UG_L	P	B	EBL
EXPLO	CAS07-MW04-0111	Nitrobenzene	98-95-3	0.292	UG_L	JP	B	FBL
EXPLO	CAS07-MW04-0111	1,3-Dinitrobenzene	99-65-0	0.522	UG_L	PM	B	FBL
EXPLO	CAS07-MW04-0111	2-Nitrotoluene	88-72-2	0.636	UG_L		B	FBL
EXPLO	CAS07-MW04-0111	3-Nitrotoluene	99-08-1	0.125	UG_L	JPM	B	EBL
EXPLO	CAS07-MW04-0111	Tetryl	479-45-8	0.364	UG_L	PM	B	EBL
EXPLO	CAS07-MW03-0111	3-Nitrotoluene	99-08-1	0.138	UG_L	JP	B	EBL
EXPLO	CAS07-MW03-0111	1,3-Dinitrobenzene	99-65-0	0.328	UG_L	P	B	FBL
EXPLO	CAS07-MW05-0111	2-Nitrotoluene	88-72-2	0.176	UG_L	J	B	FBL
EXPLO	CAS07-MW07-0111	Nitrobenzene	98-95-3	0.259	UG_L	JPM	B	FBL
FMETAL	CAS07-MW03-0111	Aluminum	7429-90-5	161	UG_L		B	MBL
FMETAL	CAS07-MW05-0111	Aluminum	7429-90-5	160	UG_L	J, D	B	MBL
FMETAL	CAS07-MW05-0111	Iron	7439-89-6	30.2	UG_L		B	MBL
METAL	CAS07-MW03-0111	Aluminum	7429-90-5	24.7	UG_L	J	B	MBL
METAL	CAS07-MW05-0111	Aluminum	7429-90-5	158	UG_L	J, D	B	MBL
METAL	CAS07-MW05-0111	Iron	7439-89-6	28.5	UG_L		B	MBL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\SITE 7\SI REPORT\FIGURE2-1_SI SAMPLE LOCATIONS.MXD MUNWIN 8/15/2011 10:59:23 AM

Legend

- Site Boundary
- Cheatham Annex Boundary
- Buildings
- Former Buildings
- Roads
- Monitoring Well Locations
- pH Soil Locations

N
W E
S

0 40 80
Feet

Figure 2-1
Site Inspection Sample Locations
Site 7 Site Inspection Report
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

SECTION 3

Site 7—Old DuPont Disposal Area

This section presents an evaluation of the results from the SI performed at Site 7. The section includes a summary of the previous investigations conducted at the site, a historical CSM, site-specific background data, an updated current CSM, and the release assessment decision analysis.

3.1 Site History and Potential Release Sources

According to the IAS, non-hazardous inert wastes from the former City of Penniman and the former DuPont Company Penniman facility were disposed at the site adjacent to the York River during the early 1900s (C.C. Johnson & Associates Inc. and CH2M HILL, 1984). Information on the types and quantities of wastes received is not available; however, the presence of ash, melted bottles, and charred metal indicate some of the waste may have been incinerated prior to disposal (Baker, 2004).

In September 2003, Hurricane Isabel eroded approximately 15 to 20 feet of York River shoreline adjacent to the site, resulting in a large amount of formerly buried debris (dinnerware, glass bottles, metal, etc.) exposed on the face of an unstable slope along the eastern boundary of Site 7 and scattered on the beach.

3.1.1 2004 Site 7 Final Trenching Study

In February 2004, trenching and soil sampling activities were initiated to delineate the extent of buried debris and potential soil contamination in preparation for a Time-Critical Removal Action (TCRA) to address shoreline erosion and exposure of debris (Baker, 2004).

Fourteen trenches were excavated, ranging from 1 to 6 feet in depth and 7 to 14 feet in length. Final depth was determined when native soils were encountered (Baker, 2004). During the trenching activities, an ash layer was identified west of the site's eastern fence line, as well as within the exposed slope. The ash layer was thickest near the fence and thinned as it extended west and was generally within the top 12 inches of soil; however, it thickened to approximately 16 inches bgs south of Building 169.

Surface and subsurface soil samples were collected to assess the nature and extent of soil contamination within the identified waste boundary and included a sample of ash collected from the exposed slope. Soil sample analytical results were compared to Soil Association 2 background upper confidence limits (UCLs), as well as the clean-up goals established for nearby Site 1, due to its close proximity and similar nature of waste. Primarily, the highest contamination was identified in the soil samples collected closest to where the ash layer was found.

3.1.2 Bhate Project Completion Report

The TCRA was completed in July and August of 2006 to stabilize the shoreline and prevent further erosion of disposal area contents into the York River. The TCRA consisted of the placement of sand-filled geotubes against the toe of approximately 240 feet of eroding

shoreline. In addition, Buildings 169 and 170 were demolished, and the upland area of the site was covered with approximately 6 inches of topsoil. As part of the TCRA, a housekeeping effort was conducted to remove visible surface debris from the shoreline. Approximately 40 cubic yards (cy) of debris, consisting of glass, plastic, metal, and ceramic material, were removed by hand along the shoreline. In addition, a munitions and explosives of concern removal action was performed, during which approximately 86 pounds of munitions debris (MD) consisting mainly of lifting lugs and fuse adapters were recovered from the shoreline (Bhate, 2007). No live ordnance was identified. Debris and soil contamination removal was addressed under the 2008 soil and debris removal (summarized below).

3.1.3 2008 Soil and Debris Removal

Based on the results of the 2004 trenching and soil sampling, a removal action was completed between December 2007 and April 2008 to remove waste and waste-impacted soils. As a conservative safety measure, using a magnetic, gradiometer, a unexploded ordnance (UXO) technician was onsite to inspect the removal area for the presence of iron- or steel-bearing objects near and below the ground surface. Approximately 2,998 cy of soil and debris were removed during the action; 2,549 cy of non-hazardous materials and 439 cy of hazardous materials (due to lead concentrations) were disposed (Shaw, 2009). No munitions, explosives of concern, or UXO items were encountered during the removal action. Post-removal soil samples were collected from the sidewalls and bottom of the excavation to evaluate post-removal conditions and assess the need for additional investigation and action. All samples were analyzed for VOCs, SVOCs, including polycyclic aromatic hydrocarbons (PAHs), pesticides and PCBs, explosives, metals, cyanide, and 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD).

Although no site-specific remediation goals were set for the removal action, the Navy used a lead removal criterion of 400 parts per million (ppm), based on the USEPA residential child soil screening value, to verify lead-contaminated soil would be sufficiently removed from the site. If constituent concentrations exceeded the lead removal criterion at a sample location, additional material was removed and the excavation was re-sampled. Successful completion of the removal action was based upon visual confirmation of debris removal and post-removal soil lead results. Following removal activities, the excavated area was backfilled with approximately 2,181 cy of clay backfill, which was certified as clean through analytical testing (Shaw, 2009), covered with 6 inches of topsoil, and seeded. The analytical results from the post-removal soil samples are discussed in Section 3.4.2.

3.2 Pre-Hurricane Isabel Conceptual Site Model

The CSM for pre-Hurricane Isabel Site 7 conditions (2003) is based on select pre-TCRA (2004) surface soil and subsurface ash sampling data collected by Michael Baker Jr., Inc. (Baker) during the 2004 Trenching and Limited Field Investigation. Since no site-specific analytical data exists prior to 2004 (pre-Hurricane Isabel), pre-TCRA Site 7 samples collected in 2004 along the York River were used to interpret potential migration pathways, the pre-Hurricane Isabel distribution of contamination, and the pre-Hurricane Isabel potential exposure and receptor pathways to conservatively estimate potential soil to sediment

transport from the site to the York River as a result of Hurricane Isabel. The pre-Hurricane Isabel conceptual site model (CSM) is shown in **Figure 3-1**.

The pre-TCRA soil and ash data were compared to the following conservative screening values:

- USEPA Regional Screening Levels (RSLs) for Residential Soil Adjusted for sediment (May 2011)
- Effects Range – Low (ER-L) and Effects Range – Median (ER-M) sediment screening values, or their approximate equivalent

As described in Section 1.1.1, it is appropriate to compare only those site-specific concentrations above basewide background concentrations to risk-based screening criteria. The background 95 percent UTLs (CH2M HILL, 2011) were used for comparison as part of this process.

3.2.1 Historical Potential Migration Pathways

Prior to 2003, the Site 7 topographic gradient was fairly level, with a nearly vertical bluff (approximately 15 feet high) along the eastern site boundary along the York River shoreline. This bluff was highly vulnerable to erosion caused by surface water runoff and wave action. Historically, as the shoreline eroded, non-hazardous site waste, including dinner ware, incinerated bottles, and metal, could be found littered on the beach.

In September 2003, Hurricane Isabel eroded approximately 15 to 20 feet of shoreline, resulting in a large amount of exposed debris covering the beach and an unstable bluff slope along the eastern boundary of Site 7. A TCRA was completed in July/August 2006 to stabilize the shoreline and prevent further erosion of disposal area contents into the York River (Baker, 2004). The TCRA consisted of the placement of sand-filled geotubes against the toe of approximately 240 feet of eroding shoreline. In addition, Buildings 169 and 170 were demolished and the upland area of the site was covered with approximately 6 inches of topsoil and seeded.

Based on the 2008 removal area, it is likely that only a small lobe (east of former Building 169) of debris from Site 7 eroded into the York River as a result of Hurricane Isabel (**Figure 3-1**). However, the amount of material within this lobe cannot be confirmed.

3.2.2 Historical Distribution of Contamination

In total, seven surface soil samples (SO05, SO08, SO09, SO12, SO13, SO14, and SO15) and one subsurface ash sample (SO04) collected during the 2004 Trenching Investigation were used to estimate the pre-Hurricane Isabel soil contamination concentrations (**Table 3-1**) that may have eroded into the York River. These surface soil and subsurface ash samples were used in this evaluation because they were collected along the eastern site boundary, adjacent to the York River, and are more likely to represent the type of material and contamination that was eroded away during the storm.

The samples used in this evaluation were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and metals. The ash sample was also analyzed for dioxins and furans.

Organic Compounds

Soil Samples

Two SVOCs (bis(2-ethylhexyl)phthalate and di-n-octylphthalate) and two pesticides (alpha-chlordane and heptachlor epoxide) exceeded at least one screening criterion in pre-TCRA soils (**Figure 3-2**).

Ash Sample

2,3,7,8-TCDD exceeded at least one screening criterion (**Figure 3-2**).

Inorganic Constituents

Soil Samples

Six inorganic constituents (barium, chromium, copper, lead, manganese, and zinc) exceeded the background 95 percent UTL and at least one screening criterion in pre-TCRA soils (**Figure 3-2**).

Ash Sample

Five inorganic constituents (barium, copper, lead, mercury, and zinc) exceeded the background 95 percent UTL and at least one screening criterion in the historical ash sample (**Figure 3-2**).

3.2.3 Human Health Risk Evaluation – Soil to Sediment Transport Pathway

The human health risk screening and risk ratio evaluation for pre-TCRA surface soil and ash are presented in **Appendix G**. The human health risk screening for the soil to sediment exposure pathway was conducted assuming that the concentrations in the pre-TCRA surface soil and subsurface ash data from samples at the edge of the site adjacent to the river represented a conservative estimate of the potential concentrations in the river sediment. In reality, contaminated soil and ash that was eroded during a major storm would be transported, diluted, and dispersed over a wide area, causing actual river sediment concentrations resulting from the exposed debris to be significantly lower than assumed in this evaluation. Therefore, the results of the human health risk screening provide a conservative preliminary indication of potential risks from exposure to chemicals of potential concern (COPCs) in the river sediment and may be used to help determine whether the site requires further evaluation (e.g., a baseline risk assessment or additional data collection).

The human health risk screening was conducted in three steps using a risk ratio technique (U.S. Navy, 2000). The supporting tables for the evaluation are presented in **Appendix G, Attachment G.1**. An overview of the various potential receptors and exposure pathways addressed in the risk evaluation is presented in the human health CSM, **Figure G-1** of **Appendix G**.

Tables G-2.1 through **G-2.1a** in **Appendix G** present the risk-based screening and risk ratio evaluation for soil (representing sediment) at Site 7. Two metals (arsenic and chromium) were identified in Step 1 as COPCs for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations, **Table G-2.1a**), neither of these metals was identified as a COPC. The potential unacceptable carcinogenic risk identified in Step 1 from exposure to Site 7 soil was primarily associated with chromium. However, only 1 of the 45 detected concentrations of chromium exceeded the background 95 percent UTL for chromium. Also,

it is important to note that in performing the risk evaluation, it was assumed that all of the chromium detected in the soil was in the hexavalent form, which is very unlikely. Chromium is generally found in natural soil predominantly in the trivalent form, unless activities at the site have resulted in the release or formation of hexavalent chromium. At Site 7, it is likely that trivalent chromium is the predominant form of chromium that is present at the site. Chromium was identified as a COPC in soil only when screened against the RSL for hexavalent chromium. However, the maximum detected concentration for chromium in soil was less than the RSL for trivalent chromium. If chromium is not retained as a COPC since site concentrations are consistent with base background concentrations and the chromium present is likely to be the trivalent form, arsenic would not be considered a COPC, as it alone does not contribute a cancer risk above the 5×10^{-5} risk-ratio screening benchmark level. Therefore, exposure to sediment (based on the conservative use of Pre-TCRA site soil data) would not result in unacceptable risks to potential human receptors.

3.2.4 Ecological Risk Screening – Soil to Sediment Transport Pathway

An ecological risk screening (**Appendix H)** was conducted using 2004, pre-TCRA surface soil and subsurface ash data collected from the Site 7 boundary adjacent to the York River to conservatively estimate potential pre-TCRA soil to sediment transport from the site to the York River as a result of Hurricane Isabel. Similar to the human health risk evaluation, the ecological risk screening for this potential soil/ash to sediment pathway assumed that the concentrations in the pre-TCRA surface soil (0 to 6 inches)/ash data from samples at the site perimeter adjacent to the river were an appropriate representation of the potential concentrations in the sediment. However, in reality, contaminated soil and ash that was eroded during a major storm would be transported, diluted, and dispersed over a wide area, causing actual river sediment concentrations resulting from the exposed debris to be significantly lower than assumed in this evaluation. While there is some uncertainty associated with the use of these surface soil data, the surface layer is likely to be the best representation of the soil that washed out since it was at the top of the soil column when the 2003 storm event occurred. Also, since the concentrations in the surface strata were generally similar to, or higher than, the corresponding subsurface strata (where multiple depths were sampled) for the sample locations considered, the process used is likely to be a conservative representation of the available 2004 soil data set.

The mean (or maximum, if the mean exceeded the maximum) concentrations of six constituents (bis[2-ethylhexyl]phthalate, di-n-octylphthalate, heptachlor epoxide, dioxins/ furans, barium, and lead) exceeded the most conservative screening values. Therefore, these six constituents were identified as initial COPCs (**Appendix H; Tables H-3 and H-4**).

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean concentrations of all initial COPCs, except dioxins/furans, did not exceed screening values in the secondary evaluation (**Appendix H; Tables H-3 and H-4**); the HQ for dioxins/furans was 1.56. However, the dioxins/furans data were associated with a single sample, SO04 (the maximum concentrations for barium and lead also occurred in this sample), which was a subsurface sample that consisted almost entirely of ash. Because the majority of the soil that eroded into the York River did not consist of ash, this sample is not likely to be representative of the dioxins/furans concentrations in

the material potentially washed into the York River during Hurricane Isabel. Therefore, utilizing the dioxins/furans results from this single sample adds additional conservatism to the evaluation beyond the assumption of no dilution or dispersion. In addition, the fine-grained nature of the ash material would likely result in its transport and deposition over a relatively large area of river bottom at concentrations that are likely to be orders of magnitude lower than those represented by sample SO04.

The ecological risk screening evaluation assumed that no dilution or attenuation of the soil (including the ash) occurred prior to deposition and that the deposited soil would constitute the entire sediment surface (exposure medium) to which potential ecological exposures would occur, both highly conservative and unrealistic assumptions. Dilution by a factor of just 1.56 would reduce the dioxins/furans HQ to one. Consequently, the ecological risk evaluation determined that unacceptable ecological risks in the York River from potential historical soil transport from the site are very unlikely.

Buried debris has subsequently been removed from the site, and the potential for future contaminant migration via erosion or surface runoff to sediment is no longer a complete pathway. It has been documented that Hurricane Isabel eroded between 15 and 20 feet of shoreline from Site 7 in 2003. However, due to the hurricane's extensive surge, it is very unlikely that the portion of the Site 7 shoreline that was removed during this storm was deposited immediately adjacent to the site within the York River. Studies of the York River, including the *Estuarine Suspended Sediment Loads and Sediment Budgets in Tributaries of Chesapeake Bay*, conducted by the Center for Coastal Resource Management (CCRM) and the Virginia Institute of Marine Science (VIMS) (CCRM & VIMS, 2010), indicate that river sediment within the vicinity of Site 7 is continually eroding at a rate of 0.58 meters per year. As part of this study, historical hydrographic surveys (1857 and 1945) conducted by NOAA were used to create a sediment accumulation map. Over the course of the 88-year time frame of the study, CCRM calculated a net loss of sediment within the vicinity of Site 7. Due to this continual erosion, sediment data collected at present from along the Site 7 shoreline would not be useful in determining whether or not a CERCLA release occurred from Site 7.

3.2.5 Conclusions

Exposure to sediment (based on the pre-TCRA soil data) would not result in unacceptable risks to potential human or ecological receptors. Only under the highly unrealistic assumption of no dilution or attenuation during soil erosion and subsequent deposition, dioxins/furans in the subsurface ash sample SO04 posed a potential risk to ecological receptors. However, dilution by a factor of only 1.56 would reduce the dioxins/furans ecological risk to acceptable levels. Therefore, it is concluded that unacceptable ecological risks in the York River from potential historical soil transport from Site 7 are very unlikely. In addition, due to historical and continual erosion from both normal wave action and periodic storm events such as Hurricane Isabel, it is unlikely that sediment data collected at present from along the Site 7 shoreline would be useful in determining whether or not a CERCLA release occurred from Site 7.

3.3 Site-Specific Background Data

Groundwater samples were collected from two upgradient background monitoring wells (CAS07-MW01 and CAS07-MW02) during the 2011 SI field activities (**Figure 2-1**) to

supplement the background 95 percent UTLs. Groundwater samples from these wells were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, explosives, dioxin and furans, and TAL total and dissolved metals.

One pesticide (gamma-chlordane), two dioxins/furans (1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin, octachlorodibenzo-p-dioxin, and total TEQ), and three explosives (1,3-dinitrobenzene, HMX, and RDX) were detected in at least one of the upgradient monitoring wells (**Table 3-2**). No VOCs or SVOCs were detected in the site-specific background monitoring wells.

In addition, 13 total metals (aluminum, barium, cadmium, calcium, chromium, cobalt, iron, magnesium, manganese, nickel, potassium, sodium, and zinc) and 12 dissolved metals (aluminum, barium, cadmium, calcium, cobalt, iron, magnesium, manganese, nickel, potassium, sodium, and zinc) were detected at concentrations consistent with base background concentrations in the upgradient monitoring wells (**Table 3-2**).

3.4 Current Conceptual Site Model

The CSM for current Site 7 conditions (post Hurricane Isabel [2003]) is based on the data collected as part of a 2008 removal action and the 2011 SI. The CSM interprets the physical characteristics, the distribution of contamination and the potential exposure and receptor pathways. The current CSM for Site 7 is shown in **Figure 3-3**.

3.4.1 Physical Setting

Topography and Surface Water

Site 7 is approximately 1 acre in size and located immediately adjacent to the York River. The site gradient is fairly level, with a steady sloping drop along the eastern boundary to the York River shoreline. Since the York River shoreline is highly vulnerable to erosion caused by surface water runoff and wave action, the eastern boundary of the site was a nearly vertical drop of approximately 15 feet towards the York River prior to a 2008 removal action.

Surface water from the site runs off to the York River or infiltrates into the ground. Other than the York River, there are no wetlands or water bodies on or immediately adjacent to Site 7.

Hydrogeology

The geology at Site 7 consists of yellow and brown sands with varying degrees of silt and clay overlain by fill dirt brought in during excavation activities. Soil boring logs from the SI field activities present descriptions of the soil and general subsurface geology and are included as **Appendix C**.

Groundwater underlying Site 7 was encountered within the Yorktown-Eastover Aquifer between 15 and 25 feet bgs. Based on water-level measurements collected during the SI, groundwater flows towards the York River (**Figure 3-4**).

Current and Future Land Use

Currently, the portions of the site surrounding the removal area are forested, with the removal area consisting of successional old field habitat. Site 7 is within the confines of CAX

and access is restricted to the general public. Navy and DoD personnel do have access to the area; however, the site itself is surrounded by a fence which may deter trespassers. At this time, the future use of this site is not expected to change from current use; however due to its location, the site may eventually be used as a recreational area.

3.4.2 Distribution of Contamination

Data collected during the 2008 Shaw removal action and 2011 SI field activities were evaluated as part of this SI Report (**Table 2-1**). **Tables 3-3** and **3-4** summarize all constituents detected in Site 7 soil and groundwater samples from Site 7. The tables also identify screening criteria exceedances. All analytical data for all samples are provided in **Appendix I.**

Soil

In total, 47 soil samples[2] were collected from Site 7 (**Table 2-1**) during the 2008 Shaw removal action. These locations, collected prior to backfilling activities, were chosen to determine if a release from historical activities had occurred and to characterize potential migration pathways. In addition, five surface soil samples were collected from Site 7 (**Table 2-1**) during the 2011 SI field activities and analyzed for pH to evaluate the toxicity and bioavailability of certain metals in soil. The analytical results for the 2011 samples (pH only) will not be discussed in this section; however, the results were used to complete the ecological risk screening (**Appendix B**).

Soil samples collected during the 2008 Shaw removal action were analyzed for Target Compound List (TCL) VOCs, TCL SVOCs, PAHs by selective ion monitoring (SIM), TCL pesticides and PCBs, explosives, Target Analyte List (TAL) metals, cyanide, and 2,3,7,8-TCDD.

Organic Compounds

One SVOC (benzo[a]anthracene) and 2,3,7,8-TCDD only exceeded their respective SSL (10 micrograms per kilogram [µg/kg] and 0.26 picograms per gram [pg/g]) in the soil samples (**Figure 3-5**); however, these constituents (detected at 18J µg/kg and 0.267 pg/g, respectively) were not detected in groundwater. One pesticide (endrin) exceeded its ESV (1.95 µg/kg) at a concentration of 2.4J µg/kg; however since pesticides were not known to be disposed at Site 7 this low detected concentration is likely attributable to normal pesticide use at DoD facilities to control pests and not from the disposal of pesticides. No other VOCs, SVOCs, pesticides, PCBs, or explosives were detected at concentrations exceeding their respective RSLs, SSLs, or ESVs.

Inorganic Constituents

Ten inorganic constituents (aluminum, arsenic, chromium, iron, lead, manganese, mercury, selenium, thallium, and vanadium) exceeded the background 95 percent UTL and at least one screening criterion in soil (**Figure 3-5**). Selenium and thallium may not be attributable to a release from buried debris as described below.

- Selenium was detected in several soil samples above the SSL (0.95 mg/kg) and ESV (0.52 mg/kg) at a maximum concentration of 2.9 mg/kg. The selenium exceedances are

[2] Due to the variable thickness of backfill used after all visible debris was removed during the 2008 removal action, all soil samples were evaluated as surface soil.

relatively consistent and located throughout the site and selenium was not detected in any soil samples collected prior to the 2008 removal action; therefore; they may not be attributable to a release from the buried debris.

- Thallium was detected in several soil samples above the SSL (0.026 mg/kg), RSL (0.078 mg/kg) and ESV (0.51 mg/kg) at a maximum concentration of 2.4 mg/kg. The thallium exceedances are relatively consistent and located throughout the site and thallium was not detected in any soil samples collected prior to the 2008 removal action; therefore; they may not be attributable to a release from the buried debris.

Groundwater

Groundwater samples were collected from five onsite (CAS07-MW03 through CAS07-MW07) monitoring wells during the 2011 SI field activities (**Tables 3-5**). Since no groundwater samples had previously been collected from Site 7, the onsite monitoring well locations were chosen by placing locations within the excavated area with some biasing toward those areas where post-removal soil concentrations exceeded residential RSLs and ESVs (**Figure 2-1**).

All groundwater samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, explosives, dioxin and furans, and TAL total and dissolved metals.

Organic Compounds

Six VOCs (bromodichloromethane, chloroform, dibromochloromethane, tetrachloroethene [PCE], trichloroethene [TCE], and vinyl chloride [VC]), one SVOC (2,4-dinitrotoluene), two pesticides (4,4'- dichlorodiphenyldichloroethane [DDD] and gamma-Chlordane), one dioxin (octachlorodibenzo-p-dioxin), and one explosive (hexahydro-1,3,5-trinitro-1,3,5-triazine [RDX]) exceeded at least one screening criterion in groundwater (**Figure 3-6**).

- The VOCs and SVOCs that exceeded their respective screening criteria were detected in the general vicinity of former Building 169. It was in this area where the thickest ash was identified prior to the 2008 removal action.

- Octachlorodibenzo-p-dioxin was detected in four out of the five monitoring wells at concentrations exceeding the ESV (0.002 pg/g)/ However, since this constituent was also detected in both upgradient monitoring wells at a maximum concentration of 0.0129 pg/g, the detected octachlorodibenzo-p-dioxin concentrations are likely not attributable to a release from the site and may be naturally occurring (i.e., forest fires) or from a non-site related anthropogenic source (e.g., atmospheric deposition).

- RDX was detected in one monitoring well at an estimated concentration of 0.651J µg/kg. While this concentration slightly exceeds the residential RSL of 0.61 µg/kg, it is below the RDX concentration detected in upgradient background monitoring well MW02 (0.721 µg/kg) and is not likely attributable to a release from buried debris.

- Chloroform was detected in two monitoring wells in the general vicinity of former Buildings 169 and 170 at a maximum estimated concentration of 0.757J µg/L. While chloroform has historically been considered to be of solely anthropogenic origin, several natural sources of chloroform have been identified (Ivahnenko, et. al., 2006). Due to the trace concentrations detected, the chloroform may be related to naturally occurring conditions.

- Pesticides were not known to be disposed at Site 7. The low detected 4,4'-DDD and gamma-chlordane concentrations are likely attributable to normal pesticide use at DoD facilities to control pests and not from the disposal of pesticides. In addition, gamma-chlordane was detected in one of the site-specific upgradient background monitoring wells at generally similar concentrations as the site samples (the mean ratio between site and upgradient samples was 1.29), indicating that this compound is likely the result of basewide pesticide applications and is not a site-related constituent. The legal application of pesticides is not a CERCLA-regulated release.

Inorganic Constituents

Two total inorganic constituents (arsenic and manganese) and three dissolved inorganic constituents (arsenic, cobalt, and manganese) exceeded at least one screening criterion in groundwater (**Figure 3-6**).

- Total and dissolved arsenic was detected in two monitoring wells (CAS07-MW04 and CAS07-MW07) above their respective background 95 percent UTLs (2.28 micrograms per liter [µg/L] and 1.37 µg/L) and the Adjusted Tap Water RSL (0.045 µg/L) at maximum concentrations of 4.26 µg/L and 3.55 µg/L (in CAS07-MW07) respectively.
- Dissolved cobalt was detected in three monitoring wells above the background 95 percent UTL (0.7 µg/L) and the Adjusted Tap Water RSL (1.1 µg/L) at a maximum concentration of 4.59 µg/L.
- Total and dissolved manganese was detected in one monitoring well (CAS07-MW04) above their respective background 95 percent UTLs (57.9 µg/L and 49.5 µg/L), the Adjusted Tap Water RSL (88 µg/L), and the ESV (100.0 µg/L), at concentrations of 216 µg/L and 208 µg/L, respectively.

3.4.3 Potential Exposure and Receptor Pathways

Potential receptors at Site 7 include potential future industrial workers, current and potential future trespassers, potential future construction workers, potential future residents, and lower trophic level terrestrial receptors (such as plants and soil invertebrates). Although the site is relatively small (approximately 1 acre), exposures to upper trophic level receptors (such as birds and mammals) are possible and were also evaluated. In addition, there is the potential for groundwater transport and subsequent discharge from the site to the York River (brackish to marine water body).

Human Health Risk Evaluation

The human health risk screening and risk-ratio evaluation for Site 7 are presented in **Appendix A**. Soil screenings were conducted using all 2008 post-removal samples; however, samples of the backfill material were not included in the evaluation.

The evaluation was conducted in three steps using a risk ratio technique (Navy, 2000). The supporting tables for the evaluation are presented in **Appendix A, Attachment A.1**. An overview of the various potential receptors and exposure pathways addressed in the risk evaluation is presented in the human health CSM, **Figure A-1** of **Appendix A**. The results of the human health risk evaluation for Site 7 are summarized as follows.

Soil

The risk-based screening and risk ratio evaluation for soil at Site 7 is provided in **Appendix A, Attachment A.1, Tables 2.1** through **2.2a**.

In Step 1, the seven metals that were detected in soil samples above the background 95% UTLs and the human health screening levels were selected as constituents of potential concern (COPCs): aluminum, arsenic, chromium, iron, manganese thallium, and vanadium.

In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 2×10^{-4} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Constituents contributing to the cumulative cancer risk include arsenic and chromium. Cumulative target organ hazard indexes (HIs) calculated for the COPCs ranged from 0.2 to 4.9; two HI values (1.2 for gastrointestinal effects, associated with iron, and 3.2 for hair effects, associated with thallium and vanadium) were greater than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk or target organ HI greater than 0.5 were identified as initial COPCs and include arsenic, chromium, iron, thallium, and vanadium.

In Step 3, based on the use of the 95 percent UCL for the exposure point concentrations (EPC), a cumulative cancer risk of 7×10^{-5} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Arsenic and chromium contributed to the cumulative cancer risk, but chromium was the only COPC to contribute an individual cancer risk above 5×10^{-5}. However, it is important to note that in performing the risk assessment, it was assumed that all of the chromium detected in the soil was in the hexavalent form, which is very unlikely. Chromium is generally found in natural soil predominantly in the trivalent form, unless activities at the site have resulted in the release or formation of hexavalent chromium. At Site 7, it is likely that trivalent chromium is the predominant form of chromium that is present at the site. Chromium was identified as a COPC in soil when screened against the RSL for hexavalent chromium. However, the maximum detected concentration for chromium in soil was less than the RSL for trivalent chromium. In addition, while only 3 of the 45 detected concentrations of chromium exceeded the background 95 percent UTL for chromium, these concentrations did not exceed the maximum base background concentrations. If chromium is not retained as a COPC, arsenic would not be considered a COPC, as it alone does not contribute a cancer risk above the 5×10^{-5} risk ratio screening benchmark level.

Based on Step 3 (risk ratio using 95 percent UCL concentrations), the cumulative corresponding HI (affecting hair as the target organ) of 1.4 is primarily due to exposure to thallium (HI = 1.0) and exceeds the target level of 0.5. Therefore, exposure to thallium in soil at Site 7 could result in unacceptable human health risks. Iron (HI=0.3) and vanadium (HI=0.1) hazard indices do not exceed the target level of 0.5 and are not retained as COPCs.

In Step 1 for the particulate emissions from soil to air evaluation, the one metal (chromium) that was detected in soil samples above the background 95 percent UTL and the human health screening levels was selected as a COPC. In Step 2, a cancer risk of 3×10^{-6} was calculated; therefore, since this value is less than the 5×10^{-5} risk-ratio screening benchmark, chromium was eliminated as a COPC for the particulate emissions from the soil to air exposure pathway.

The human health risk evaluation indicates the potential for hazards associated with exposure to thallium in soil; therefore, exposure to soil at Site 7 could result in unacceptable human health risks, and further evaluation of thallium in soil is recommended.

Groundwater

The risk-based screening and risk ratio evaluation for groundwater at Site 7 are provided in **Appendix A, Attachment A.1, Tables 2.3** through **2.3b**.

In Step 1, the 13 constituents that were detected in groundwater samples above the background 95 percent UTLs and the human health screening levels were identified as COPCs: bromodichloromethane, chloroform, dibromochloromethane, PCE, TCE, VC, 2,4-dinitrotoluene, RDX, arsenic, manganese, dissolved arsenic, dissolved cobalt, and dissolved manganese.

In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 2×10^{-4} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Constituents contributing to the cumulative cancer risk include bromodichloromethane, chloroform, dibromochloromethane, PCE, TCE, VC, 2,4-dinitrotoluene, RDX, and dissolved arsenic. Cumulative target organ HIs calculated for the COPCs were 0.2 (central nervous system) and 0.4 (thyroid), both less than the cumulative target organ HI risk-ratio screening benchmark of 0.5.

In Step 3, based on the use of the 95 percent UCL for the EPC, a cumulative cancer risk of 2×10^{-4} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Bromodichloromethane, chloroform, dibromochloromethane, PCE, TCE, VC, 2,4-dinitrotoluene, RDX, and dissolved arsenic contributed to the cumulative cancer risk. The maximum detected concentrations of bromodichloromethane, chloroform, dibromochloromethane, PCE, and VC are below their respective MCL. The maximum detected concentrations of TCE and 2,4-dinitrotoluene exceed their MCL, and there is no MCL for RDX.

The preliminary human health risk-based screening indicates the potential for unacceptable risks associated with exposure to groundwater.

Ecological Risk Screening Results

The ecological risk screening was performed to determine the potential for ecological risks associated with direct exposure to surface soil (0 to 24 inches) and groundwater. Soil screenings were conducted using 36 of the 47 2008 post-removal samples (which represents all post-removal samples that are within the 0- to 24-inch depth range relative to the current [backfilled] site elevation); samples of the backfill material, however, were not included in the evaluation. This depth range was selected since ecological exposures are generally considered to be confined to the top two feet of the soil column. The samples used in the screening were within 24 inches (the depth of potential ecological exposures) of the current ground elevation (following backfilling) and were below the backfill material (i.e., soil in areas where less than 24 inches of backfill were placed). Thus, the use of these data is conservative since the samples are covered by backfill, which likely contains lower chemical concentrations, but less than 24 inches of backfill were present, which means that some ecological exposures to these samples are still possible.

The results of the ecological risk screening (**Appendix B**) provide a preliminary indication of potential risks from exposure to COPCs identified for the site and are used to help determine whether the site requires further evaluation or whether the risks are acceptable.

Soil

Eight inorganic constituents (aluminum, arsenic, iron, lead, manganese, mercury, selenium, and thallium) and one organic compound (endrin) exceeded screening values based upon maximum detected concentrations or pH. All except mercury also exceeded background 95 percent UTLs, where available (**Appendix B; Tables B-4 and B-5**). Thus, aluminum, arsenic, iron, lead, manganese, selenium, thallium, and endrin were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean hazard quotients (HQs) for aluminum, arsenic, iron, lead, manganese, and thallium were less than 1. Thus, these constituents were not identified as refined COPCs.
- Although the mean HQ (1.01) exceeded 1 for endrin, it did so by only a very small amount. Since endrin exceeded the screening value in only 1 of 36 soil samples, at a maximum HQ of just 1.23, potential risks associated with this chemical are very low and this constituent was not identified as a refined COPC.
- The mean HQ for selenium (3.44) exceeded 1. However, this constituent is not likely to be site-related since it was not detected in 2004 (pre-removal) surface and subsurface soil samples (all samples were flagged U or B). In addition, the screening value used is based upon potential impacts to plants. Soil screening values for other receptors (such as 4.10 mg/kg for soil invertebrates) are not exceeded (maximum selenium concentrations in soil were 2.90 mg/kg). Thus, selenium is not likely to constitute a risk to ecological receptors, and this constituent was not identified as a refined COPC.

No refined COPCs were identified in soil and it is concluded that there are no unacceptable ecological risks associated with this medium.

Terrestrial Food Web

Chromium, copper, lead, selenium, and zinc exceeded bird and/or mammal Eco-SSLs based upon the maximum detected soil concentrations (**Appendix B; Table B-6**) and were retained for site-specific food web modeling, along with mercury, endrin, and dioxins (which were detected but lacked Eco-SSLs).

The HQs from site-specific food web modeling, based upon maximum exposure doses for each upper trophic level terrestrial receptor, are listed in **Appendix B; Table B-7** (calculations are shown in **Appendix B; Tables B-8 through B-13**). Based upon a comparison to No Observed Adverse Effect Levels (NOAELs), chromium, mercury, lead, and selenium had HQs exceeding 1 for one or more receptors. Thus, these four chemicals were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- HQs based upon 95 percent UCL exposure doses for each upper trophic level terrestrial receptor that had at least one exceedance based upon maximum exposure doses are listed in **Appendix B; Table B-14** (calculations are shown in **Appendix B; Tables B-15 through B-17**). No chemical had an HQ that exceeded 1 based upon the NOAEL, Maximum Acceptable Toxicant Concentration (MATC), or Lowest Observed Adverse Effect Level (LOAEL).
- Because there were no exceedances based upon 95 percent UCL exposure doses, mean exposure doses were not calculated. No refined COPCs were identified for terrestrial food web exposures, and risks from this exposure pathway are considered acceptable.

Groundwater

Although ecological receptors do not typically have direct exposure to groundwater, surface water screening values were compared to analytical groundwater data in order to provide a conservative evaluation of the potential for significant contaminant transport via groundwater to downgradient receiving water bodies. The surface water values used to screen groundwater considered the salinity of the receiving water body (York River) to determine whether to apply freshwater or marine values. As such, marine values were used, where available, although freshwater values were extrapolated to the site if marine values were not available.

Two metals (aluminum and manganese) exceeded screening values based upon maximum detected concentrations in unfiltered samples. Aluminum did not exceed background 95% UTLs nor did it exceed screening values in filtered samples (**Appendix B; Tables B-18 and B-19**). Manganese exceeded both background 95% UTLs and screening values in filtered samples. Thus, manganese was identified as an initial COPC. Two pesticides (4,4′-DDD and gamma-chlordane) also exceeded screening values based upon maximum detected concentrations.Bromodichloromethane and dibromochloromethane were detected in at least one groundwater sample, but screening values were not available. Thus, 4,4′-DDD, gamma-chlordane, , bromodichloromethane, and dibromochloromethane were also identified as initial COPCs (**Appendix B; Tables B-18 and B-19**).

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQs for manganese and 4,4′-DDD did not exceed 1. The mean ratio of site concentrations to site-specific upgradient concentrations also did not exceed 1 for manganese (4,4′-DDD was not detected in upgradient wells). Thus, these constituents were not identified as refined COPCs.
- The mean HQ for gamma-chlordane (2.31) exceeded 1. However, gamma-chlordane was detected in upgradient wells at generally similar concentrations (the mean ratio between site and upgradient samples was 1.29), indicating that this compound is likely the result of basewide pesticide applications and is not a site-related constituent. Therefore, gamma-chlordane was not identified as a refined COPC.

- Bromodichloromethane and dibromochloromethane were identified as initial COPCs because they were detected and screening values were not available. The maximum concentrations of these chemicals in groundwater (0.53 and 0.61 µg/L, respectively) were lower than marine-based screening values for other, similar VOCs (**Appendix B; Table B-2**). Thus, neither of these constituents was identified as a refined COPC.

No refined COPCs were identified for groundwater and it is concluded that there are no unacceptable ecological risks associated with this medium.

3.5 Site 7 Release Assessment Decision Analysis

This subsection discusses the sample results in the context of the Data Evaluation Decision Analysis (Section 1.1.1) and is also summarized in **Table 3-5**.

Step 1—Determination of Potential CERCLA Eligibility and if CERCLA-eligible, if a CERCLA-regulated release occurred at the site

Historical information indicates the site was an unlined, non-permitted disposal area where non-hazardous materials such as bottles and scrap metal were disposed and covered with soil during the early 1900s (C. C. Johnson & Associates, Inc. and CH2M HILL, 1984).

Because Site 7 is listed as a Site Screening Area (SSA) within the FFA as a site that "may pose a threat, or potential threat, to human health and the environment" (Navy, 2005), and because VOCs, SVOCs, pesticides, dioxins, explosives, and inorganic constituents were observed above background levels during the SI, it is considered to be CERCLA-eligible. Site 7 is further evaluated in the decision analysis process in Step 2a.

Step 2—Does the CERCLA Release Pose Potential Unacceptable Risks to Human Health and the Environment?

Step 2a—Comparison of Data against Conservative Risk-Based Screening Values

Specifically, the data for the CERCLA-regulated constituents detected at Site 7 were compared to the screening criteria described in Section 1, and exceedances of the screening criteria are identified on **Tables 3-1** and **3-3**. Those constituents that exceeded one or more criteria (and base background concentrations, if available, for inorganic constituents) are depicted in **Figures 3-5** and **3-6.**

In summary, one SVOC (benzo[a]anthracene), one pesticide (endrin), one dioxin (2,3,7,8-TCDD), and ten inorganic constituents (aluminum, arsenic, chromium, iron, lead, manganese, mercury, selenium, thallium, and vanadium) exceeded at least one screening criterion in soil. In groundwater, six VOCs (bromodichloromethane, chloroform, dibromochloromethane, PCE, TCE, and VC), one SVOC (2,4-dinitrotoluene), two pesticides (4,4'-DDD and gamma-chlordane), one dioxin (octachlorodibenzo-p-dioxin), one explosive (RDX), two total inorganic constituents (arsenic and manganese), and three dissolved inorganic constituents (arsenic, cobalt, and manganese) exceeded at least one screening criterion.

Step 2b—Conduct a Semi-quantitative Risk Evaluation Using More Realistic Assumptions

Human Health Risk Evaluation

The human health risk evaluation indicates the potential for hazards associated with exposure to thallium in soil and bromodichloromethane, chloroform,

dibromochloromethane, PCE, TCE, VC, 2,4-dinitrotoluene, RDX, and arsenic in groundwater.

Ecological Risk Evaluation

No unacceptable ecological risks associated with exposure to soil or groundwater were identified. In addition, no refined COPCs were identified for terrestrial food web exposures and risks from this exposure pathway are considered acceptable.

Step 3—Is Further Investigation or Action Required?

Based on the results from risk screenings conducted using pre-TCRA soil and ash analytical data, only dioxin and furans in the historical ash sample posed a potential risk to ecological receptors. However, a dilution by a factor of 1.56 would reduce the dioxin and furan risk to acceptable levels. Thus, unacceptable ecological risks in the York River from potential historical soil transport from Site 7 are very unlikely. In addition, due to erosion, it is unlikely that sediment data collected from along the Site 7 shoreline would be indicative of a CERCLA release from Site 7.

Results from Shaw's post-removal soil sampling activities indicate that all visible debris was removed from the site in 2008. Following the removal of 2,998 cubic yards of soil, the only remaining potential risk to human health and ecological receptors from exposure to soil was due to thallium and selenium concentrations in several samples, respectively. However, since thallium was not detected in any soil samples collected prior to the 2008 samples, there is some uncertainty regarding these results and the concentrations may not be attributable to a release from the buried debris. Regarding selenium, it was not detected in any of the 2004 (pre-removal) surface and subsurface soil samples (all samples were flagged U or B), thus, there is some uncertainty regarding the results and the concentrations may not be attributable to a release from the buried debris. In addition, the screening value used for selenium is based upon potential impacts to plants. Soil screening values for other receptors (such as 4.10 mg/kg for soil invertebrates) are not exceeded (maximum selenium concentrations in soil were 2.90 mg/kg). Thus, selenium is not likely to constitute a risk to ecological receptors.

Results from the groundwater sampling indicate that there are potential human health risks associated with bromodichloromethane, chloroform, dibromochloromethane, PCE, TCE, VC, 2,4-dinitrotoluene, RDX, and arsenic. However, of these constituents, chloroform is likely naturally occurring, RDX is detected in the off-site background monitoring wells and not considered to be a site related contaminant, and arsenic is likely attributable to natural background conditions. These constituents were detected in the general vicinity of former Building 169. It was in this area where the thickest ash was identified prior to the 2008 removal action.

An RI is recommended to further characterize site related contamination and evaluate potential risk to human health and ecological receptors. **Table 3-5** summarizes the results of the decision analysis for Site 7.

Table 3-1
Pre-TCRA Soil and Ash Exceedance Results
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Station ID	CLEAN CAX BKG SS	Marine Sediment Screening Value 1 (Effects Range - Low)	Marine Sediment Screening Value 2 (Effects Range - Median)	CLEAN RSLs Residential Soil X 10	CAS07N-SO04	CAS07N-SO05	CAS07N-SO08	CAS07N-SO09	CAS07N-SO12	CAS07N-SO13	CAS07N-SO14	CAS07N-SO15
Sample ID					CAX-07N-SB4-01	CAX-07N-SS5-00	CAX-07N-SS8-00	CAX-07N-SS9-00	07N-SS12-00	07N-SS13-00	07N-SS14-00	07N-SS15-00
Sample Date					03/03/04	03/03/04	03/03/04	03/03/04	04/22/04	04/22/04	04/22/04	04/22/04
Chemical Name												
Volatile Organic Compounds (UG/KG)												
No Detections	--	--	--	--								
Semivolatile Organic Compounds (UG/KG)												
Benzo(a)anthracene	--	261	--	1,500	11 U	**9.3 J**	10 U	**5.2 J**	9.5 U	9.7 U	9.5 U	9.8 U
Benzo(a)pyrene	--	430	--	150	11 U	**8.9 J**	10 U	**5.2 J**	9.5 U	9.7 U	9.5 U	9.8 U
Benzo(b)fluoranthene	--	1,800	--	1,500	11 U	**13**	10 U	**11 J**	9.5 U	9.7 U	9.5 U	9.8 U
Benzo(g,h,i)perylene	--	670	--	1,700,000	11 U	**8 J**	10 U	**5.6 J**	9.5 U	9.7 U	9.5 U	9.8 U
Benzo(k)fluoranthene	--	1,800	--	15,000	11 U	**9.3 J**	10 U	**7.6 J**	**4.7 J**	9.7 U	9.5 U	9.8 U
bis(2-Ethylhexyl)phthalate	--	182	2,647	350,000	450 U	430 U	410 U	400 U	380 U	380 U	**990**	**190 J**
Chrysene	--	384	--	150,000	11 U	**12**	10 U	**6.1 J**	**5 J**	9.7 U	9.5 U	9.8 U
Dibenz(a,h)anthracene	--	63.4	--	150	11 U	11 U	10 U	**5.4 J**	9.5 U	9.7 U	9.5 U	9.8 U
Di-n-octylphthalate	--	61.0	580	350,000	450 U	430 U	410 U	400 U	380 U	380 U	380 U	**97 J**
Fluoranthene	--	600	--	2,300,000	11 U	**19**	10 U	**11**	**6.7 J**	**4.6 J**	9.5 U	**4.4 J**
PAH (HMW)	--	1,700	--	--	47.7 U	**85.9**	43.7 U	**60.9**	**45**	43.7 U	42.8 U	44.1 U
PAH (LMW)	--	552	--	--	**271**	**282**	245 U	**251**	**231**	**229**	228 U	**234**
PAH (total)	--	4,022	--	--	**319**	**368**	289 U	**311**	**276**	**272**	271 U	**278**
Phenanthrene	--	240	--	17,000,000	**7.7 J**	**15**	10 U	**9.5 J**	**5.4 J**	**4.8 J**	9.5 U	9.8 U
Pyrene	--	665	--	1,700,000	11 U	**16**	10 U	**8.8 J**	**6.8 J**	9.7 U	9.5 U	9.8 U
Pesticide/Polychlorinated Biphenyls (UG/KG)												
4,4'-DDE	--	2.20	--	14,000	4.5 U	4.3 U	4.1 U	4 U	**2 J**	3.8 U	3.8 U	3.9 U
4,4'-DDT	--	1.58	--	17,000	4.5 U	4.3 U	4.1 U	4 U	**1.3 J,P**	3.8 U	3.8 U	3.9 U
alpha-BHC	--	1,360	--	770	2.3 U	**0.94 J**	2.1 U	2.1 U	2 U	2 U	2 U	2 U
alpha-Chlordane	--	2.26	--	16,000	2.3 U	2.2 U	2.1 U	**3.6**	**0.46 J,P**	2 U	2 U	2 U
beta-BHC	--	5.00	--	2700	**2.6 J**	**1.5 J**	**0.82 J**	2.1 U	**1.1 J,P**	2 U	2 U	2 U
Heptachlor epoxide	--	0.60	2.74	530	2.3 U	**0.61 J**	2.1 U	2.1 U	2 U	2 U	2 U	2 U
Dioxin/Furans (PG/G)												
1,2,3,4,6,7,8-Heptachlorodibenzofuran	--	TEQ	--	4,500	**6.14**	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	--	TEQ	--	4,500	**105**	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	--	TEQ	--	4,500	**0.765 J**	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	--	TEQ	--	450	**1.4 J**	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	--	TEQ	--	450	**14.6**	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	--	TEQ	--	450	**1.55 J**	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	--	TEQ	--	450	**18.7**	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzofuran	--	TEQ	--	450	**0.773 J**	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	--	TEQ	--	450	**21.5**	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzofuran	--	TEQ	--	1,500	**0.833 J**	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	--	TEQ	--	45	**19.1**	NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	--	TEQ	--	450	**2.27 J**	NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-Pentachlorodibenzofuran	--	TEQ	--	150	**1.84 J**	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD (dioxin)	--	TEQ	--	45	**4.88**	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzofuran	--	TEQ	--	450	**0.478 J**	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzofuran	--	TEQ	--	150,000	**5.32 J**	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzo-p-dioxin	--	TEQ	--	150,000	**195**	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzofuran	--	TEQ	--	--	**18.3**	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzo-p-dioxin	--	TEQ	--	--	**257**	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzofuran	--	TEQ	--	--	**35.4**	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzo-p-dioxin	--	TEQ	--	--	**455**	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzofuran	--	TEQ	--	--	**31.4**	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzo-p-dioxin	--	TEQ	--	--	**473**	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzofuran	--	TEQ	--	--	**30**	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzo-p-dioxin	--	TEQ	--	--	**325**	NA	NA	NA	NA	NA	NA	NA
Dioxin TEQ	--	0.85	21.5	--	**33.5**	NA	NA	NA	NA	NA	NA	NA
Total Metals (MG/KG)												

Table 3-1
Pre-TCRA Soil and Ash Exceedance Results
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Marine Sediment Screening Value 1 (Effects Range - Low)**	**Marine Sediment Screening Value 2 (Effects Range - Median)**	**CLEAN RSLs Residential Soil X 10**	CAS07N-SO04	CAS07N-SO05	CAS07N-SO08	CAS07N-SO09	CAS07N-SO12	CAS07N-SO13	CAS07N-SO14	CAS07N-SO15
Sample ID					CAX-07N-SB4-01	CAX-07N-SS5-00	CAX-07N-SS8-00	CAX-07N-SS9-00	07N-SS12-00	07N-SS13-00	07N-SS14-00	07N-SS15-00
Sample Date					03/03/04	03/03/04	03/03/04	03/03/04	04/22/04	04/22/04	04/22/04	04/22/04
Chemical Name												
Aluminum	12,200	18,000	--	77,000	**5,130**	**9,440**	**7,580**	**9,520**	**9,840**	**10,200**	**10,100**	**9,760**
Arsenic	6.36	8.20	--	3.9	**4.8**	**4.1**	**4.4**	**3**	**3.5**	**2.8**	**3**	2.3 B
Barium	52.9	48.0	130	15,000	**264**	**173**	**33.5 J**	**76.6**	**65**	**63.9**	**63.2**	**65**
Calcium	2,290	--	--	--	**8,880**	**3,390**	**2,000**	**870 J**	738 B	**1,130**	**1,240**	774 B
Chromium	18.2	81.0	--	2.9	**14.4**	**18.5**	**13.2**	**7.4**	**9.8 E**	**8.4 E**	**8 E**	**6.6 E**
Cobalt	9.93	10.0	--	23	**6.3 J**	**6.7 J**	1.3 B	**4.4 J**	2.7 B	2.4 B	2.7 B	2.6 B
Copper	4.25	34.0	--	3,100	**69.2**	**66.1**	**10.2**	**5.4 J**	**9.6**	**6**	4.5 B	4.1 B
Iron	19,900	220,000	--	55,000	**4,670**	**9,050**	**11,000**	**6,270**	**8,400**	**7,130**	**6,920**	**5,800**
Lead	17.4	46.7	218	4,000	**283**	**250**	**38.3**	**19.2**	**68.7**	**33**	**20.1**	**17.3**
Magnesium	1,070	--	--	--	**1,140 J**	**838 J**	**651 J**	**573 J**	587 B	570 B	534 B	516 B
Manganese	324	260	--	1,800	**289**	**393**	**64.3**	**256**	**163**	**127**	**186**	**216**
Mercury	0.111	0.15	--	23	**0.24**	**0.075 J**	**0.063 J**	0.058 U	0.067 B	0.058 B	0.054 B	0.053 U
Nickel	9.52	20.9	--	1,500	**13.6**	**14.2**	**4.2 J**	**5.6 J**	6.5 B	4.9 B	5 B	4.7 B
Potassium	708	--	--	--	**993 J**	**420 J**	**634 J**	**289 J**	315 B,E	321 B,E	302 B,E	303 B,E
Sodium	521	--	--	--	**369 J**	**87.5 J**	**55.2 J**	51.4 U	92.3 B	73 B	72.6 B	72.1 B
Vanadium	27.9	57.0	--	390	**17.9**	**14.2**	**26.8**	**12.8**	**19.3**	**14.9**	**15.3**	**11.8**
Zinc	26.5	150	--	23,000	**182**	**201**	**344**	**35.4**	**49**	**28.6**	**21.1**	**18.1**

Notes:

Exceeds Background
Exceeds BKG & ER-L
Exceeds BKG, ER-L & ER-M
Exceeds BKG & RSL
Bold indicates detections
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
E - Concentration exceeds calibration range of GC/MS instrument (Organic) OR Value is estimated due to matrix interferences (Inorganic)
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
P - used for an analyte when there is > 25% difference for detected concentrations between the two GC columns. The lower of the two values is flagged 'P".
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PG/G - Picograms per gram
UG/KG - Micrograms per kilogram

TABLE 3-2
Background Monitoring Well Detections
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Station ID	CAS07-MW01	CAS07-MW02
Sample ID	CAS07-MW01-0111	CAS07-MW02-0111
Sample Date	01/28/11	01/28/11
Chemical Name		
Volatile Organic Compounds (UG/L)		
No Detections		
Semivolatile Organic Compounds (UG/L)		
No Detections		
Pesticide/Polychlorinated Biphenyls (UG/L)		
gamma-Chlordane	0.0102 U	**0.00921 J**
Dioxin/Furans (NG/L)		
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.000995 U	**0.000810 J**
Octachlorodibenzo-p-dioxin	**0.001110 J**	**0.012900 J**
Toxic Equivalents (Total TEQ)	**0.000000**	**0.000004**
Explosives (UG/L)		
1,3-Dinitrobenzene	0.163 U	**1.46**
HMX	0.163 U	**0.64**
RDX	0.163 U	**0.721**
Total Metals (UG/L)		
Aluminum	**203**	**149**
Barium	**17.2**	**16.6**
Cadmium	**0.932 J**	**0.597 J**
Calcium	**50,600**	**39,600**
Chromium	**1.57 J**	**1.49 J**
Cobalt	**1.29 J**	**2.35 J**
Iron	**389**	**113**
Magnesium	**1,990**	**2,020**
Manganese	**42.9**	**135**
Nickel	**2.44 J**	**2.06 J**
Potassium	**854 J**	**1,010 J**
Sodium	**16,400**	**13,000**
Zinc	**2.37 J**	**1.84 J**
Dissolved Metals (UG/L)		
Aluminum, Dissolved	**43.5 J**	**40.3 J**
Barium, Dissolved	**17.1**	**15.9**
Cadmium, Dissolved	**0.893 J**	**0.591 J**
Calcium, Dissolved	**52,100**	**39,800**
Cobalt, Dissolved	2.5 U	**2.22 J**
Iron, Dissolved	**23.7 J**	**7.6 J**
Magnesium, Dissolved	**1,950**	**1,990**
Manganese, Dissolved	**46.3**	**137**
Nickel, Dissolved	**2.11 J**	**1.71 J**
Potassium, Dissolved	**807 J**	**979 J**
Sodium, Dissolved	**16,800**	**12,900**
Zinc, Dissolved	**1.53 J**	**1.59 J**

Notes:

Bold indicates detections
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
NG/L - Nanograms per liter
UG/L - Micrograms per liter

Table 3-3
Soil Exceedance Results
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Station ID	CLEAN CAX BKG Surface Soil	ECO	CLEAN Adjusted RSL Residential Soil	CLEAN RSL Risk-Based SSL	CAS07-SO001		CAS07-SO002		CAS07-SO003	CAS07-SO004	CAS07-SO005	CAS07-SO006	CAS07-SO007
Sample ID					NWSY-90-7-SC-PER-132	NWSY-90-7-SC-PER-133	NWSY-90-7-SC-PER-135	NWSY-90-7-SC-PER-183	NWSY-90-7-SC-FLR-136	NWSY-90-7-SC-FLR-137	NWSY-90-7-SC-FLR-138	NWSY-90-7-SC-FLR-139	NWSY-90-7-SC-FLR-140
Sample Date					02/28/08	02/28/08	02/28/08	04/09/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08
Chemical Name													
Volatile Organic Compounds (UG/KG)													
o-Xylene	--	--	690,000	200	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U
Semivolatile Organic Compounds (UG/KG)													
Benzo(a)anthracene	--	HMW PAH	150	10	67 U	58 U	61 U	63 U	59 U	71 U	63 U	62 U	62 U
Benzo(b)fluoranthene	--	HMW PAH	150	35	67 U	58 U	61 U	63 U	59 U	71 U	63 U	62 U	62 U
bis(2-Ethylhexyl)phthalate	--	30,000	35,000	1,100	420 U	370 U	380 U	390 U	370 U	440 U	390 U	380 U	380 U
Chrysene	--	HMW PAH	15,000	--	67 U	58 U	61 U	63 U	59 U	71 U	63 U	62 U	62 U
PAH (HMW)	--	18,000	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (UG/KG)													
Endrin	--	1.95	1,800	440	**2.4 J**	3.7 U	3.8 U	3.9 U	3.8 U	4.5 U	3.9 U	3.8 U	3.9 U
Dioxin/Furans (PG/G)													
2,3,7,8-TCDD (dioxin)	--	4	4.5	0.26	0.248 U	0.19 U	0.138 U	**0.119 J**	0.177 U	0.199 U	0.19 U	**0.267 J**	0.182 U
Explosives (UG/KG)													
No Detections					NA	NA	NA	NA	NA	NA	NA	NA	NA
Total MetaL (MG/KG)													
Aluminum	12,200	pH<5.5	7,700	55,000	**11,200**	**3,530**	**6,710**	**9,730**	**12,600**	**20,300**	**14,100**	**6,880**	**11,000**
Antimony	--	78	3.1	0.66	3.7 UL	3.3 UL	3.4 UL	13 UL	0.3 B	0.6 B	0.54 B	3.4 UL	3.3 UL
Arsenic	6.36	18	0.39	0.0013	**4.3 L**	**1.4**	**1.5**	**2.6**	**1.9**	**1.3**	**2**	**1.5**	**1.2**
Barium	52.9	330	1,500	300	**24.2 J**	**19.6 J**	**57.7 J**	**90.4**	**48.8 J**	**35.7 J**	**51.7 J**	**101 J**	**42.2 J**
Beryllium	0.587	40	16	58	**0.47**	**0.33**	**0.97**	**1.3**	**0.4**	**0.6**	**0.6**	**1.1**	**0.39**
Cadmium	1.5	32	7	1.4	0.25 UL	0.22 U	0.23 U	0.9 U	0.84 U	2.6 U	1.2 U	0.23 U	1.1 U
Calcium	2,290	--	--	--	**1,480 L**	**407**	**458**	**770 J**	**1,150**	**2,070**	**1,090**	**883**	**1,200**
Chromium	18.2	64	0.29	0.00083	**23.3 J**	**10.9 J**	**5.1 J**	**7.4**	**16.8 J**	**41.1 J**	**16.3 J**	**7.6 J**	**15.3 J**
Cobalt	9.93	13	2.3	0.49	**1.1 J**	**3.4**	**3.3**	**5.1 J**	**1.5 J**	**2.3 J**	**1.9 J**	**2.8 J**	**2 J**
Copper	4.25	70	310	51	**7.5 J**	**4.6 J**	**3.3 J**	**2.9 J**	**2 J**	**2.7 J**	**3.5 J**	**12.9 J**	**3.7 J**
Cyanide	--	15.80	160	7.4	0.14 U	0.13 U	0.13 U	0.14 U	0.13 U	0.16 U	0.14 U	0.14 U	0.13 U
Iron	19,900	pH < 5 or pH >8	5,500	640	**11,100**	**4,530**	**4,050**	**5,750**	**20,300**	**64,000**	**15,400**	**3,640**	**17,000**
Lead	17.4	120	400	--	**20.2 J**	**16.4 J**	**6.9 J**	**10 J**	**1.1 J**	26 U	**6.6 J**	**84.3 J**	**2.2 J**
Magnesium	1,070	--	--	--	**957**	**661**	**429**	**610 J**	**779**	**1,390**	**916**	**454**	**715**
Manganese	324	220	180	57	**16.1 J**	**49.4 J**	**126 J**	**258**	**9.1 J**	**15.6 J**	**20.1 J**	**169 J**	**15 J**
Mercury	0.111	0.10	2.3	0.03	**0.044 K**	**0.032 K**	**0.021 K**	**0.025 J**	**0.05 K**	**0.18 K**	**0.036 K**	**0.043 K**	**0.047 K**
Nickel	9.52	38	150	48	**2.5**	**4.2**	**3.7**	**6 J**	**2.7**	**4.1**	**3.7**	**4.9**	**2.5**
Selenium	0.51	0.52	39	0.95	**1 L**	**0.41 J**	**0.47 J**	22 U	**1.6 J**	**3.5 J**	**1.2 J**	**0.37 J**	**1.2 J**
Thallium	--	1	0.078	0.026	**0.38 J**	0.54 U	0.57 U	2.2 U	**1.3**	**2.4**	**0.87**	0.57 U	**1**
Vanadium	27.9	130	39	180	**34.3 J**	**12.7 J**	**8.1 J**	**10.5 J**	**30.7 J**	**53.8 J**	**28.5 J**	**7.2 J**	**26.1 J**
Zinc	26.5	120	2,300	680	**22.9 J**	**41.7 J**	**14.2 J**	**15.3**	**9.2 J**	**14.5 J**	**11.3 J**	**51.2 J**	**12.5 J**

Notes:

Exceeds Background
Exceeds BKG & SSL
Exceeds BKG & ECO
Exceeds BKG & RSL
Exceeds BKG, RSL & SSL
Exceeds BKG, ECO &SSL
Exceeds BKG, ECO, RSL & SSL
Bold indicates detections
* Duplicate Sample
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PG/G - Picograms per gram
UG/KG - Micrograms per kilogram
PH - pH units

Table 3-3
Soil Exceedance Results
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Station ID	CLEAN CAX BKG Surface Soil	ECO	CLEAN Adjusted RSL Residential Soil	CLEAN RSL Risk-Based SSL	CAS07-SO008			CAS07-SO009	CAS07-SO010	CAS07-SO011	CAS07-SO012	CAS07-SO013	
Sample ID					NWSY-90-7-SC-PER-143	NWSY-90-7-SC-PER-184	NWSY-90-7-SC-PER-185*	NWSY-90-7-SC-FLR-144	NWSY-90-7-SC-FLR-145	NWSY-90-7-SC-FLR-146	NWSY-90-7-SC-FLR-147	NWSY-90-7-SC-PER-148	NWSY-90-7-SC-PER-149
Sample Date					02/28/08	04/09/08	04/09/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08
Chemical Name													
Volatile Organic Compounds (UG/KG)													
o-Xylene	--	--	690,000	200	8.6 U	7.8 U	8.4 U	8.1 U	5.7 U	8.4 U	8 U	13 UJ	6.5 U
Semivolatile Organic Compounds (UG/KG)													
Benzo(a)anthracene	--	HMW PAH	150	10	63 U	62 U	62 U	**18 J**	61 U	60 U	59 U	76 U	66 U
Benzo(b)fluoranthene	--	HMW PAH	150	35	63 U	62 U	62 U	**16.6 J**	61 U	60 U	59 U	76 U	66 U
bis(2-Ethylhexyl)phthalate	--	30,000	35,000	1,100	390 U	380 U	390 U	380 U	380 U	**256 J**	370 U	480 U	410 U
Chrysene	--	HMW PAH	15,000	--	63 U	62 U	62 U	**22.5 J**	61 U	60 U	59 U	76 U	66 U
PAH (HMW)	--	18,000	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (UG/KG)													
Endrin	--	1.95	1,800	440	3.8 U	3.9 U	3.8 U	3.9 U	3.8 U	3.8 U	3.6 U	4.7 U	4.1 U
Dioxin/Furans (PG/G)													
2,3,7,8-TCDD (dioxin)	--	4	4.5	0.26	0.201 U	0.109 U	**0.135 J**	0.189 U	0.175 U	**0.104 J**	**0.102 J**	0.289 U	0.104 U
Explosives (UG/KG)													
No Detections					NA								
Total MetaL (MG/KG)													
Aluminum	12,200	pH<5.5	7,700	55,000	**7,400**	**7,350**	**8,900**	**7,220**	**6,370**	**7,140**	**8,830 J**	**6,990 J**	**7,630 J**
Antimony	--	78	3.1	0.66	3.5 UL	3.4 UL	**0.23 L**	3.3 UL	3.4 UL	3.3 UL	3.2 UL	4.1 UL	3.5 UL
Arsenic	6.36	18	0.39	0.0013	**1.4**	**1.8**	**1.9**	**1.8**	**1.1**	**2.1**	**1.8 L**	**24.3**	**1.9**
Barium	52.9	330	1,500	300	**69.1 J**	**57.6**	**53.7**	**90.1 J**	**44.5 J**	**57.5 J**	**48.3 J**	**250 J**	**56.8 J**
Beryllium	0.587	40	16	58	**0.91**	**0.39**	**0.41**	**0.85**	**0.52**	**0.75**	**0.57**	**0.94**	**0.7**
Cadmium	1.5	32	7	1.4	0.23 U	0.22 U	0.22 U	0.22 U	0.23 U	0.22 U	0.21 UL	**0.12 J**	0.24 U
Calcium	2,290	--	--	--	**781**	**556**	**1,000**	**873**	**483**	**576**	**1,060 J**	**24,800 J**	**1,250 J**
Chromium	18.2	64	0.29	0.00083	**7.6 J**	**7.4**	**10**	**11.6 J**	**5.3 J**	**6.8 J**	**8.7 J**	**18 J**	**6.3 J**
Cobalt	9.93	13	2.3	0.49	**2.9**	**2.1 J**	**2.3 J**	**2.4 J**	**2.3 J**	**2.2 J**	**2.2 L**	**2 J**	**2.1 J**
Copper	4.25	70	310	51	**5.2 J**	**2.9**	**7**	**39.6 J**	**2.4 J**	**9.8 J**	**2.6**	**42.7**	**3.6**
Cyanide	--	15.80	160	7.4	0.14 U	0.13 U	0.13 U	0.14 U	0.14 U	0.13 U	0.13 U	**0.33**	0.15 U
Iron	19,900	pH < 5 or pH >8	5,500	640	**3,680**	**6,200**	**7,850**	**7,120**	**4,450**	**4,690**	**8,060 J**	**4,240 J**	**4,730 J**
Lead	17.4	120	400	--	**81.9 J**	**13.6**	**37.3**	**204 J**	**8 J**	**41.5 J**	**6.4 J**	**42.1 J**	**11.5 J**
Magnesium	1,070	--	--	--	**429**	**481**	**563**	**427**	**395**	**412**	**493 J**	**1,320 J**	**505 J**
Manganese	324	220	180	57	**114 J**	**30.4**	**69.2**	**184 J**	**50.3 J**	**122 J**	**92.9 J**	**466 J**	**89.4 J**
Mercury	0.111	0.10	2.3	0.03	**0.031 K**	**0.025 J**	**0.08 J**	**0.043 K**	**0.019 K**	**0.037 K**	**0.027 K**	**0.048 K**	**0.026 K**
Nickel	9.52	38	150	48	**3.9**	**3.5**	**3.9**	**4.6**	**3.2**	**4.1**	**3.2 J**	**6.6 J**	**3.7 J**
Selenium	0.51	0.52	39	0.95	**0.26 J**	5.6 U	5.5 U	**0.58 J**	**0.41 J**	**0.63 J**	**0.77 L**	**0.33 J**	**0.52 J**
Thallium	--	1	0.078	0.026	0.58 U	2.2 U	2.2 U	0.56 U	0.57 U	0.56 U	0.53 UL	2.7 U	0.59 U
Vanadium	27.9	130	39	180	**7.5 J**	**12.7**	**15.7**	**10.2 J**	**9.5 J**	**10 J**	**15.5 J**	**16.3 J**	**11.2 J**
Zinc	26.5	120	2,300	680	**23.2 J**	**13.2**	**26.6**	**79.4 J**	**10.2 J**	**29 J**	**9.8 L**	**119**	**20.3**

Notes:

Exceeds Background
Exceeds BKG & SSL
Exceeds BKG & ECO
Exceeds BKG & RSL
Exceeds BKG, RSL & SSL
Exceeds BKG, ECO &SSL
Exceeds BKG, ECO, RSL & SSL
Bold indicates detections
* Duplicate Sample
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PG/G - Picograms per gram
UG/KG - Micrograms per kilogram
PH - pH units

Table 3-3
Soil Exceedance Results
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Station ID	CLEAN CAX BKG Surface Soil	ECO	CLEAN Adjusted RSL Residential Soil	CLEAN RSL Risk-Based SSL	CAS07-SO014			CAS07-SO015		CAS07-SO016	CAS07-SO017	CAS07-SO018	CAS07-SO019
Sample ID					NWSY-90-7-SC-PER-150	NWSY-90-7-SC-PER-151	NWSY-90-7-SC-PER-152*	NWSY-90-7-SC-PER-153	NWSY-90-7-SC-PER-154	NWSY-90-7-SC-PER-159	NWSY-90-7-SC-FLR-160	NWSY-90-7-SC-PER-162	NWSY-90-7-SC-PER-164
Sample Date					02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/29/08	02/29/08	02/29/08	02/29/08
Chemical Name													
Volatile Organic Compounds (UG/KG)													
o-Xylene	--	--	690,000	200	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U	7.5 U
Semivolatile Organic Compounds (UG/KG)													
Benzo(a)anthracene	--	HMW PAH	150	10	76 U	63 U	63 U	66 U	59 U	57 U	61 U	61 U	62 U
Benzo(b)fluoranthene	--	HMW PAH	150	35	76 U	63 U	63 U	66 U	59 U	57 U	61 U	61 U	62 U
bis(2-Ethylhexyl)phthalate	--	30,000	35,000	1,100	480 U	400 U	390 U	410 U	370 U	360 U	380 U	380 U	390 U
Chrysene	--	HMW PAH	15,000	--	76 U	63 U	63 U	66 U	59 U	57 U	61 U	61 U	62 U
PAH (HMW)	--	18,000	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (UG/KG)													
Endrin	--	1.95	1,800	440	4.6 U	4 U	3.9 U	4.1 U	3.6 U	3.6 U	3.8 U	3.8 U	3.9 U
Dioxin/Furans (PG/G)													
2,3,7,8-TCDD (dioxin)	--	4	4.5	0.26	**0.217 J**	0.088 U	0.15 U	0.272 U	0.457 U	0.0712 U	0.361 U	0.187 U	0.127 U
Explosives (UG/KG)													
No Detections													
Total MetaL (MG/KG)													
Aluminum	12,200	pH<5.5	7,700	55,000	**7,760 J**	**7,190 J**	**7,300 J**	**7,150 J**	**4,010 J**	**6,220 J**	**12,100 J**	**8,460 J**	**7,000 J**
Antimony	--	78	3.1	0.66	4.2 UL	3.4 UL	3.5 UL	3.6 UL	3.2 UL	3.2 UL	3.4 UL	3.3 UL	3.4 UL
Arsenic	6.36	18	0.39	0.0013	**2**	**1.5**	**1.4**	**1.6**	**3.5**	**1.4**	**1.7**	**1.4**	**1.4**
Barium	52.9	330	1,500	300	**42 J**	**54 J**	**54.3 J**	**54.6 J**	**17.8 J**	**42.6 J**	**48.3 J**	**51.4 J**	**50.4 J**
Beryllium	0.587	40	16	58	**0.5**	**0.69**	**0.61**	**0.74**	**0.39**	**0.39**	**0.43**	**0.48**	**0.73**
Cadmium	1.5	32	7	1.4	0.28 U	0.23 U	0.23 U	0.24 U	1.1 U	0.21 U	1.2 U	0.22 U	0.22 U
Calcium	2,290	--	--	--	**1,640 J**	**988 J**	**907 J**	**1,180 J**	**485 J**	**594 J**	**1,210 J**	**762 J**	**449 J**
Chromium	18.2	64	0.29	0.00083	**7.7 J**	**5 J**	**5.6 J**	**5.9 J**	**16.2 J**	**7 J**	**16.5 J**	**8.3 J**	**6.2 J**
Cobalt	9.93	13	2.3	0.49	**1.9 J**	**2.1 J**	**1.8 J**	**2.1 J**	**4**	**1.6 J**	**1.6 J**	**1.9 J**	**2.3 J**
Copper	4.25	70	310	51	**4.9**	**3**	**2.7**	**3.8**	**4.8**	**3.4 J**	**6.1 J**	**2.5 J**	**1.5 J**
Cyanide	--	15.80	160	7.4	**0.24**	0.13 U	0.14 U	0.15 U	0.13 U	0.12 U	0.14 U	0.14 U	0.14 U
Iron	19,900	pH < 5 or pH >8	5,500	640	**6,760 J**	**4,010 J**	**4,410 J**	**5,150 J**	**19,800 J**	**6,480 J**	**20,000 J**	**8,230 J**	**5,550 J**
Lead	17.4	120	400	--	**15.6 J**	**10.3 J**	**8.1 J**	**11.8 J**	**1.8 J**	**10.8 J**	**23.2 J**	**9.2 J**	**4.8 J**
Magnesium	1,070	--	--	--	**605 J**	**366 J**	**399 J**	**442 J**	**170 J**	**450 J**	**723 J**	**560 J**	**439 J**
Manganese	324	220	180	57	**102 J**	**204 J**	**110 J**	**125 J**	**100 J**	**31.6 J**	**15.3 J**	**37.4 J**	**63.5 J**
Mercury	0.111	0.10	2.3	0.03	**0.058 K**	**0.03 K**	**0.019 K**	**0.1 K**	0.092 U	**0.015 K**	**0.033 K**	0.085 U	**0.019 K**
Nickel	9.52	38	150	48	**3.9 J**	**3.4 J**	**3.2 J**	**3.4 J**	**2.8 J**	**2.2 J**	**2.9 J**	**3 J**	**3.2 J**
Selenium	0.51	0.52	39	0.95	**0.82 J**	**0.63 J**	**0.48 J**	**0.47 J**	**1.7 J**	**0.51 J**	**1.5 J**	**0.78 J**	**0.59 J**
Thallium	--	1	0.078	0.026	0.71 U	0.57 U	0.58 U	0.6 U	**1.4**	**0.37 J**	**1.2**	0.55 U	0.56 U
Vanadium	27.9	130	39	180	**18.4 J**	**9.3 J**	**10.2 J**	**10.6 J**	**18.6 J**	**12.4 J**	**30.2 J**	**15.9 J**	**11 J**
Zinc	26.5	120	2,300	680	**23.3**	**13.7**	**11.6**	**18.5**	**16.4**	**8.3 J**	**34.3 J**	**9.2 J**	**8.2 J**

Notes:

Exceeds Background
Exceeds BKG & SSL
Exceeds BKG & ECO
Exceeds BKG & RSL
Exceeds BKG, RSL & SSL
Exceeds BKG, ECO &SSL
Exceeds BKG, ECO, RSL & SSL
Bold indicates detections
* Duplicate Sample
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PG/G - Picograms per gram
UG/KG - Micrograms per kilogram
PH - pH units

Table 3-3
Soil Exceedance Results
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Station ID	CLEAN CAX BKG Surface Soil	ECO	CLEAN Adjusted RSL Residential Soil	CLEAN RSL Risk-Based SSL	CAS07-SO020	CAS07-SO021	CAS07-SO022	CAS07-SO023			CAS07-SO024		
Sample ID					NWSY-90-7-SC-FLR-165	NWSY-90-7-SC-FLR-166	NWSY-90-7-SC-FLR-167	NWSY-90-7-SC-PER-169	NWSY-90-7-SC-PER-170*	NWSY-90-7-SC-PER-187	NWSY-90-7-SC-PER-172	NWSY-90-7-SC-PER-188	NWSY-90-7-SC-PER-193*
Sample Date					02/29/08	02/29/08	02/29/08	02/29/08	02/29/08	04/09/08	02/29/08	04/09/08	04/09/08
Chemical Name													
Volatile Organic Compounds (UG/KG)													
o-Xylene	--	--	690,000	200	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U
Semivolatile Organic Compounds (UG/KG)													
Benzo(a)anthracene	--	HMW PAH	150	10	61 U	64 U	59 U	61 U	62 U	64 U	62 U	64 U	63 U
Benzo(b)fluoranthene	--	HMW PAH	150	35	61 U	64 U	59 U	61 U	62 U	64 U	62 U	64 U	63 U
bis(2-Ethylhexyl)phthalate	--	30,000	35,000	1,100	380 U	400 U	370 U	380 U	390 U	400 U	390 U	400 U	400 U
Chrysene	--	HMW PAH	15,000	--	61 U	64 U	59 U	61 U	62 U	64 U	62 U	64 U	63 U
PAH (HMW)	--	18,000	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (UG/KG)													
Endrin	--	1.95	1,800	440	3.8 U	4 U	3.7 U	3.8 U	3.9 U	4.1 U	3.9 U	4 U	4.1 U
Dioxin/Furans (PG/G)													
2,3,7,8-TCDD (dioxin)	--	4	4.5	0.26	0.181 U	0.506 U	0.348 U	0.176 U	0.163 U	0.205 U	0.188 U	0.233 U	0.187 U
Explosives (UG/KG)													
No Detections													
Total MetaL (MG/KG)													
Aluminum	12,200	pH<5.5	7,700	55,000	**6,850 J**	**7,140 J**	**8,190 J**	**9,100 J**	**8,610 J**	**8,390**	**7,080 J**	**9,730**	**11,900**
Antimony	--	78	3.1	0.66	3.4 UL	3.5 UL	3.3 UL	3.3 UL	3.4 UL	14 UL	3.4 UL	14 UL	14 UL
Arsenic	6.36	18	0.39	0.0013	**1.5**	**1.6**	**2.1**	**1.4**	**1.5**	**1.8 J**	**1.4**	**2.3**	**2.9**
Barium	52.9	330	1,500	300	**54.2 J**	**64.8 J**	**64.9 J**	**47.2 J**	**47.7 J**	**80.3**	**60.8 J**	**83.4**	**98.5**
Beryllium	0.587	40	16	58	**0.91**	**0.93**	**0.53**	**0.61**	**0.58**	**1 J**	**0.98**	**1.2**	**1.3**
Cadmium	1.5	32	7	1.4	0.23 U	0.23 U	0.22 U	0.88 U	0.92 U	0.95 U	0.23 U	0.91 U	0.96 U
Calcium	2,290	--	--	--	**518 J**	**1,010 J**	**1,020 J**	**902 J**	**980 J**	**999 J**	**685 J**	**758 J**	**976 J**
Chromium	18.2	64	0.29	0.00083	**4.8 J**	**5.9 J**	**10.1 J**	**9.6 J**	**9.5 J**	**6.8**	**5.2 J**	**6.3**	**8.1**
Cobalt	9.93	13	2.3	0.49	**3.1**	**2.9**	**2.6 J**	**2.2 J**	**2 J**	**4.1 J**	**4.1**	**5 J**	**5.8 J**
Copper	4.25	70	310	51	**2.5 J**	**14.3 J**	**3.7 J**	**2.1 J**	**2.2 J**	**5.1 J**	**6.5 J**	**5.5 J**	**6.4**
Cyanide	--	15.80	160	7.4	0.14 U	0.14 U	0.13 U	0.13 U	0.14 U	0.14 U	0.14 U	0.13 U	0.14 U
Iron	19,900	pH < 5 or pH >8	5,500	640	**3,890 J**	**3,900 J**	**10,200 J**	**8,820 J**	**8,750 J**	**5,070**	**3,800 J**	**4,820**	**5,820**
Lead	17.4	120	400	--	**7.3 J**	**58.5 J**	**4 J**	**6.3 J**	**8 J**	**18.9 J**	**20.4 J**	**12.8 J**	**13.9 J**
Magnesium	1,070	--	--	--	**406 J**	**434 J**	**574 J**	**577 J**	**562 J**	**526 J**	**394 J**	**520 J**	**679 J**
Manganese	324	220	180	57	**124 J**	**196 J**	**33.2 J**	**27.7 J**	**29 J**	**241**	**157 J**	**225**	**270**
Mercury	0.111	0.10	2.3	0.03	**0.019 K**	**0.042 K**	0.088 U	**0.031 K**	**0.043 K**	0.088 U	**0.025 K**	**0.027 J**	**0.027 J**
Nickel	9.52	38	150	48	**3.9 J**	**4.6 J**	**3.1 J**	**3.7 J**	**3.4 J**	**5.2 J**	**4 J**	**5.6 J**	**7 J**
Selenium	0.51	0.52	39	0.95	**0.36 J**	**0.51 J**	**0.67 J**	**0.73 J**	**0.63 J**	24 U	**0.36 J**	23 U	24 U
Thallium	--	1	0.078	0.026	0.57 U	0.58 U	0.55 U	**0.33 J**	**0.41 J**	2.4 U	0.57 U	2.3 U	2.4 U
Vanadium	27.9	130	39	180	**8.2 J**	**9.5 J**	**18.7 J**	**17.4 J**	**16.9 J**	**9.6 J**	**7.8 J**	**9.2 J**	**11.8 J**
Zinc	26.5	120	2,300	680	**11.3 J**	**39.3 J**	**9.4 J**	**9.4 J**	**9.9 J**	**21.2**	**17.4 J**	**14.9**	**19.6**

Notes:

Exceeds Background
Exceeds BKG & SSL
Exceeds BKG & ECO
Exceeds BKG & RSL
Exceeds BKG, RSL & SSL
Exceeds BKG, ECO &SSL
Exceeds BKG, ECO, RSL & SSL
Bold indicates detections
* Duplicate Sample
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PG/G - Picograms per gram
UG/KG - Micrograms per kilogram
PH - pH units

Table 3-3
Soil Exceedance Results
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Station ID	CLEAN CAX BKG Surface Soil	ECO	CLEAN Adjusted RSL Residential Soil	CLEAN RSL Risk-Based SSL	CAS07-SO025	CAS07-SO026	CAS07-SO027		CAS07-SO028			CAS07-SO029	CAS07-SO030
Sample ID					NWSY-90-7-SC-FLR-173	NWSY-90-7-SC-FLR-174	NWSY-90-7-SC-PER-175	NWSY-90-7-SC-PER-176	NWSY-90-7-SC-PER-177	NWSY-90-7-SC-PER-178	NWSY-90-7-SC-PER-179*	NWSY-90-7-SC-FLR-189	NWSY-90-7-SC-FLR-190
Sample Date					02/29/08	02/29/08	02/29/08	02/29/08	02/29/08	02/29/08	02/29/08	04/09/08	04/09/08
Chemical Name													
Volatile Organic Compounds (UG/KG)													
o-Xylene	--	--	690,000	200	8.5 U	6.5 U	5.5 U	6 U	6.4 U	**7.3 J**	6.1 UJ	7.1 U	6.5 U
Semivolatile Organic Compounds (UG/KG)													
Benzo(a)anthracene	--	HMW PAH	150	10	63 U	59 U	62 U	61 U	73 U	62 U	62 U	63 U	62 U
Benzo(b)fluoranthene	--	HMW PAH	150	35	63 U	59 U	62 U	61 U	73 U	62 U	62 U	63 U	62 U
bis(2-Ethylhexyl)phthalate	--	30,000	35,000	1,100	390 U	370 U	390 U	380 U	460 U	390 U	390 U	390 U	380 U
Chrysene	--	HMW PAH	15,000	--	63 U	59 U	62 U	61 U	73 U	62 U	62 U	63 U	62 U
PAH (HMW)	--	18,000	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (UG/KG)													
Endrin	--	1.95	1,800	440	4 U	3.8 U	3.9 U	3.8 U	4.6 U	3.9 U	3.9 U	3.9 U	3.8 U
Dioxin/Furans (PG/G)													
2,3,7,8-TCDD (dioxin)	--	4	4.5	0.26	0.174 U	0.121 U	0.132 U	0.153 U	0.19 U	0.136 U	0.181 U	0.139 U	**0.123 J**
Explosives (UG/KG)													
No Detections													
Total MetaL (MG/KG)													
Aluminum	12,200	pH<5.5	7,700	55,000	**17,300 J**	**10,600 J**	**13,500 J**	**9,590**	**6,810**	**7,910**	**7,840**	**12,300**	**7,730**
Antimony	--	78	3.1	0.66	**0.29 L**	3.4 UL	3.3 UL	3.3 UL	4.1 UL	3.5 UL	3.3 UL	**0.49 L**	3.3 UL
Arsenic	6.36	18	0.39	0.0013	**2.6**	**1.8**	**1.1**	**1.5**	**2**	**1.3**	**1.1**	**1.7**	**3.3**
Barium	52.9	330	1,500	300	**25.5 J**	**49.9 J**	**33.2 J**	**52.6**	**76**	**54.6**	**53.1**	**45.7**	**56**
Beryllium	0.587	40	16	58	**0.67**	**0.57**	**0.43**	**0.69**	**0.9**	**0.75**	**0.77**	**0.28 J**	**0.62**
Cadmium	1.5	32	7	1.4	2.3 U	0.23 U	0.88 U	0.22 U	0.27 U	0.23 U	0.22 U	0.92 U	0.22 U
Calcium	2,290	--	--	--	**2,050 J**	**867 J**	**1,490 J**	**744**	**2,190**	**546**	**555**	**1,200**	**752**
Chromium	18.2	64	0.29	0.00083	**39 J**	**11.8 J**	**19 J**	**10**	**6.7**	**6.7**	**6.6**	**15.5**	**7.2**
Cobalt	9.93	13	2.3	0.49	**2 J**	**2.1 J**	**2 J**	**2.4 J**	**2.8 J**	**2.9**	**2.9**	**1.7 J**	**4**
Copper	4.25	70	310	51	**2.9 J**	**3.4 J**	**2.6 J**	**3.4**	**8.9**	**2.5**	**2.7**	**1.6**	**8.2**
Cyanide	--	15.80	160	7.4	0.14 U	0.13 U	0.14 U	0.14 U	0.16 U	0.14 U	0.14 U	0.14 U	**0.13**
Iron	19,900	pH < 5 or pH >8	5,500	640	**57,800 J**	**10,700 J**	**18,000 J**	**8,480**	**4,240**	**5,300**	**5,230**	**13,900**	**5,720**
Lead	17.4	120	400	--	5.8 U	**7.5 J**	**3.1 J**	**7.2 J**	**62.9 J**	**6.5 J**	**7 J**	**8.9 K**	**43.2**
Magnesium	1,070	--	--	--	**889 J**	**676 J**	**877 J**	**615**	**573**	**522**	**513**	**770**	**511**
Manganese	324	220	180	57	**17 J**	**22.1 J**	**14.4 J**	**36.2**	**166**	**56.7**	**57.3**	**13.8**	**54.9**
Mercury	0.111	0.10	2.3	0.03	**0.014 K**	**0.026 K**	**0.041 K**	**0.013 K**	**0.071 K**	**0.022 K**	**0.023 K**	**0.026 J**	**0.026 J**
Nickel	9.52	38	150	48	**3.2 J**	**3.7 J**	**3.3 J**	**4**	**4.2**	**4.1**	**4**	**3.2**	**4.8**
Selenium	0.51	0.52	39	0.95	**2.9 J**	**0.81 J**	**1.5 J**	**0.7 J**	**0.66 J**	**0.42 J**	**0.38 J**	5.7 U	5.5 U
Thallium	--	1	0.078	0.026	**1.6**	**0.57**	**0.44 J**	0.55 U	0.68 U	0.58 U	0.55 U	2.3 U	2.2 U
Vanadium	27.9	130	39	180	**63.1 J**	**21 J**	**29 J**	**17.9**	**9.6**	**11.6**	**11.2**	**25.1**	**11**
Zinc	26.5	120	2,300	680	**15.3 J**	**20.2 J**	**11.3 J**	**13.5 J**	**35.5 J**	**9.6 J**	**9.7 J**	**10.5**	**32.3**

Notes:

Exceeds Background
Exceeds BKG & SSL
Exceeds BKG & ECO
Exceeds BKG & RSL
Exceeds BKG, RSL & SSL
Exceeds BKG, ECO &SSL
Exceeds BKG, ECO, RSL & SSL
Bold indicates detections
* Duplicate Sample
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PG/G - Picograms per gram
UG/KG - Micrograms per kilogram
PH - pH units

Table 3-3
Soil Exceedance Results
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG Surface Soil**	**ECO**	**CLEAN Adjusted RSL Residential Soil**	**CLEAN RSL Risk-Based SSL**	CAS07-SO031	CAS07-SO032
Sample ID					NWSY-90-7-SC-FLR-191	NWSY-90-7-SC-FLR-192
Sample Date					04/09/08	04/09/08
Chemical Name						
Volatile Organic Compounds (UG/KG)						
o-Xylene	--	--	690,000	200	7.7 U	7.7 U
Semivolatile Organic Compounds (UG/KG)						
Benzo(a)anthracene	--	HMW PAH	150	10	60 U	62 U
Benzo(b)fluoranthene	--	HMW PAH	150	35	60 U	62 U
bis(2-Ethylhexyl)phthalate	--	30,000	35,000	1,100	380 U	390 U
Chrysene	--	HMW PAH	15,000	--	60 U	62 U
PAH (HMW)	--	18,000	--	--	NA	NA
Pesticide/Polychlorinated Biphenyls (UG/KG)						
Endrin	--	1.95	1,800	440	3.9 U	3.9 U
Dioxin/Furans (PG/G)						
2,3,7,8-TCDD (dioxin)	--	4	4.5	0.26	0.13 U	0.195 U
Explosives (UG/KG)						
No Detections						
Total MetaL (MG/KG)						
Aluminum	12,200	pH<5.5	7,700	55,000	**9,250**	**10,600**
Antimony	--	78	3.1	0.66	14 UL	14 UL
Arsenic	6.36	18	0.39	0.0013	**2.1**	**3.1**
Barium	52.9	330	1,500	300	**103**	**99.1**
Beryllium	0.587	40	16	58	**1.1**	**1.2**
Cadmium	1.5	32	7	1.4	0.91 U	0.91 U
Calcium	2,290	--	--	--	**1,340**	**1,120**
Chromium	18.2	64	0.29	0.00083	**7.2**	**10.3**
Cobalt	9.93	13	2.3	0.49	**3.7 J**	**5.1 J**
Copper	4.25	70	310	51	**2.9 J**	**9.1**
Cyanide	--	15.80	160	7.4	**0.18**	0.14 U
Iron	19,900	pH < 5 or pH >8	5,500	640	**5,410**	**6,660**
Lead	17.4	120	400	--	**14.9 J**	**57.1**
Magnesium	1,070	--	--	--	**595 J**	**708 J**
Manganese	324	220	180	57	**256**	**219**
Mercury	0.111	0.10	2.3	0.03	**0.038 J**	**0.043 J**
Nickel	9.52	38	150	48	**5.6 J**	**6.7 J**
Selenium	0.51	0.52	39	0.95	23 U	23 U
Thallium	--	1	0.078	0.026	2.3 U	2.3 U
Vanadium	27.9	130	39	180	**10.1 J**	**13.6**
Zinc	26.5	120	2,300	680	**18.5**	**44.7**

Notes:

Exceeds Background
Exceeds BKG & SSL
Exceeds BKG & ECO
Exceeds BKG & RSL
Exceeds BKG, RSL & SSL
Exceeds BKG, ECO &SSL
Exceeds BKG, ECO, RSL & SSL
Bold indicates detections
* Duplicate Sample
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PG/G - Picograms per gram
UG/KG - Micrograms per kilogram
PH - pH units

TABLE 3-4
Groundwater Exceedance Results
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Station ID	CLEAN CAX BKG GW YE AQUIFER	Maximum Site Specific Background Concentration (Table 3-2)	Ecological Screening Value	CLEAN MCL-Groundwater	CLEAN RSLs Tapwater Adjusted	CAS07-MW03	CAS07-MW04	CAS07-MW05	CAS07-MW06		CAS07-MW07
Sample ID						CAS07-MW03-0111	CAS07-MW04-0111	CAS07-MW05-0111	CAS07-MW06-0111	CAS07-MW06P-0111	CAS07-MW07-0111
Sample Date						01/25/11	01/28/11	01/25/11	01/24/11	01/24/11	01/24/11
Chemical Name											
Volatile Organic Compounds (UG/L)											
Acetone	--	--	564,000	--	2,200	5 U	**4.73 J**	5 U	5 U	5 U	5 U
Bromodichloromethane	--	--	--	80	0.12	0.5 U	0.5 U	0.5 U	**0.46 J**	**0.528 J**	0.5 U
Chloroform	--	--	815	80	0.19	0.5 U	**0.614 J**	0.5 U	**0.757 J**	**0.628 J**	0.5 U
cis-1,2-Dichloroethene	--	--	680	70	7.3	**2.27 J**	0.5 U	0.5 U	0.5 U	0.5 U	**7.26**
Dibromochloromethane	--	--	--	80	0.15	0.5 U	0.5 U	0.5 U	**0.609 J**	**0.555 J**	**0.345 J**
Tetrachloroethene	--	--	45.0	5	0.11	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	**0.474 J**
Toluene	--	--	215	1,000	230	0.5 U	**0.28 J**	0.5 U	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	--	--	680	100	11	**0.444 J**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	--	--	1,940	5	2	**1.27 J**	0.5 U	0.5 U	**0.274 J**	**0.518 J**	**86.4**
Vinyl chloride	--	--	930	2	0.016	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	**0.33 J**
Semivolatile Organic Compounds (UG/L)											
2,4-Dinitrotoluene	--	--	480	--	0.22	**0.582 J**	**1.09**	0.154 U	**0.412 J**	**0.481 J**	**0.0987 J**
2,6-Dinitrotoluene	--	--	1,000	--	3.7	0.154 U	**0.39**	0.154 U	0.151 U	0.154 U	0.162 U
Pesticide/Polychlorinated Biphenyls (UG/L)											
4,4'-DDD	--	--	0.025	--	0.28	0.00943 U	**0.0398 J**	0.0102 U	0.0098 UJ	0.00926 UJ	**0.00992 J**
alpha-BHC	--	--	25.0	--	0.011	0.00943 U	**0.00531 J**	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
delta-BHC	--	--	25.0	--	0.037	**0.00558 J**	0.00943 UJ	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
Endosulfan II	--	--	0.0087	--	22	0.00943 U	0.00943 UJ	0.0102 U	0.0098 UJ	**0.00575 J**	**0.00714 J**
gamma-Chlordane	--	0.00921	0.004	--	0.19	0.00943 U	**0.0251 J**	0.0102 U	0.0098 UJ	0.00926 UJ	**0.00646 J**
Dioxin/Furans (NG/L)											
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	--	0.00810	TEQ	3	0.052	0.000836 U	**0.00136 J**	0.000689 U	0.00079 U	0.000881 U	0.000833 U
1,2,3,4,7,8-Hexachlorodibenzofuran	--	--	TEQ	0.3	0.0052	**0.000596 J**	0.000331 U	0.00039 U	0.000461 U	0.000455 U	0.00046 U
2,3,4,7,8-Pentachlorodibenzofuran	--	--	TEQ	0.06	0.0017	**0.000425 J**	0.000314 U	0.0004 U	0.000496 U	0.00064 U	0.000499 U
Octachlorodibenzo-p-dioxin	--	0.012900	TEQ	--	1.7	**0.00817 J**	**0.0606 J**	0.00079 U	**0.00204 J**	**0.00311 J**	**0.0101 J**
Total heptachlorodibenzo-p-dioxin	--	--	--	--	--	0.000836 U	**0.0044 J**	0.000689 U	0.00079 U	0.000881 U	0.000833 U
Total hexachlorodibenzofuran	--	--	--	--	--	**0.000596 J**	0.000283 U	0.000334 U	0.000398 U	0.000392 U	0.000394 U
Toxic Equivalents (Total TEQ)	--	0.000004	0.002	0.03	--	**0.000062**	**0.0000318**	**0.0**	**0.0000006**	**0.0000009**	**0.000003**
Explosives (UG/L)											
1,3,5-Trinitrobenzene	--	--	15.0	--	110	0.154 U	**0.132 J**	0.154 U	0.151 U	0.154 U	0.162 U
2,4,6-Trinitrotoluene	--	--	100	--	1.8	0.154 U	0.157 U	0.154 U	0.151 U	**0.214 J**	0.162 U
2-Amino-4,6-dinitrotoluene	--	--	19.0	--	7.3	0.154 U	0.157 U	0.154 U	**0.0796 J**	**0.118 J**	0.162 U
3-Nitrotoluene	--	--	750	--	0.37	0.138 B	0.125 B	0.154 U	**0.138 J**	0.154 U	**0.143 J**
4-Amino-2,6-dinitrotoluene	--	--	19.0	--	7.3	0.154 U	0.157 U	0.154 U	**0.188 J**	**0.204 J**	0.162 U
HMX	--	0.64	330	--	180	**0.122 J**	**0.532 J**	0.154 U	**0.114 J**	**0.109 J**	0.162 U
Nitroglycerin	--	--	--	--	0.37	0.385 U	**0.231 J**	0.385 U	0.377 U	0.385 U	0.404 U
PETN	--	--	85,000	--	--	**0.251 J**	**0.463 J**	0.385 U	**0.288 J**	**0.269 J**	0.404 U
RDX	--	0.721	5,000	--	0.61	**0.133 J**	**0.651 J**	**0.263 J**	0.151 U	0.154 U	**0.282 J**
Total Metals (UG/L)											
Aluminum	2,230	203	87.0	--	3,700	24.7 B	**262**	158 B	**59.9**	**60.3**	**298**
Arsenic	2.28	--	36.0	10	0.045	1.5 U	**3.15**	1.5 U	1.5 U	1.5 U	**4.26**
Barium	118	17.2	200	2,000	730	**28.6**	**22.3**	**41.5**	**28.3**	**29.4**	**31.1**
Cadmium	0.605	0.932	8.85	5	1.8	**1.1 J**	**1.05 J**	**0.861 J**	**1.14 J**	**1.17 J**	**0.716 J**
Calcium	169,000	50,600	--	--	--	**84,700**	**105,000**	**140,000**	**91,600**	**92,200**	**104,000**
Chromium	15.1	1.57	50.4	100	0.043	1 U	**2.45 J**	**2.49 J**	1 U	1 U	**1.67 J**
Cobalt	20.6	2.35	23.0	--	1.1	**4.28**	**3.84**	2.5 U	**1.84 J**	**2 J**	**1.43 J**
Copper	12.2	--	3.73	1,300	150	2 U	**1.12 J**	2 U	**2.04 J**	2 U	2 U
Iron	894	389	1,000	--	2,600	15 U	**333**	28.5 B	**89.2**	**104**	**603**
Magnesium	11,500	1,990	--	--	--	**3,290**	**2,080**	**6,490**	**2,080**	**2,160**	**2,310**
Manganese	57.9	135	100	--	88	**57.1**	**216**	**18.5**	**56.9**	**55.9**	**67.7**
Nickel	11.4	2.44	8.28	--	73	**3.94**	**2.7**	**2.63**	**2.48 J**	**2.61**	**2.76**
Potassium	12,700	1,010	--	--	--	**1,130 J**	**1,760**	**2,260**	**1,360**	**1,390**	**1,440**
Selenium	--	--	71.1	50	18	1.25 U	1.25 U	**2.4 J**	**0.878 J**	1.25 U	1.25 U
Sodium	64,500	16,400	--	--	--	**15,700**	**9,090**	**21,100**	**7,360**	**7,580**	**7,270**
Vanadium	26.2	--	50.0	--	18	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	**1.46 J**
Zinc	4.52	2.37	85.6	--	1,100	**9.91**	**2.13 J**	12.5 U	**1.98 J**	**2.17 J**	**3.11 J**

TABLE 3-4
Groundwater Exceedance Results
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG GW YE AQUIFER**	**Maximum Site Specific Background Concentration (Table 3-2)**	**Ecological Screening Value**	**CLEAN MCL-Groundwater**	**CLEAN RSLs Tapwater Adjusted**	CAS07-MW03	CAS07-MW04	CAS07-MW05	CAS07-MW06		CAS07-MW07
Sample ID						CAS07-MW03-0111	CAS07-MW04-0111	CAS07-MW05-0111	CAS07-MW06-0111	CAS07-MW06P-0111	CAS07-MW07-0111
Sample Date						01/25/11	01/28/11	01/25/11	01/24/11	01/24/11	01/24/11
Chemical Name											
Dissolved Metals (UG/L)											
Aluminum, Dissolved	100	43.5	87.0	--	3,700	161 B	**16.9 J**	160 B	**14.9 J**	**15.4 J**	25 U
Arsenic, Dissolved	1.37	--	36.0	10	0.045	1.5 U	**2.56**	1.5 U	1.5 U	1.5 U	**3.55**
Barium, Dissolved	127	17.1	200	2,000	730	**29.1**	**20.7**	**41.3**	**28.2**	**27.7**	**30.4**
Cadmium, Dissolved	0.177	0.893	8.80	5	1.8	**1.12 J**	**0.949 J**	**0.896 J**	**1.12 J**	**1.12 J**	**0.652 J**
Calcium, Dissolved	113,000	52,100	--	--	--	**85,900**	**101,000**	**141,000**	**90,500**	**87,900**	**104,000**
Chromium, Dissolved	6.04	--	50.0	100	0.043	**0.818 J**	1 U	**2.52**	1 U	1 U	1 U
Cobalt, Dissolved	0.7	2.22	23.0	--	1.1	**4.59**	**3.53**	2.5 U	**1.84 J**	**1.84 J**	2.5 U
Iron, Dissolved	275	23.7	1,000	--	2,600	**338**	**8.22 J**	30.2 B	15 U	15 U	15 U
Magnesium, Dissolved	11,200	1,990	--	--	--	**3,340**	**1,970**	**6,520**	**2,030**	**2,000**	**2,270**
Manganese, Dissolved	49.5	137	100	--	88	**58.5**	**208**	**18.3**	**55**	**53.9**	**70.4**
Nickel, Dissolved	12.2	2.11	8.20	--	73	**4.58**	**1.8 J**	**2.65**	**2.25 J**	**2.27 J**	**1.89 J**
Potassium, Dissolved	12,600	979	--	--	--	**1,170 J**	**1,620**	**2,240**	**1,340**	**1,320**	**1,310**
Selenium, Dissolved	9.1	--	71.0	50	18	1.25 U	1.25 U	**2.29 J**	1.25 U	1.25 U	1.25 U
Sodium, Dissolved	62,800	16,800	--	--	--	**15,700**	**8,670**	**21,000**	**7,390**	**7,240**	**7,370**
Zinc, Dissolved	--	1.59	81.0	--	1,100	**12**	2.5 U	12.5 U	**1.83 J**	**1.54 J**	2.5 U

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & RSL
Exceeds BKG, MCL & RSL
Exceeds BKG, ECO & RSL
Bold indicates detections
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
NG/L - Nanograms per liter
UG/L - Micrograms per liter

TABLE 3-5
Site 7 Decision Summary
CAX Site 7 Site Inspection Report
Cheatham Annex
Williamsburg, Virginia

Medium	Step 1			Step 2a	Step 2b	Step 3
	Site Potentially CERCLA-eligible?	Inorganics Above Background or Non-inorganics Detected?	Potentially Attributable to CERCLA Release?	Exceedances of Comparison Criteria?	Results of Qualitative Risk Evaluation Using More Realistic Assumptions	Is Further Investigation or Action Required?
Site 7 Soil	Yes	VOCs	Yes	o-Xylene (>Bkg & SSL)	acceptable HH risk value	An RI is recommended to further characterize site related contamination and evaluate potential risk to human health and ecological receptors.
		SVOCs	Yes	Benzo(a)anthracene (>Bkg & SSL)	acceptable HH risk value	
		Pesticides	Yes	Endrin (>Bkg & Eco)	acceptable eco risk value	
		PCBs	No	N/A	N/A	
		Dioxins/Furans	Yes	2,3,7,8-TCDD (dioxin) (>Bkg & SSL)	acceptable HH risk value	
		Explosives	No	N/A	N/A	
		Inorganics	Yes	Aluminum (>Bkg, Eco & RSL)	acceptable HH and eco risk value	
				Arsenic (>Bkg, Eco, RSL & SSL)	acceptable HH and eco risk value	
				Chromium (>Bkg, RSL & SSL)	acceptable HH risk value	
				Iron (>Bkg, Eco, RSL & SSL)	acceptable HH and eco risk value	
				Lead (>Bkg & Eco)	acceptable eco risk value	
				Manganese (>Bkg, Eco, RSL & SSL)	acceptable HH and eco risk value	
				Mercury (>Bkg, Eco & SSL)	acceptable HH and eco risk value	
				Selenium (>Bkg, Eco & SSL)	acceptable HH risk value; acceptable eco risk value (with uncertainties)	
				Thallium (>Bkg, Eco, RSL & SSL)	exceeds acceptable HH risk level; acceptable eco risk value	
				Vanadium (>Bkg, RSL & SSL)	acceptable HH risk value	
Site 7 Groundwater	Yes	VOCs	Yes	Bromodichloromethane (>Bkg & RSL)	exceeds acceptable HH risk level	An RI is recommended to further characterize site related contamination and evaluate potential risk to human health and ecological receptors.
				Chloroform (>Bkg & RSL)	exceeds acceptable HH risk level	
				Dibromochloromethane (>Bkg & RSL)	exceeds acceptable HH risk level	
				Tetrachloroethene (PCE) (>Bkg, MCL & RSL)	exceeds acceptable HH risk level	
				Trichloroethene (TCE) (>Bkg & RSL)	exceeds acceptable HH risk level	
				Vinyl chloride (VC) (>Bkg & RSL)	exceeds acceptable HH risk level	
		SVOCs	Yes	2,4-Dinitrotoluene (>Bkg & RSL)	exceeds acceptable HH risk level	
		Pesticides	Yes	4,4'-DDD (>Bkg & Eco)	acceptable eco risk value	
				gamma-Chlordane (>Bkg & Eco)	acceptable eco risk value	
		PCBs	No	N/A	N/A	
		Dioxins/Furans	Yes	Octachlorodibenzo-p-dioxin (>Bkg & Eco)	acceptable eco risk value	
		Explosives	Yes	RDX (>Bkg & RSL)	exceeds acceptable HH risk level	
		Total Inorganics	Yes	Arsenic (>Bkg & RSL)	exceeds acceptable HH risk level	
				Manganese (>Bkg, Eco & RSL)	acceptable HH and eco risk value	
		Dissolved Inorganics	Yes	Arsenic, Dissolved (>Bkg & RSL)	exceeds acceptable HH risk level	
				Cobalt, Dissolved (>Bkg & RSL)	acceptable HH risk value	
				Manganese, Dissolved (>Bkg, Eco & RSL)	acceptable HH and eco risk value	

Notes:
N/A - Not applicable

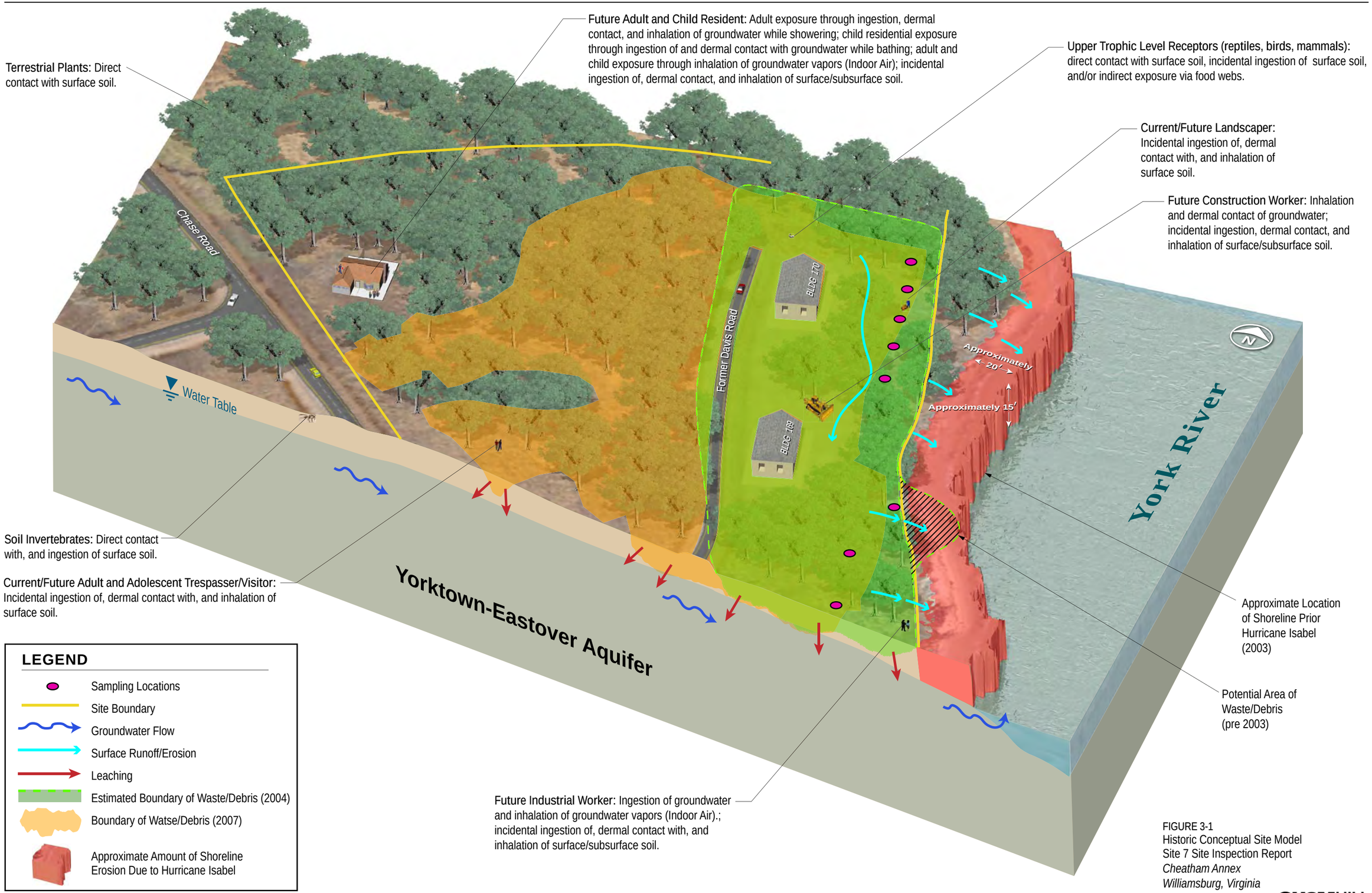
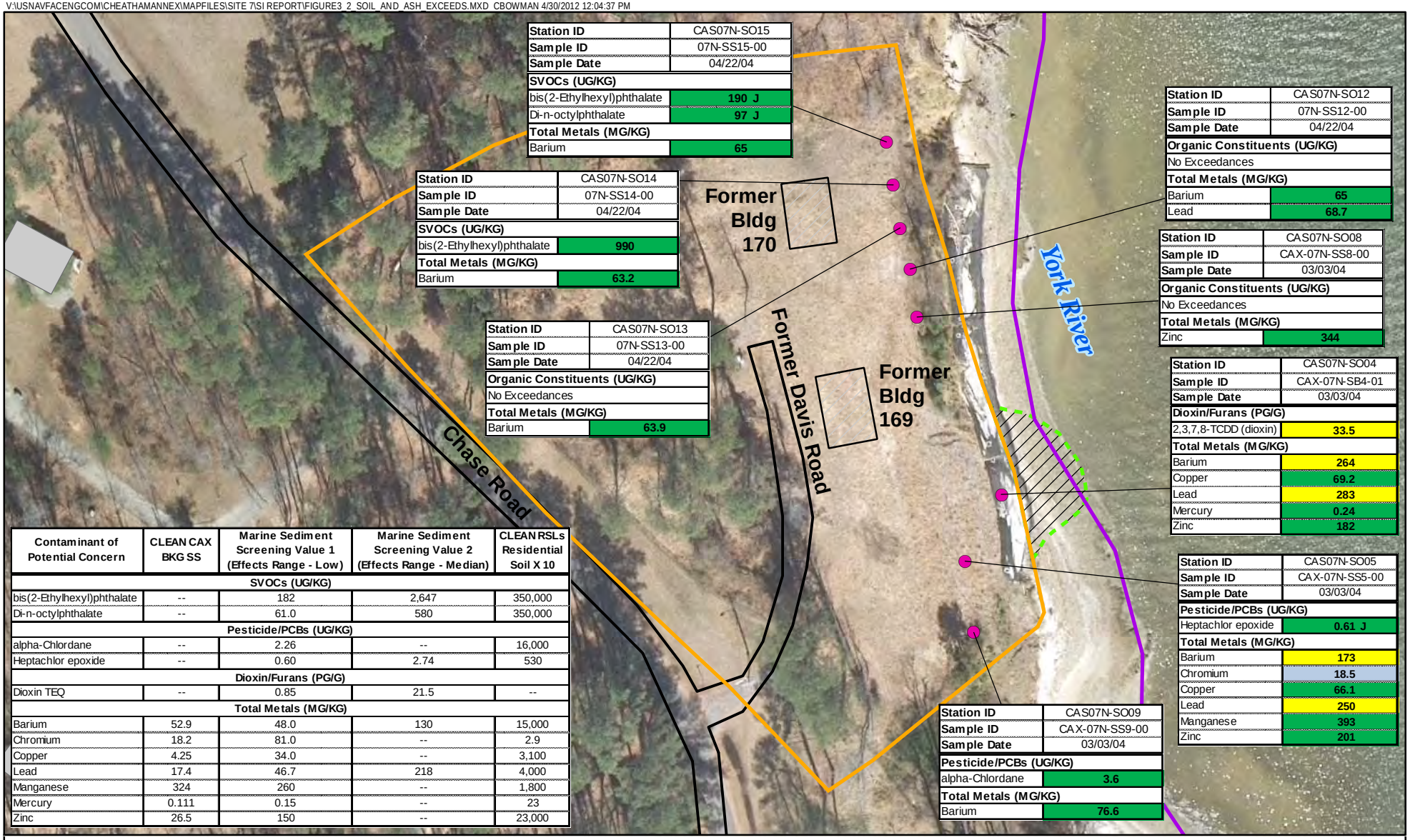


FIGURE 3-1
Historic Conceptual Site Model
Site 7 Site Inspection Report
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

ES062111113638VBO Fig3-1_Yorktown_Cheatham_Site7_UFP-SAP_Historic_Rev17.ai 03/14/12 LED

V:\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\SITE 7\SI REPORT\FIGURE3_2_SOIL_AND_ASH_EXCEEDS.MXD CBOWMAN 4/30/2012 12:04:37 PM



Station ID	CAS07N-SO15
Sample ID	07N-SS15-00
Sample Date	04/22/04
SVOCs (UG/KG)	
bis(2-Ethylhexyl)phthalate	**190 J**
Di-n-octylphthalate	**97 J**
Total Metals (MG/KG)	
Barium	**65**

Station ID	CAS07N-SO14
Sample ID	07N-SS14-00
Sample Date	04/22/04
SVOCs (UG/KG)	
bis(2-Ethylhexyl)phthalate	**990**
Total Metals (MG/KG)	
Barium	**63.2**

Station ID	CAS07N-SO13
Sample ID	07N-SS13-00
Sample Date	04/22/04
Organic Constituents (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Barium	**63.9**

Station ID	CAS07N-SO12
Sample ID	07N-SS12-00
Sample Date	04/22/04
Organic Constituents (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Barium	**65**
Lead	**68.7**

Station ID	CAS07N-SO08
Sample ID	CAX-07N-SS8-00
Sample Date	03/03/04
Organic Constituents (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Zinc	**344**

Station ID	CAS07N-SO04
Sample ID	CAX-07N-SB4-01
Sample Date	03/03/04
Dioxin/Furans (PG/G)	
2,3,7,8-TCDD (dioxin)	**33.5**
Total Metals (MG/KG)	
Barium	**264**
Copper	**69.2**
Lead	**283**
Mercury	**0.24**
Zinc	**182**

Station ID	CAS07N-SO05
Sample ID	CAX-07N-SS5-00
Sample Date	03/03/04
Pesticide/PCBs (UG/KG)	
Heptachlor epoxide	**0.61 J**
Total Metals (MG/KG)	
Barium	**173**
Chromium	**18.5**
Copper	**66.1**
Lead	**250**
Manganese	**393**
Zinc	**201**

Station ID	CAS07N-SO09
Sample ID	CAX-07N-SS9-00
Sample Date	03/03/04
Pesticide/PCBs (UG/KG)	
alpha-Chlordane	**3.6**
Total Metals (MG/KG)	
Barium	**76.6**

Contaminant of Potential Concern	CLEAN CAX BKG SS	Marine Sediment Screening Value 1 (Effects Range - Low)	Marine Sediment Screening Value 2 (Effects Range - Median)	CLEAN RSLs Residential Soil X 10
SVOCs (UG/KG)				
bis(2-Ethylhexyl)phthalate	--	182	2,647	350,000
Di-n-octylphthalate	--	61.0	580	350,000
Pesticide/PCBs (UG/KG)				
alpha-Chlordane	--	2.26	--	16,000
Heptachlor epoxide	--	0.60	2.74	530
Dioxin/Furans (PG/G)				
Dioxin TEQ	--	0.85	21.5	--
Total Metals (MG/KG)				
Barium	52.9	48.0	130	15,000
Chromium	18.2	81.0	--	2.9
Copper	4.25	34.0	--	3,100
Lead	17.4	46.7	218	4,000
Manganese	324	260	--	1,800
Mercury	0.111	0.15	--	23
Zinc	26.5	150	--	23,000

Legend

- Site Boundary
- Cheatham Annex Boundary
- Buildings
- Former Buildings
- Approximate Location of the Waste/Debris Lobe Pre-Hurricane Isabel (September 2003)
- Roads
- Soil Sample Locations

Notes

- **Exceeds BKG & ER-L**
- **Exceeds BKG, ER-L & ER-M**
- **Exceeds BKG & RSL**

Bold indicates detections

J - Analyte present, value may or may not be accurate or precise
MG/KG - Milligrams per kilogram
PG/G - Picograms per gram
UG/KG - Micrograms per kilogram

N W E S

0 40 80 Feet

Figure 3-2
Pre-TCRA Soil and Ash Exceedances
Site 7 Site Inspection Report
Cheatham Annex
Williamsburg, Virginia

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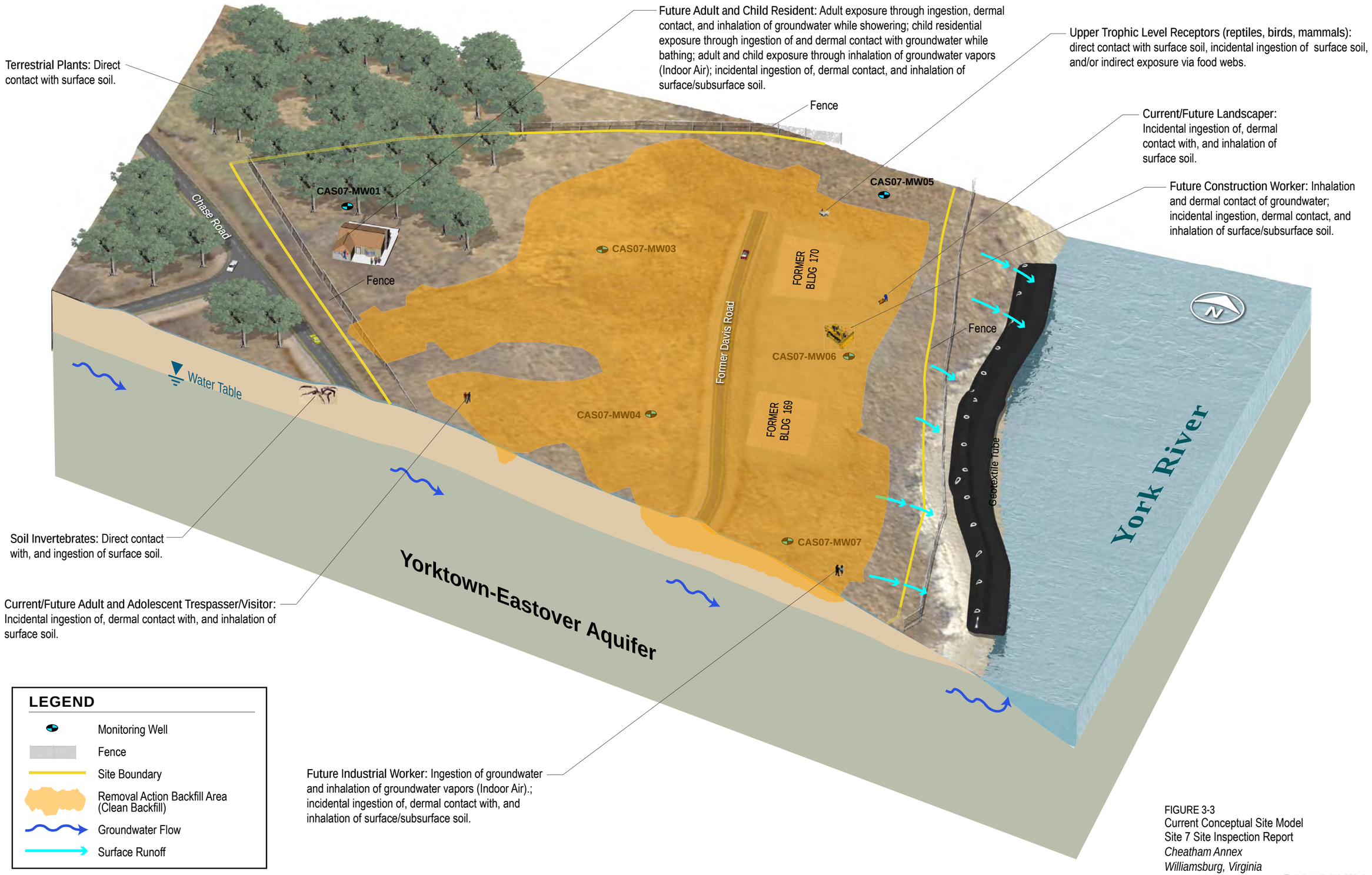

FIGURE 3-3
Current Conceptual Site Model
Site 7 Site Inspection Report
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

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\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\SITE 7\SI REPORT\FIGURE3_4_GW_CONTOURS.MXD BHATHAWA 8/23/2011 3:20:18 PM

Legend

- Monitoring Well Location
- Excavation Boundary
- Site 7 Boundary
- Groundwater Contour
- Inferred Groundwater Contour
- Groundwater Flow Direction

2.34 - Groundwater Elevatoin

N
W E
S

0 40 80
Feet

Figure 3-4
Groundwater Contour Map
Site 7 Site Inspection Report
Cheatham Annex
Williamsburg, Virginia

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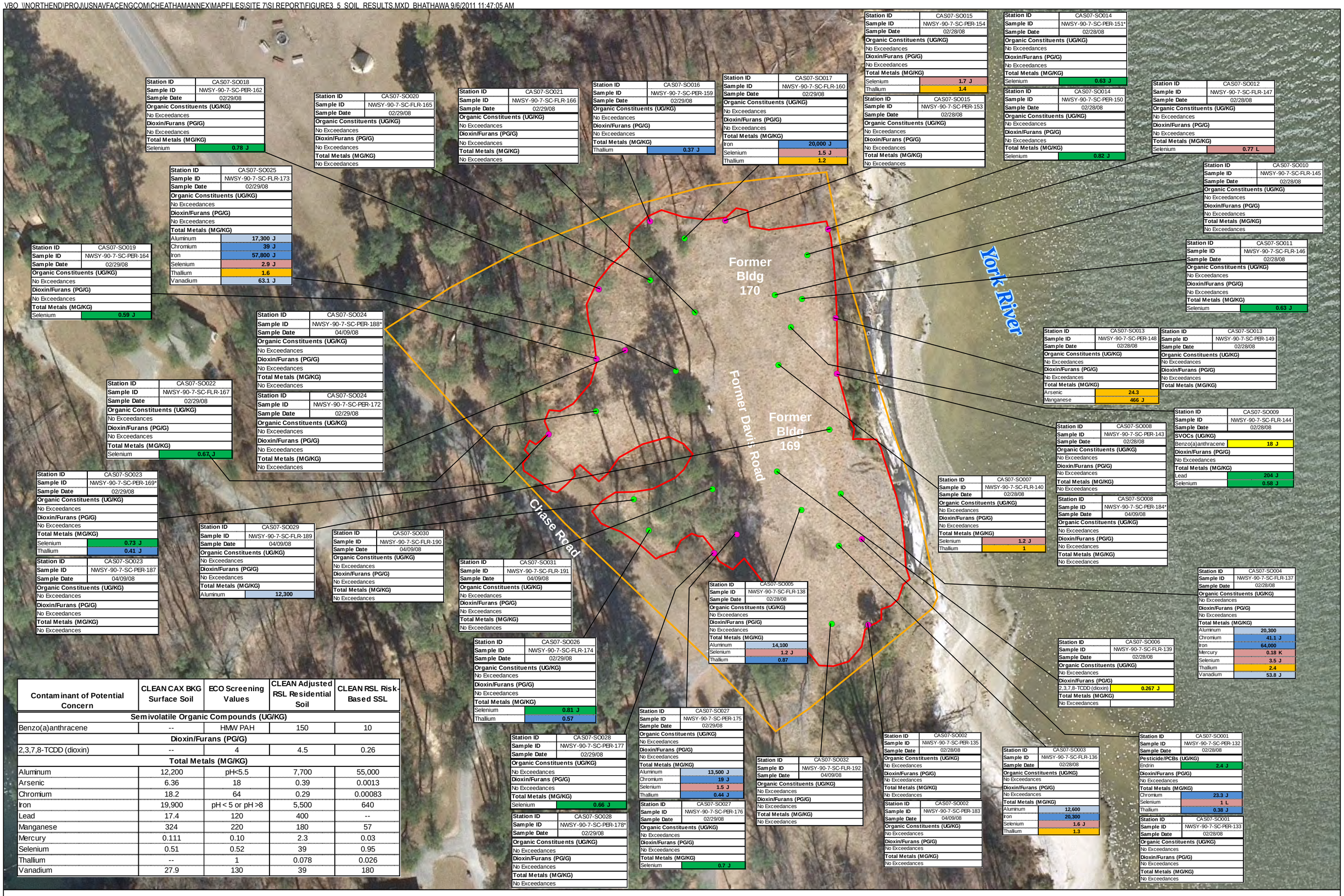

Station ID	CAS07-SO018
Sample ID	NWSY-90-7-SC-PER-162
Sample Date	02/29/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Selenium	0.78 J

Station ID	CAS07-SO020
Sample ID	NWSY-90-7-SC-FLR-165
Sample Date	02/29/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAS07-SO021
Sample ID	NWSY-90-7-SC-FLR-166
Sample Date	02/29/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAS07-SO016
Sample ID	NWSY-90-7-SC-PER-159
Sample Date	02/29/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Thallium	0.37 J

Station ID	CAS07-SO017
Sample ID	NWSY-90-7-SC-FLR-160
Sample Date	02/29/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Iron	20,000 J
Selenium	1.5 J
Thallium	1.2

Station ID	CAS07-SO015
Sample ID	NWSY-90-7-SC-PER-154
Sample Date	02/28/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Selenium	1.7 J
Thallium	1.4

Station ID	CAS07-SO014
Sample ID	NWSY-90-7-SC-PER-151*
Sample Date	02/28/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Selenium	0.63 J

Station ID	CAS07-SO015
Sample ID	NWSY-90-7-SC-PER-153
Sample Date	02/28/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAS07-SO014
Sample ID	NWSY-90-7-SC-PER-150
Sample Date	02/28/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Selenium	0.82 J

Station ID	CAS07-SO012
Sample ID	NWSY-90-7-SC-FLR-147
Sample Date	02/28/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Selenium	0.77 L

Station ID	CAS07-SO025
Sample ID	NWSY-90-7-SC-FLR-173
Sample Date	02/29/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Aluminum	17,300 J
Chromium	39 J
Iron	57,800 J
Selenium	2.9 J
Thallium	1.6
Vanadium	63.1 J

Station ID	CAS07-SO010
Sample ID	NWSY-90-7-SC-FLR-145
Sample Date	02/28/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAS07-SO019
Sample ID	NWSY-90-7-SC-PER-164
Sample Date	02/29/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Selenium	0.59 J

Station ID	CAS07-SO011
Sample ID	NWSY-90-7-SC-FLR-146
Sample Date	02/28/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Selenium	0.63 J

Station ID	CAS07-SO024
Sample ID	NWSY-90-7-SC-PER-188*
Sample Date	04/09/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAS07-SO013
Sample ID	NWSY-90-7-SC-PER-148
Sample Date	02/28/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Arsenic	24.3
Manganese	466 J

Station ID	CAS07-SO013
Sample ID	NWSY-90-7-SC-PER-149
Sample Date	02/28/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	

Station ID	CAS07-SO022
Sample ID	NWSY-90-7-SC-FLR-167
Sample Date	02/29/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Selenium	0.67 J

Station ID	CAS07-SO024
Sample ID	NWSY-90-7-SC-PER-172
Sample Date	02/29/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAS07-SO009
Sample ID	NWSY-90-7-SC-FLR-144
Sample Date	02/28/08
SVOCs (UG/KG)	
Benzo(a)anthracene	18 J
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Lead	204 J
Selenium	0.58 J

Station ID	CAS07-SO008
Sample ID	NWSY-90-7-SC-PER-143
Sample Date	02/28/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAS07-SO007
Sample ID	NWSY-90-7-SC-FLR-140
Sample Date	02/28/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Selenium	1.2 J
Thallium	1

Station ID	CAS07-SO023
Sample ID	NWSY-90-7-SC-PER-169*
Sample Date	02/29/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Selenium	0.73 J
Thallium	0.41 J

Station ID	CAS07-SO008
Sample ID	NWSY-90-7-SC-PER-184*
Sample Date	04/09/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAS07-SO029
Sample ID	NWSY-90-7-SC-FLR-189
Sample Date	04/09/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Aluminum	12,300

Station ID	CAS07-SO030
Sample ID	NWSY-90-7-SC-FLR-190
Sample Date	04/09/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAS07-SO031
Sample ID	NWSY-90-7-SC-FLR-191
Sample Date	04/09/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAS07-SO005
Sample ID	NWSY-90-7-SC-FLR-138
Sample Date	02/28/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Aluminum	14,100
Selenium	1.2 J
Thallium	0.87

Station ID	CAS07-SO004
Sample ID	NWSY-90-7-SC-FLR-137
Sample Date	02/28/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Aluminum	20,300
Chromium	41.1 J
Iron	64,000
Mercury	0.18 K
Selenium	3.5 J
Thallium	2.4
Vanadium	53.8 J

Station ID	CAS07-SO026
Sample ID	NWSY-90-7-SC-FLR-174
Sample Date	02/29/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Selenium	0.81 J
Thallium	0.57

Station ID	CAS07-SO006
Sample ID	NWSY-90-7-SC-FLR-139
Sample Date	02/28/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
2,3,7,8-TCDD (dioxin)	0.267 J
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAS07-SO027
Sample ID	NWSY-90-7-SC-PER-175
Sample Date	02/29/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Aluminum	13,500 J
Chromium	19 J
Selenium	1.5 J
Thallium	0.44 J

Station ID	CAS07-SO028
Sample ID	NWSY-90-7-SC-PER-177
Sample Date	02/29/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Selenium	0.66 J

Station ID	CAS07-SO027
Sample ID	NWSY-90-7-SC-PER-176
Sample Date	02/29/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Selenium	0.7 J

Station ID	CAS07-SO028
Sample ID	NWSY-90-7-SC-PER-178*
Sample Date	02/29/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAS07-SO032
Sample ID	NWSY-90-7-SC-FLR-192
Sample Date	04/09/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAS07-SO002
Sample ID	NWSY-90-7-SC-PER-135
Sample Date	02/28/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAS07-SO002
Sample ID	NWSY-90-7-SC-PER-183
Sample Date	04/09/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAS07-SO003
Sample ID	NWSY-90-7-SC-FLR-136
Sample Date	02/28/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Aluminum	12,600
Iron	20,300
Selenium	1.6 J
Thallium	1.3

Station ID	CAS07-SO001
Sample ID	NWSY-90-7-SC-PER-132
Sample Date	02/28/08
Pesticide/PCBs (UG/KG)	
Endrin	2.4 J
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
Chromium	23.3 J
Selenium	1 L
Thallium	0.38 J

Station ID	CAS07-SO001
Sample ID	NWSY-90-7-SC-PER-133
Sample Date	02/28/08
Organic Constituents (UG/KG)	
No Exceedances	
Dioxin/Furans (PG/G)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Contaminant of Potential Concern	CLEAN CAX BKG Surface Soil	ECO Screening Values	CLEAN Adjusted RSL Residential Soil	CLEAN RSL Risk-Based SSL
Semivolatile Organic Compounds (UG/KG)				
Benzo(a)anthracene	--	HMW PAH	150	10
Dioxin/Furans (PG/G)				
2,3,7,8-TCDD (dioxin)	--	4	4.5	0.26
Total Metals (MG/KG)				
Aluminum	12,200	pH<5.5	7,700	55,000
Arsenic	6.36	18	0.39	0.0013
Chromium	18.2	64	0.29	0.00083
Iron	19,900	pH < 5 or pH >8	5,500	640
Lead	17.4	120	400	--
Manganese	324	220	180	57
Mercury	0.111	0.10	2.3	0.03
Selenium	0.51	0.52	39	0.95
Thallium	--	1	0.078	0.026
Vanadium	27.9	130	39	180

Legend

- Side Wall Sample
- Floor Sample
- Excavation Boundary
- Site Boundary

Notes:

- Exceeds BKG & SSL
- Exceeds BKG & ECO
- Exceeds BKG & RSL
- Exceeds BKG, RSL & SSL
- Exceeds BKG, ECO &SSL
- Exceeds BKG, ECO, RSL & SSL

* Duplicate sample collected. Most conservative value reported
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PG/G - Picograms per gram
UG/KG - Micrograms per kilogram

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Figure 3-5
Soil Exceedance Results
Site 7 Site Inspection Report
Cheatham Annex
Williamsburg, Virginia

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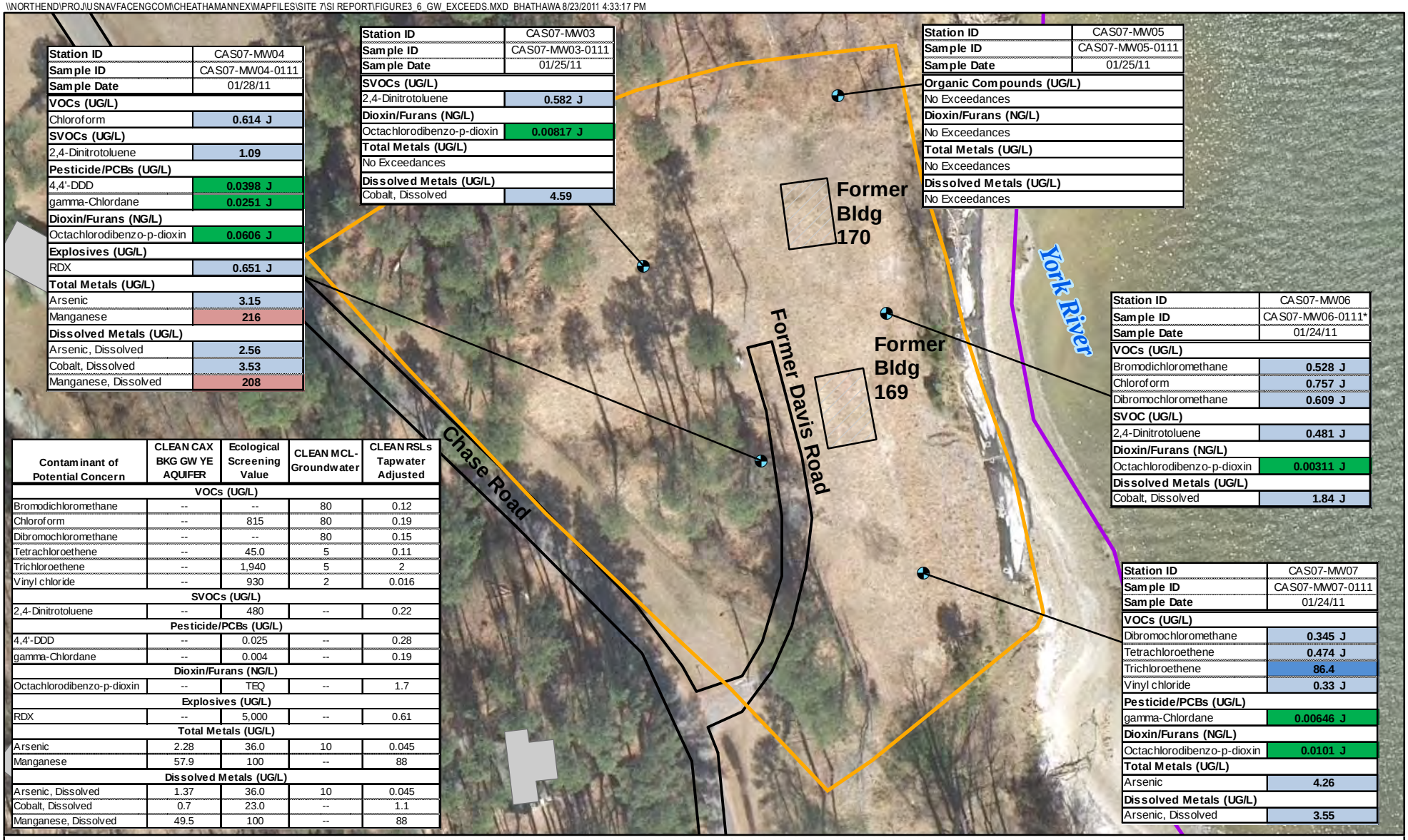
\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\SITE 7\SI REPORT\FIGURE3_6_GW_EXCEEDS.MXD BHATHAWA 8/23/2011 4:33:17 PM



Station ID	CAS07-MW04
Sample ID	CAS07-MW04-0111
Sample Date	01/28/11
VOCs (UG/L)	
Chloroform	0.614 J
SVOCs (UG/L)	
2,4-Dinitrotoluene	1.09
Pesticide/PCBs (UG/L)	
4,4'-DDD	0.0398 J
gamma-Chlordane	0.0251 J
Dioxin/Furans (NG/L)	
Octachlorodibenzo-p-dioxin	0.0606 J
Explosives (UG/L)	
RDX	0.651 J
Total Metals (UG/L)	
Arsenic	3.15
Manganese	216
Dissolved Metals (UG/L)	
Arsenic, Dissolved	2.56
Cobalt, Dissolved	3.53
Manganese, Dissolved	208

Station ID	CAS07-MW03
Sample ID	CAS07-MW03-0111
Sample Date	01/25/11
SVOCs (UG/L)	
2,4-Dinitrotoluene	0.582 J
Dioxin/Furans (NG/L)	
Octachlorodibenzo-p-dioxin	0.00817 J
Total Metals (UG/L)	
No Exceedances	
Dissolved Metals (UG/L)	
Cobalt, Dissolved	4.59

Station ID	CAS07-MW05
Sample ID	CAS07-MW05-0111
Sample Date	01/25/11
Organic Compounds (UG/L)	
No Exceedances	
Dioxin/Furans (NG/L)	
No Exceedances	
Total Metals (UG/L)	
No Exceedances	
Dissolved Metals (UG/L)	
No Exceedances	

Station ID	CAS07-MW06
Sample ID	CAS07-MW06-0111*
Sample Date	01/24/11
VOCs (UG/L)	
Bromodichloromethane	0.528 J
Chloroform	0.757 J
Dibromochloromethane	0.609 J
SVOC (UG/L)	
2,4-Dinitrotoluene	0.481 J
Dioxin/Furans (NG/L)	
Octachlorodibenzo-p-dioxin	0.00311 J
Dissolved Metals (UG/L)	
Cobalt, Dissolved	1.84 J

Station ID	CAS07-MW07
Sample ID	CAS07-MW07-0111
Sample Date	01/24/11
VOCs (UG/L)	
Dibromochloromethane	0.345 J
Tetrachloroethene	0.474 J
Trichloroethene	86.4
Vinyl chloride	0.33 J
Pesticide/PCBs (UG/L)	
gamma-Chlordane	0.00646 J
Dioxin/Furans (NG/L)	
Octachlorodibenzo-p-dioxin	0.0101 J
Total Metals (UG/L)	
Arsenic	4.26
Dissolved Metals (UG/L)	
Arsenic, Dissolved	3.55

Contaminant of Potential Concern	CLEAN CAX BKG GW YE AQUIFER	Ecological Screening Value	CLEAN MCL-Groundwater	CLEAN RSLs Tapwater Adjusted
VOCs (UG/L)				
Bromodichloromethane	--	--	80	0.12
Chloroform	--	815	80	0.19
Dibromochloromethane	--	--	80	0.15
Tetrachloroethene	--	45.0	5	0.11
Trichloroethene	--	1,940	5	2
Vinyl chloride	--	930	2	0.016
SVOCs (UG/L)				
2,4-Dinitrotoluene	--	480	--	0.22
Pesticide/PCBs (UG/L)				
4,4'-DDD	--	0.025	--	0.28
gamma-Chlordane	--	0.004	--	0.19
Dioxin/Furans (NG/L)				
Octachlorodibenzo-p-dioxin	--	TEQ	--	1.7
Explosives (UG/L)				
RDX	--	5,000	--	0.61
Total Metals (UG/L)				
Arsenic	2.28	36.0	10	0.045
Manganese	57.9	100	--	88
Dissolved Metals (UG/L)				
Arsenic, Dissolved	1.37	36.0	10	0.045
Cobalt, Dissolved	0.7	23.0	--	1.1
Manganese, Dissolved	49.5	100	--	88

Legend

- Site Boundary
- Cheatham Annex Boundary
- Buildings
- Former Buildings
- Roads
- Monitoring Well Locations

Notes:

- Exceeds BKG & ECO
- Exceeds BKG & RSL
- Exceeds BKG, MCL &
- Exceeds BKG, ECO & RSL

J - Analyte present, value may or may not be accurate or precise
NG/L - Nanograms per liter
UG/L - Micrograms per liter

N W E S

0 40 80 Feet

Figure 3-6
Site 7 Groundwater Exceedance Results
Site 7 Site Inspection Report
Cheatham Annex
Williamsburg, Virginia

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SECTION 4

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Appendix A
Human Health Risk Screening

APPENDIX A

Human Health Risk Screening (Site 7)

A conservative human health risk screening (HHRS) was performed to determine the potential for human health risks associated with exposure to site media (soil and groundwater) at Site 7. The results of the human health risk screening provide a preliminary indication of potential risks from exposure to chemicals of potential concern (COPCs) and are used to help determine whether the site requires further evaluation (e.g., a baseline risk assessment or additional data collection) or future unrestricted (i.e., residential) use of the site is acceptable based on human health risks.

A.1 Human Health Conceptual Site Model

The human health conceptual site model (CSM) presents an overview of site conditions, potential contaminant migration pathways, and exposure pathways to potential receptors. The human health CSM for soil and groundwater for Site 7 is presented in **Figure A-1**.

CAX currently comprises 1,578 acres, of which approximately 50% is undeveloped with outdoor recreational facilities. The mission of CAX includes supplying Atlantic Fleet ships and providing recreational opportunities to military and civilian personnel. In addition to receiving, storing, issuing, packing, and shipping Navy stock material and shipboard equipment, CAX provides warehouse and distribution services for 39 Storage Authorization Programs and tenant organizations. Site 7, the Old DuPont Disposal Area, is approximately 1 acre in size located along the York River, northeast of Chase Road in the north central portion of CAX. The site gradient is fairly level with a nearly vertical drop (approximately 15 feet) along the eastern boundary to the York River shoreline which is highly vulnerable to erosion caused by surface water runoff and wave action. Site 7 received wastes from the City of Penniman and from the DuPont facility. Wastes were reported to be non-hazardous and/or inert; however, specific information documenting the types and quantities of wastes is not available. The presence of ash, melted bottles, and charred metal indicate some of the waste may have been incinerated prior to disposal (Baker/CH2M HILL, 2004b). In September 2003, Hurricane Isabel eroded approximately 15 to 20 feet of shoreline, resulting in a large amount of debris covering the beach and an unstable slope along the eastern boundary of Site 7. A time critical removal action (TCRA) was completed in July/August 2006 to stabilize the shoreline and prevent further erosion of disposal area contents into the York River (Baker/CH2M HILL, 2004a). A removal action was completed between December 2007 and April 2008 to remove waste and waste-impacted soils remaining on site

Currently, Site 7 is vacant and surrounded by a fence to prevent trespassers from entering the site. Although unlikely due to site use, potential current receptors at Site 7 could include trespassers and landscapers. The potential current receptors may come in contact with soil; exposure routes may include incidental ingestion of and dermal contact with the surface soil, and inhalation of particulate emissions from the soil.

There are no future anticipated uses for Site 7. However, if the site is developed in the future, potential future receptors could include current receptors and future construction

workers, future industrial workers, and/or future residents. Future receptors could be exposed to soil if future industrial facilities, piping/utilities, or residential houses are constructed at the sites. Exposure routes for future exposure to the soil are the same as those for current soil, incidental ingestion of and dermal contact with the soil, and inhalation of particulate emissions from the soil.

Potable water supplies for CAX are provided by the City of Newport News Water Works. Groundwater is not used as a source of water on the base. However, a potable use scenario was evaluated in this risk assessment. It was conservatively assumed if future residential development of the site occurs; the residents could use the groundwater as a potable water supply. The residents would be exposed through ingestion, and dermal contact and inhalation while bathing. If future industrial development occurs, potential future industrial workers could be exposed to groundwater through ingestion. Additionally, due to the depth to groundwater (less than 10 feet below ground surface in a number of monitoring wells), construction workers could be exposed to the groundwater through dermal contact and inhalation of vapors in an excavation trench during construction activities.

A.2 Human Health Risk Screening Methodology

The human health risk screening was conducted in three steps using a risk ratio technique (U.S. Navy, 2000). If COPCs were identified after Step 1, the COPCs were evaluated in Step 2. If COPCs were identified after Step 2, the COPCs were evaluated in Step 3. The three-step screening process is described below:

A.2.1 Step 1

The maximum detected constituent concentrations for soil and groundwater were compared to the 95% upper tolerance limit (UTL) background concentrations. Concentrations of naturally occurring constituents (metals) were compared to background UTLs. If the constituent concentration was below background, it was eliminated from further evaluation. Background data was obtained from the *Preliminary Draft Background Investigation Naval Weapons Station Yorktown and Cheatham Annex* (CH2M HILL, 2011). A brief description of the background data sets are provided in Section 1.1.1 of the SI report. If there were no background data or the constituent concentration was greater than background concentration, the site data was compared to the USEPA human health regional screening levels (RSL, USEPA 2011), and other human health risk-based screening levels (if appropriate). RSLs based on noncarcinogenic effects were divided by 10 to account for exposure to multiple constituents (i.e., were adjusted to a hazard quotient of 0.1, from the hazard quotient of 1.0 used on the USEPA RSL table). RSLs based on carcinogenic endpoints were used as presented in the RSL table, and are based on a carcinogenic risk of 1×10^{-6}.

The soil data were compared to residential soil RSLs. Although trespassers, construction workers, industrial workers are potential receptors for soil in addition to residential receptors, the soil data were only screened against residential soil RSLs. Residential soil RSLs are more conservative (i.e., lower) than industrial soil RSLs and are therefore protective of all potential receptors (e.g., residents, industrial workers, construction workers, trespassers).

Soil data were also compared to the SSL for protection of groundwater. If the maximum detected concentration was greater than the SSL, a constituent was identified as a COPC. However, constituents were not carried forward to Step 2 based on exceedance of the SSL alone.

The groundwater data were compared to tap water RSLs. Groundwater data were also compared to MCLs (USEPA, 2009) however these comparisons were not used to identify the groundwater COPCs to carry forward to Step 2. In accordance with EPA guidance (USEPA, 1992), total and dissolved concentrations of aluminum, iron, and manganese were compared to determine if a notable disparity (one order of magnitude difference) exists. No disparity was found therefore filtered concentrations were used to evaluate industrial and residential exposure to groundwater. Unfiltered groundwater concentrations were used to evaluate construction worker exposure to groundwater, as the construction worker would be exposed to the groundwater directly in the excavation.

The COPC selection process for dioxin/furan congeners (in groundwater) was performed using the 2,3,7,8- tetrachlorodibenzo-p-dioxin (TCDD) toxicity equivalent (TEQ) concentration. TEQ concentrations for the dioxin/furan congeners were calculated for each sample in accordance with the World Health Organization (WHO) toxicity equivalency factor (TEF) approach (Van den Berg et al., 2006; USEPA, 2010b) to adjust the relative carcinogenic potency of specific dioxin/furan congeners, relative to 2,3,7,8-TCDD, the most potent dioxin congener. Using the measured concentration values for each congener and the TEF for that congener, the dioxin TEQ concentration for a mixture of dioxin/furan congeners in a specific sample was calculated using the equation below. The TEFs used to calculate the dioxin TEQ concentrations are shown in **Table 2.3, Supplement A**.

$$\textit{1,3,7,8-TCDD TEQ Concentration} = \Sigma\ (TEFi \times Ci)$$

where:

2,3,7,8-TCDD TEQ = 2,3,7,8-TCDD toxicity equivalent concentration (mg/kg)

TEFi = Toxicity equivalency factor for congener "i" (unitless)

Ci = Concentration of congener "i" (mg/kg)

If the maximum detected concentration in soil or groundwater exceeded the appropriate RSL and background concentration, the screening level risk evaluation proceeded to Step 2.

A.2.2 Step 2

For chemicals identified as COPCs in Step 1, a corresponding risk level was calculated using the following equation:

$$\text{corresponding risk level} = \frac{\text{concentration x acceptable risk level}}{\text{RSL}}$$

The concentration is the maximum detected concentration (the same concentration that was used in Step 1). The acceptable risk level is 1 for noncarcinogens and 10^{-6} for carcinogens. RSLs for noncarcinogenic effects are not adjusted by 10 as was done in Step 1; they are used as presented in the RSL table. All of the corresponding risk levels for each constituent within a media are summed to calculate the cumulative corresponding hazard index (for

noncarcinogens) and cumulative corresponding carcinogenic risk (for carcinogens). A cumulative corresponding hazard index is also calculated for each target organ/effect. If the cumulative corresponding hazard index for a target organ/effect is greater than the risk-ratio screening benchmark of 0.5, or the cumulative corresponding carcinogenic risk is greater than the 5×10^{-5} risk-ratio screening benchmark, the chemicals contributing to these values are retained as COPCs and carried forward to Step 3.

A.2.3 Step 3

For constituents identified as COPCs in Step 2, a corresponding risk level was calculated as discussed above for Step 2. However, the 95 percent upper confidence limit (UCL) was used in place of the maximum detected concentration to obtain a more site-specific risk ratio. If the cumulative corresponding HI by target organ/effect is greater than the risk-ratio screening benchmark of 0.5, or the cumulative corresponding carcinogenic risk is greater than the 5×10^{-5} risk-ratio screening benchmark, then chemicals contributing to these values are considered COPCs.

The most current version of the ProUCL software program (USEPA, 2010a), was used to test the data distribution and calculate 95 percent UCL exposure point concentrations (EPC) used for the Step 3 risk ratio calculations.

A.3 Human Health Risk Screening Results

The human health risk-based screening and risk ratio evaluation were performed for Site 7 soil and groundwater.

A.3.1 Soil

Tables 2.1 through **2.2a, Appendix A**, present the risk-based screening and risk ratio evaluation for soil at Site 7. Seven metals (aluminum, arsenic, chromium, iron, manganese, thallium, and vanadium) were identified as COPCs for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations, **Table 2.1a, Appendix A**), only aluminum and manganese were eliminated as COPCs. Based on Step 3 (risk ratio using 95% UCLs), four metals (arsenic, chromium, thallium, and vanadium) were retained as COPCs for soil at Site 7.

As shown on **Table 2.2, Appendix A**, chromium was identified as a COPC for Step 1 for particulate emissions from soil to air and was evaluated in Step 2. Based on Step 2, chromium was eliminated as a COPC from air. Therefore, exposure to emissions from soil from Site 7 is not expected to result in any unacceptable human health risk.

The potential unacceptable carcinogenic risk from exposure to Site 7 soil is primarily associated with chromium. However, it is important to note that in performing the risk assessment, it was assumed that all of the chromium detected in the soil was in the hexavalent form, which is very unlikely. Chromium is generally found in natural soil predominantly in the trivalent form, unless activities at the site have resulted in the release or formation of hexavalent chromium. At Site 7, it is likely that trivalent chromium is the predominant form of chromium that is present at the site. Chromium was identified as a COPC in soil when screened against the RSL for hexavalent chromium. However, the maximum detected concentration for chromium in soil was less than the RSL for trivalent

chromium. In addition, while only 3 of the 45 detected concentrations of chromium exceeded the background 95 percent UTL for chromium, these concentrations did not exceed the maximum base background concentrations. If chromium is not retained as a COPC, arsenic would not be considered a COPC, as it alone does not contribute a cancer risk above the 5×10^{-5} risk-ratio screening benchmark level.

The cumulative corresponding hazard index (affecting hair as the target organ) of 1.0, is primarily due to exposure to thallium, and exceeds the target level of 0.5. Therefore, further evaluation of total soil is recommended.

A.3.2 Groundwater

Tables 2.3 through 2.3b, Appendix A, present the risk-based screening and risk ratio evaluation for the groundwater. As shown on **Table 2.3**, **Appendix A**, six VOCs, one explosive, two metals from unfiltered samples (for construction worker exposure), and three metals from filtered samples (for potable use scenarios) were selected as COPCs. Based on Step 2 (risk ratio using maximum detected concentrations, **Table 2.3a**, **Appendix A**), all Step 1 COPCs, except manganese (filtered and unfiltered) and cobalt (filtered) were identified as COPCs and carried forward to Step 3, where the 95% UCL concentrations resulted in a cumulative carcinogenic risk above the screening criteria.

Although arsenic was selected as a COPC from both the unfiltered and filtered groundwater samples, the maximum detected concentrations are below the USEPA MCL. Additionally, the maximum detected concentrations of bromodichloromethane, chloroform, dibromochloromethane, tetrachloroethene, and vinyl chloride are below the MCL.

A.3.3 Site 7 Risk Screening Summary

Exposure to soil could result in potential unacceptable human health risks associated with chromium, and thallium. As discussed above, the evaluation was based on the assumption that all of the chromium detected in the soil is in the more toxic hexavalent form. Additionally, only three of the 45 detected concentrations of chromium exceed the background 95% UTL for chromium. Additional evaluation of soil at Site 7 is recommended.

Exposure to groundwater could result in potential unacceptable human health risks, associated with exposure to VOCs, explosives, and metals. Although, detected concentrations of all of the COPCs, except for the maximum detected concentrations of trichloroethene and 2,4-dinitrotoluene, are below the MCL.

A.4 References

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Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 7

Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Soil*	75-09-2	Methylene chloride	4.2E-02	4.2E-02	MG/KG	NWSY-90-7-SC-PER-186	1/45	0.011 - 0.027	4.2E-02	NA	1.1E+01 C	1.2E-03	SSL	NO	BSL
	95-47-6	o-Xylene	7.3E-03 J	7.3E-03 J	MG/KG	NWSY-90-7-SC-PER-178	1/45	0.0055 - 0.013	7.3E-03	NA	6.9E+01 N	1.2E+00	SSL	NO	BSL
	56-55-3	Benzo(a)anthracene	1.8E-02 J	1.8E-02 J	MG/KG	NWSY-90-7-SC-FLR-144	1/45	0.057 - 0.076	1.8E-02	NA	1.5E-01 C	1.0E-02	SSL	NO	BSL
	205-99-2	Benzo(b)fluoranthene	1.7E-02 J	1.7E-02 J	MG/KG	NWSY-90-7-SC-FLR-144	1/45	0.057 - 0.076	1.7E-02	NA	1.5E-01 C	3.5E-02	SSL	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	2.6E-01 J	2.6E-01 J	MG/KG	NWSY-90-7-SC-FLR-146	1/45	0.36 - 0.48	2.6E-01	NA	3.5E+01 C*	1.1E+00	SSL	NO	BSL
	218-01-9	Chrysene	2.3E-02 J	2.3E-02 J	MG/KG	NWSY-90-7-SC-FLR-144	1/45	0.057 - 0.076	2.3E-02	NA	1.5E+01 C	1.1E+00	SSL	NO	BSL
	72-20-8	Endrin	2.4E-03 J	2.4E-03 J	MG/KG	NWSY-90-7-SC-PER-132	1/45	0.0036 - 0.0047	2.4E-03	NA	1.8E+00 N	4.4E-01	SSL	NO	BSL
	1746-01-6	2,3,7,8-TCDD TEQ (dioxin)	1.0E-07 J	2.7E-07 J	MG/KG	NWSY-90-7-SC-FLR-139	7/45	0.0000000702 - 0.00000113	2.7E-07	NA	4.5E-06 C*	2.6E-07	SSL	NO	BSL
	7429-90-5	**Aluminum**	**3.5E+03**	**2.0E+04**	**MG/KG**	**NWSY-90-7-SC-FLR-137**	**45/45**	**11 - 48**	**2.0E+04**	**1.2E+04**	**7.7E+03 N**	**5.5E+04**	**SSL**	**YES**	**ASL**
	7440-36-0	Antimony	2.3E-01 L	4.9E-01 L	MG/KG	NWSY-90-7-SC-FLR-189	3/45	3.2 - 14	4.9E-01	1.1E+01	3.1E+00 N	6.6E-01	SSL	NO	BSL
	7440-38-2	**Arsenic**	**1.1E+00**	**2.4E+01**	**MG/KG**	**NWSY-90-7-SC-PER-148**	**45/45**	**0.42 - 1.9**	**2.4E+01**	**6.4E+00**	**3.9E-01 C***	**1.3E-03**	**SSL**	**YES**	**ASL**
	7440-39-3	Barium	1.8E+01 J	2.5E+02 J	MG/KG	NWSY-90-7-SC-PER-148	45/45	11 - 48	2.5E+02	5.3E+01	1.5E+03 N	3.0E+02	SSL	NO	BSL
	7440-41-7	Beryllium	2.8E-01 J	1.6E+00	MG/KG	NWSY-90-7-SC-PER-154	45/45	0.26 - 1.2	1.6E+00	5.9E-01	1.6E+01 N	5.8E+01	SSL	NO	BSL
	7440-43-9	Cadmium	1.2E-01 J	1.2E-01 J	MG/KG	NWSY-90-7-SC-PER-148	1/45	0.21 - 2.6	1.2E-01	1.5E+00	7.0E+00 N	1.4E+00	SSL	NO	BSL
	7440-70-2	Calcium	4.1E+02	2.5E+04 J	MG/KG	NWSY-90-7-SC-PER-148	45/45	260 - 1200	2.5E+04	2.3E+03	NA	NA	NA	NO	NUT
	7440-47-3	**Chromium**	**4.8E+00 J**	**4.1E+01 J**	**MG/KG**	**NWSY-90-7-SC-FLR-137**	**45/45**	**0.53 - 2.4**	**4.1E+01**	**1.8E+01**	**2.9E-01 C**	**8.3E-04**	**SSL**	**YES**	**ASL**
	7440-48-4	Cobalt	1.1E+00 J	5.8E+00 J	MG/KG	NWSY-90-7-SC-PER-193	45/45	2.6 - 12	5.8E+00	9.9E+00	2.3E+00 N	4.9E-01	SSL	NO	BBK
	7440-50-8	Copper	1.3E+00 J	4.3E+01	MG/KG	NWSY-90-7-SC-PER-148	45/45	1.3 - 6	4.3E+01	4.3E+00	3.1E+02 N	5.1E+01	SSL	NO	BSL
	57-12-5	Cyanide	1.3E-01	3.3E-01	MG/KG	NWSY-90-7-SC-PER-148	4/45	0.12 - 0.17	3.3E-01	NA	1.6E+02 N	7.4E+00	SSL	NO	BSL
	7439-89-6	**Iron**	**3.6E+03**	**6.4E+04**	**MG/KG**	**NWSY-90-7-SC-FLR-137**	**45/45**	**5.3 - 130**	**6.4E+04**	**2.0E+04**	**5.5E+03 N**	**6.4E+02**	**SSL**	**YES**	**ASL**
	7439-92-1	Lead	1.1E+00 J	2.0E+02 J	MG/KG	NWSY-90-7-SC-FLR-144	43/45	5.3 - 30	2.0E+02	1.7E+01	4.0E+02	NA	NA	NO	BSL
	7439-95-4	Magnesium	1.7E+02 J	1.4E+03	MG/KG	NWSY-90-7-SC-FLR-137	45/45	260 - 1200	1.4E+03	1.1E+03	NA	NA	NA	NO	NUT
	7439-96-5	**Manganese**	**9.1E+00 J**	**4.7E+02 J**	**MG/KG**	**NWSY-90-7-SC-PER-148**	**45/45**	**0.79 - 4.5**	**4.7E+02**	**3.2E+02**	**1.8E+02 N**	**5.7E+01**	**SSL**	**YES**	**ASL**
	7439-97-6	Mercury	1.3E-02 K	1.8E-01 K	MG/KG	NWSY-90-7-SC-FLR-137	41/45	0.082 - 0.43	1.8E-01	1.1E-01	2.3E+00 N	3.3E-02	SSL	NO	BSL
	7440-02-0	Nickel	2.2E+00 J	7.0E+00 J	MG/KG	NWSY-90-7-SC-PER-193	45/45	2.1 - 9.6	7.0E+00	9.5E+00	1.5E+02 N	4.8E+01	SSL	NO	BSL
	7782-49-2	Selenium	2.6E-01 J	3.5E+00 J	MG/KG	NWSY-90-7-SC-FLR-137	36/45	5.3 - 24	3.5E+00	5.1E-01	3.9E+01 N	9.5E-01	SSL	NO	BSL
	7440-28-0	**Thallium**	**3.7E-01 J**	**2.4E+00**	**MG/KG**	**NWSY-90-7-SC-FLR-137**	**12/45**	**0.53 - 2.7**	**2.4E+00**	**NA**	**7.8E-02 N**	**2.6E-02**	**SSL**	**YES**	**ASL**
	7440-62-2	**Vanadium**	**7.2E+00 J**	**6.3E+01 J**	**MG/KG**	**NWSY-90-7-SC-FLR-173**	**45/45**	**2.6 - 12**	**6.3E+01**	**2.8E+01**	**3.9E+01 N**	**1.8E+02**	**SSL**	**YES**	**ASL**
	7440-66-6	Zinc	8.2E+00 J	1.2E+02	MG/KG	NWSY-90-7-SC-PER-148	45/45	1.1 - 4.8	1.2E+02	2.7E+01	2.3E+03 N	6.8E+02	SSL	NO	BSL

* Surface soil & subsurface soil combined

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values from Cheatham Annex surface soil; values represent the 95% UTL.

[4] Oak Ridge National Laboratory (ORNL). June 2011. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites.
http://epa-prgs.ornl.gov/chemicals/index.shtml. Adjusted (noncarcinogenic RSLs adjusted by dividing by 10) residential soil RSLs.
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
RSL value for Chromium(VI) used as surrogate for chromium.
RSL value for manganese (non-diet) used as surrogate for manganese.
RSL value for mercuric chloride used as surrogate for mercury.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)
Below Background (BBK)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
C* = where: N RSL < 100X C RSL
MG/KG = micrograms per kilogram
N = Noncarcinogenic
SSL = Protection of Groundwater Soil Screening Levels
TEQ = Toxicity equivalent

TABLE 2.1a

Step 2 Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site 7 - Surface and Subsurface Soil

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (mg/kg)								
Aluminum	45 / 45	2.0E+04	NWSY-90-7-SC-FLR-137	7.7E+04	1	0.3	NA	Developmental, Neurological
Arsenic	45 / 45	2.4E+01	NWSY-90-7-SC-PER-148	3.9E-01	1E-06	NA	6E-05	NA
Chromium	45 / 45	4.1E+01 J	NWSY-90-7-SC-FLR-137	2.9E-01	1E-06	NA	1E-04	NA
Iron	45 / 45	6.4E+04	NWSY-90-7-SC-FLR-137	5.5E+04	1	1.2	NA	Gastrointestinal
Manganese	45 / 45	4.7E+02 J	NWSY-90-7-SC-PER-148	1.8E+03	1	0.3	NA	CNS
Thallium	12 / 45	2.4E+00	NWSY-90-7-SC-FLR-137	7.8E-01	1	3.1	NA	Hair
Vanadium	45 / 45	6.3E+01 J	NWSY-90-7-SC-FLR-173	3.9E+02	1	0.2	NA	Hair
Cumulative Corresponding Hazard Index[c]						**4.9**		
Cumulative Corresponding Cancer Risk[d]							**2E-04**	

Total Developmental HI =	0.3
Total CNS/Neurological HI =	0.5
Total Gastrointestinal HI =	1.2
Total Hair HI =	3.2

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central nervous System

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

mg/kg = milligrams per kilogram

NA = Not available/not applicable

TABLE 2.1b

Step 3 Soil Screening - Risk Ratio, 95% UCL

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site 7 - Surface and Subsurface Soil

Analyte	Detection Frequency	95% UCL		95% UCL Rationale	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (mg/kg)									
Arsenic	45 / 45	4.6E+00	95% Cheb-m	4	3.9E-01	1E-06	NA	1E-05	NA
Chromium	45 / 45	1.6E+01	95% Cheb-m	4	2.9E-01	1E-06	NA	6E-05	NA
Iron	45 / 45	1.8E+04	95% Cheb-m	4	5.5E+04	1	0.3	NA	Gastrointestinal
Thallum	12 / 45	7.8E-01	95% KM-Boot	1, 2, 3	7.8E-01	1E+00	1.0	NA	Hair
Vanadium	45 / 45	2.4E+01	95% Cheb-m	4	3.9E+02	1E+00	0.1	NA	Hair
Cumulative Corresponding Hazard Index[c]							**1.4**		
Cumulative Corresponding Cancer Risk[d]								**7E-05**	
								Total Gastrointestinal HI =	0.3
								Total Hair HI =	1.0

[a] Corresponding Hazard Index equals 95% UCL divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals 95% UCL divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[u] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05,

Constituents selected as COPCs are indicated by shading.

mg/kg = milligrams per kilogram

HI = Hazard Index

ProUCL, Version 4.1 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA. March 2011. Prepared by Lockheed Martin Environmental Services).

Options: 95% Chebyshev (mean, std) UCL (95% Cheb-m); 95% Percentile Bootstrap (95% Boot)

UCL Rationale:

(1) Shapiro-Wilk W Test/Lilliefors test indicates data are log-normally distributed.

(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.

(3) Test indicates data are gamma distributed.

(4) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 7

Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Emissions from Soil*

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier		Maximum [1] Concentration Qualifier		Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Soil*	75-09-2	Methylene chloride	1.7E-02		1.7E-02		µg/m^3	NWSY-90-7-SC-PER-186	1/45	NA	1.7E-02	NA	5.2E+00	C	NA	NA	NO	BSL
	95-47-6	o-Xylene	1.0E-03	J	1.0E-03	J	µg/m^3	NWSY-90-7-SC-PER-178	1/45	NA	1.0E-03	NA	1.0E+01	N	NA	NA	NO	BSL
	56-55-3	Benzo(a)anthracene	1.4E-08	J	1.4E-08	J	µg/m^3	NWSY-90-7-SC-FLR-144	1/45	NA	1.4E-08	NA	8.7E-03	C	NA	NA	NO	BSL
	205-99-2	Benzo(b)fluoranthene	1.2E-08	J	1.2E-08	J	µg/m^3	NWSY-90-7-SC-FLR-144	1/45	NA	1.2E-08	NA	8.7E-03	C	NA	NA	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	1.9E-07	J	1.9E-07	J	µg/m^3	NWSY-90-7-SC-FLR-146	1/45	NA	1.9E-07	NA	1.0E+00	C	NA	NA	NO	BSL
	218-01-9	Chrysene	1.7E-08	J	1.7E-08	J	µg/m^3	NWSY-90-7-SC-FLR-144	1/45	NA	1.7E-08	NA	8.7E-02	C	NA	NA	NO	BSL
	72-20-8	Endrin	1.8E-09	J	1.8E-09	J	µg/m^3	NWSY-90-7-SC-PER-132	1/45	NA	1.8E-09	NA	NA		NA	NA	NO	NTX
	1746-01-6	2,3,7,8-TCDD TEQ (dioxin)	7.5E-14	J	2.0E-13	J	µg/m^3	NWSY-90-7-SC-FLR-139	7/45	NA	2.0E-13	NA	6.4E-08	C	NA	NA	NO	BSL
	7429-90-5	Aluminum	2.6E-03		1.5E-02		µg/m^3	NWSY-90-7-SC-FLR-137	45/45	NA	1.5E-02	NA	5.2E-01	N	NA	NA	NO	BSL
	7440-36-0	Antimony	1.7E-07	L	3.6E-07	L	µg/m^3	NWSY-90-7-SC-FLR-189	3/45	NA	3.6E-07	NA	NA		NA	NA	NO	NTX
	7440-38-2	Arsenic	8.1E-07		1.8E-05		µg/m^3	NWSY-90-7-SC-PER-148	45/45	NA	1.8E-05	NA	5.7E-04	C*	NA	NA	NO	BSL
	7440-39-3	Barium	1.3E-05	J	1.8E-04	J	µg/m^3	NWSY-90-7-SC-PER-148	45/45	NA	1.8E-04	NA	5.2E-02	N	NA	NA	NO	BSL
	7440-41-7	Beryllium	2.1E-07	J	1.2E-06		µg/m^3	NWSY-90-7-SC-PER-154	45/45	NA	1.2E-06	NA	1.0E-03	C*	NA	NA	NO	BSL
	7440-43-9	Cadmium	8.8E-08	J	8.8E-08	J	µg/m^3	NWSY-90-7-SC-PER-148	1/45	NA	8.8E-08	NA	1.0E-03	C**	NA	NA	NO	BSL
	7440-70-2	Calcium	3.0E-04		1.8E-02	J	µg/m^3	NWSY-90-7-SC-PER-148	45/45	NA	1.8E-02	NA	NA		NA	NA	NO	NUT
	7440-47-3	**Chromium**	**3.5E-06**	**J**	**3.0E-05**	**J**	**µg/m^3**	**NWSY-90-7-SC-FLR-137**	**45/45**	**NA**	**3.0E-05**	**NA**	**1.1E-05**	**C**	**NA**	**NA**	**YES**	**ASL**
	7440-48-4	Cobalt	8.1E-07	J	4.3E-06	J	µg/m^3	NWSY-90-7-SC-PER-193	45/45	NA	4.3E-06	NA	2.7E-04	C*	NA	NA	NO	BSL
	7440-50-8	Copper	9.6E-07	J	3.1E-05		µg/m^3	NWSY-90-7-SC-PER-148	45/45	NA	3.1E-05	NA	NA		NA	NA	NO	NTX
	57-12-5	Cyanide	9.6E-08		2.4E-07		µg/m^3	NWSY-90-7-SC-PER-148	4/45	NA	2.4E-07	NA	NA		NA	NA	NO	NTX
	7439-89-6	Iron	2.7E-03		4.7E-02		µg/m^3	NWSY-90-7-SC-FLR-137	45/45	NA	4.7E-02	NA	NA		NA	NA	NO	NTX
	7439-92-1	Lead	8.1E-07	J	1.5E-04	J	µg/m^3	NWSY-90-7-SC-FLR-144	43/45	NA	1.5E-04	NA	NA		NA	NA	NO	NTX
	7439-95-4	Magnesium	1.3E-04	J	1.0E-03		µg/m^3	NWSY-90-7-SC-FLR-137	45/45	NA	1.0E-03	NA	NA		NA	NA	NO	NUT
	7439-96-5	Manganese	6.7E-06	J	3.4E-04	J	µg/m^3	NWSY-90-7-SC-PER-148	45/45	NA	3.4E-04	NA	5.2E-03	N	NA	NA	NO	BSL
	7439-97-6	Mercury	9.6E-09	K	1.3E-07	K	µg/m^3	NWSY-90-7-SC-FLR-137	41/45	NA	1.3E-07	NA	3.1E-02	N	NA	NA	NO	BSL
	7440-02-0	Nickel	1.6E-06	J	5.1E-06	J	µg/m^3	NWSY-90-7-SC-PER-193	45/45	NA	5.1E-06	NA	9.4E-03	C*	NA	NA	NO	BSL
	7782-49-2	Selenium	1.9E-07	J	2.6E-06	J	µg/m^3	NWSY-90-7-SC-FLR-137	36/45	NA	2.6E-06	NA	2.1E+00	N	NA	NA	NO	BSL
	7440-28-0	Thallium	2.7E-07	J	1.8E-06		µg/m^3	NWSY-90-7-SC-FLR-137	12/45	NA	1.8E-06	NA	NA		NA	NA	NO	NTX
	7440-62-2	Vanadium	5.3E-06	J	4.6E-05	J	µg/m^3	NWSY-90-7-SC-FLR-173	45/45	NA	4.6E-05	NA	NA	N	NA	NA	NO	NTX
	7440-66-6	Zinc	6.0E-06	J	8.8E-05		µg/m^3	NWSY-90-7-SC-PER-148	45/45	NA	8.8E-05	NA	NA		NA	NA	NO	NTX

[1] Minimum/Maximum calculated air concentrations from soil concentrations. Air concentrations calculated as $C_{air} = C_{soil}*1000*(1/PEF+1/VF)$
VF calculated for volatile and semi-volatile analytes identified as volatile in the Regional Screening Levels for Chemical Contaminants at Superfund Sites (Oak Ridge National Laboratory, Nov. 2010). VF calculated on Table F-2.2A. PEF = 1.36×10^9 m^3/kg.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Oak Ridge National Laboratory (ORNL). June 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites. [Online]. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

C = Carcinogenic
C* = where: N RSL < 100X C RSL
C** - where N RSL < 10x C RSL
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
N = Tentative identification; considered present
NA = Not available
NC = Noncarcinogenic
ND = Not detected
TEQ = Toxicity equivalent
µg/m3 = micrograms per cubic meter

Table 2.2.A
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Calculation of Generic Chemical Specific VF Factors
Site 7
Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia

Chemical	Diffusivity in Air (D_i) (cm^2/s)	Henry's Law Constant (H') (unitless)	Diffusivity in Water (D_w) (cm^2/s)	Soil Organic Carbon Partition Coeff. (K_{oc}) (cm^3/g)	Soil Water Partition Coeff. ($K_d = K_{oc} \times F_{oc}$) ($g/cm^3$)	Apparent Diffusivity (D_A) (cm^2/s)	Volatilization Factor (VF) (m^3/kg)
Methylene chloride	9.99E-02	1.33E-01	1.25E-05	2.17E+01	1.30E-01	2.77E-03	2.48E+03
o-Xylene	6.89E-02	2.12E-01	8.53E-06	3.83E+02	2.30E+00	3.19E-04	7.30E+03

Volatilization factor (VF) = (m^3/kg)

$$\frac{Q/C * (3.14 * D_A * T)^{1/2} * 10^{-4}\ m^2/cm^2}{2 * \rho_b * D_A}$$

Apparent Diffusivity (D_A) = (cm^2/s)

$$\frac{[(\Theta_a^{10/3} * D_i * H' + \Theta_w^{10/3} * D_w)/n^2]}{(\rho_b * K_d + \Theta_w + \Theta_a * H')}$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a 0.5-acre-square source (g/m^2-s per kg/m^3)	71.59
T - Exposure interval(s)	9.5E+08
ρ_b - Soil bulk density (g/cm^3)	1.5
Θ_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Θ_w	0.28
n - Total soil porosity (L_{pore}/L_{soil}) = 1 - (ρ_b/ρ_s)	0.43
Θ_w - Water-filled soil porosity (L_{water}/L_{soil})	0.15
ρ_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Equations and chemical properties from Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites. [Online]. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml

TABLE 2.2a

Step 2 Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site 7 - Emissions from Surface and Subsurface Soil

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (µg/m^3)								
Chromium	45 / 45	3.0E-05 J	NWSY-90-7-SC-FLR-137	1.1E-05	1E-06	NA	3E-06	NA
Cumulative Corresponding Hazard Index[c]						NA		
Cumulative Corresponding Cancer Risk[d]							**3E-06**	

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

µg/m^3 = micrograms per cubic meter

NA = Not available/not applicable

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 7

Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier		Maximum [1] Concentration Qualifier		Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Groundwater	67-64-1	Acetone	4.7E+00	J	4.7E+00	J	UG/L	CAS07-MW04-0111	1/5	10 - 10	4.7E+00	N/A	2.2E+03	N	N/A		NO	BSL
	75-27-4	**Bromodichloromethane**	**5.3E-01**	**J**	**5.3E-01**	**J**	**UG/L**	**CAS07-MW06P-0111**	**1/5**	**1 - 1**	**5.3E-01**	**N/A**	**1.2E-01**	**C**	**8.0E+01**	**MCL**	**YES**	**ASL**
	67-66-3	**Chloroform**	**6.1E-01**	**J**	**7.6E-01**	**J**	**UG/L**	**CAS07-MW06-0111**	**2/5**	**1 - 1**	**7.6E-01**	**N/A**	**1.9E-01**	**C**	**8.0E+01**	**MCL**	**YES**	**ASL**
	156-59-2	cis-1,2-Dichloroethene	2.3E+00	J	7.3E+00		UG/L	CAS07-MW07-0111	2/5	1 - 1	7.3E+00	N/A	7.3E+00	N	7.0E+01	MCL	NO	BSL
	124-48-1	**Dibromochloromethane**	**3.5E-01**	**J**	**6.1E-01**	**J**	**UG/L**	**CAS07-MW06-0111**	**2/5**	**1 - 1**	**6.1E-01**	**N/A**	**1.5E-01**	**C**	**8.0E+01**	**MCL**	**YES**	**ASL**
	127-18-4	**Tetrachloroethene**	**4.7E-01**	**J**	**4.7E-01**	**J**	**UG/L**	**CAS07-MW07-0111**	**1/5**	**1 - 1**	**4.7E-01**	**N/A**	**1.1E-01**	**C**	**5.0E+00**	**MCL**	**YES**	**ASL**
	108-88-3	Toluene	2.8E-01	J	2.8E-01	J	UG/L	CAS07-MW04-0111	1/5	1 - 1	2.8E-01	N/A	2.3E+02	N	1.0E+03	MCL	NO	BSL
	156-60-5	trans-1,2-Dichloroethene	4.4E-01	J	4.4E-01	J	UG/L	CAS07-MW03-0111	1/5	1 - 1	4.4E-01	N/A	1.1E+01	N	1.0E+02	MCL	NO	BSL
	79-01-6	**Trichloroethene**	**5.2E-01**	**J**	**8.6E+01**		**UG/L**	**CAS07-MW07-0111**	**3/5**	**1 - 1**	**8.6E+01**	**N/A**	**2.0E+00**	**C**	**5.0E+00**	**MCL**	**YES**	**ASL**
	75-01-4	**Vinyl chloride**	**3.3E-01**	**J**	**3.3E-01**	**J**	**UG/L**	**CAS07-MW07-0111**	**1/5**	**1 - 1**	**3.3E-01**	**N/A**	**1.6E-02**	**C**	**2.0E+00**	**MCL**	**YES**	**ASL**
	121-14-2	**2,4-Dinitrotoluene**	**9.9E-02**	**J**	**1.1E+00**		**UG/L**	**CAS07-MW04-0111**	**4/5**	**0.302 - 0.323**	**1.1E+00**	**N/A**	**2.2E-01**	**C**	**N/A**		**YES**	**ASL**
	606-20-2	2,6-Dinitrotoluene	3.9E-01		3.9E-01		UG/L	CAS07-MW04-0111	1/5	0.302 - 0.323	3.9E-01	N/A	3.7E+00	N	N/A		NO	BSL
	72-54-8	4,4'-DDD	9.9E-03	J	4.0E-02	J	UG/L	CAS07-MW04-0111	2/5	0.0185 - 0.0204	4.0E-02	N/A	2.8E-01	C	N/A		NO	BSL
	319-84-6	alpha-BHC	5.3E-03	J	5.3E-03	J	UG/L	CAS07-MW04-0111	1/5	0.0185 - 0.0204	5.3E-03	N/A	1.1E-02	C	N/A		NO	BSL
	319-86-8	delta-BHC	5.6E-03	J	5.6E-03	J	UG/L	CAS07-MW03-0111	1/5	0.0185 - 0.0204	5.6E-03	N/A	3.7E-02	C	N/A		NO	BSL
	33213-65-9	Endosulfan II	5.8E-03	J	7.1E-03	J	UG/L	CAS07-MW07-0111	2/5	0.0185 - 0.0204	7.1E-03	N/A	2.2E+01	N	N/A		NO	BSL
	5103-74-2	gamma-Chlordane	6.5E-03	J	2.5E-02	J	UG/L	CAS07-MW04-0111	2/5	0.0185 - 0.0204	2.5E-02	N/A	1.9E-01	C*	N/A		NO	BSL
	1746-01-6	2,3,7,8-TCDD TEQ (dioxin)	9.3E-10	J	1.4E-07		UG/L	CAS07-MW03-0111	4/5	N/A	1.4E-07	N/A	5.2E-07	C*	3.0E-05	MCL	NO	BSL
	99-35-4	1,3,5-Trinitrobenzene	1.3E-01	J	1.3E-01	J	UG/L	CAS07-MW04-0111	1/5	0.302 - 0.323	1.3E-01	N/A	1.1E+02	N	N/A		NO	BSL
	118-96-7	2,4,6-Trinitrotoluene	2.1E-01	J	2.1E-01	J	UG/L	CAS07-MW06P-0111	1/5	0.302 - 0.323	2.1E-01	N/A	1.8E+00	C**	N/A		NO	BSL
	35572-78-2	2-Amino-4,6-dinitrotoluene	1.2E-01	J	1.2E-01	J	UG/L	CAS07-MW06P-0111	1/5	0.302 - 0.323	1.2E-01	N/A	7.3E+00	N	N/A		NO	BSL
	99-08-1	3-Nitrotoluene	1.4E-01	J	1.4E-01	J	UG/L	CAS07-MW07-0111	2/5	0.302 - 0.323	1.4E-01	N/A	3.7E-01	N	N/A		NO	BSL
	19406-51-0	4-Amino-2,6-dinitrotoluene	2.0E-01	J	2.0E-01	J	UG/L	CAS07-MW06P-0111	1/5	0.302 - 0.323	2.0E-01	N/A	7.3E+00	N	N/A		NO	BSL
	2691-41-0	HMX	1.1E-01	J	5.3E-01	J	UG/L	CAS07-MW04-0111	3/5	0.302 - 0.323	5.3E-01	N/A	1.8E+02	N	N/A		NO	BSL
	55-63-0	Nitroglycerin	2.3E-01	J	2.3E-01	J	UG/L	CAS07-MW04-0111	1/5	0.755 - 0.808	2.3E-01	N/A	3.7E-01	N	N/A		NO	BSL
	78-11-5	PETN	2.5E-01	J	4.6E-01	J	UG/L	CAS07-MW04-0111	3/5	0.755 - 0.808	4.6E-01	N/A	N/A		N/A		NO	NTX
	121-82-4	**RDX**	**1.3E-01**	**J**	**6.5E-01**	**J**	**UG/L**	**CAS07-MW04-0111**	**4/5**	**0.302 - 0.323**	**6.5E-01**	**N/A**	**6.1E-01**	**C**	**N/A**		**YES**	**ASL**
	7429-90-5	Aluminum	6.0E+01		3.0E+02		UG/L	CAS07-MW07-0111	3/5	50 - 250	3.0E+02	2.2E+03	3.7E+03	N	50 - 200	SMCL	NO	BSL
	7440-38-2	**Arsenic**	**3.2E+00**		**4.3E+00**		**UG/L**	**CAS07-MW07-0111**	**2/5**	**2.5 - 2.5**	**4.3E+00**	**2.3E+00**	**4.5E-02**	**C**	**1.0E+01**	**MCL**	**YES**	**ASL**
	7440-39-3	Barium	2.2E+01		4.2E+01		UG/L	CAS07-MW05-0111	5/5	10 - 10	4.2E+01	1.2E+02	7.3E+02	N	2.0E+03	MCL	NO	BSL
	7440-43-9	Cadmium	7.2E-01	J	1.2E+00	J	UG/L	CAS07-MW06P-0111	5/5	1.25 - 1.25	1.2E+00	6.1E-01	1.8E+00	N	N/A		NO	BSL

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 7

Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	7440-70-2	Calcium	8.5E+04	1.4E+05	UG/L	CAS07-MW05-0111	5/5	1250 - 6250	1.4E+05	1.6E+05	N/A	N/A		NO	NUT
	7440-47-3	Chromium	1.7E+00 J	2.5E+00 J	UG/L	CAS07-MW05-0111	3/5	2.5 - 2.5	2.5E+00	1.5E+01	4.3E-02 C	1.0E+02	MCL	NO	BBK
	7440-48-4	Cobalt	1.4E+00 J	4.3E+00	UG/L	CAS07-MW03-0111	4/5	3.12 - 3.12	4.3E+00	2.1E+01	1.1E+00 N	N/A		NO	BBK
	7440-50-8	Copper	1.1E+00 J	2.0E+00 J	UG/L	CAS07-MW06-0111	2/5	2.5 - 2.5	2.0E+00	1.2E+01	1.5E+02 N	1.3E+03	MCL	NO	BSL
	7439-89-6	Iron	1.0E+02	6.0E+02	UG/L	CAS07-MW07-0111	3/5	25 - 25	6.0E+02	3.6E+03	2.6E+03 N	N/A		NO	BSL
	7439-95-4	Magnesium	2.1E+03	6.5E+03	UG/L	CAS07-MW05-0111	5/5	1250 - 1250	6.5E+03	3.6E+03	N/A	N/A		NO	NUT
	7439-96-5	**Manganese**	**1.9E+01**	**2.2E+02**	**UG/L**	**CAS07-MW04-0111**	**5/5**	**3.75 - 3.75**	**2.2E+02**	**5.8E+01**	**8.8E+01 N**	**N/A**		**YES**	**ASL**
	7440-02-0	Nickel	2.6E+00	3.9E+00	UG/L	CAS07-MW03-0111	5/5	2.5 - 2.5	3.9E+00	1.1E+01	7.3E+01 N	N/A		NO	BSL
	7440-09-7	Potassium	1.1E+03 J	2.3E+03	UG/L	CAS07-MW05-0111	5/5	1250 - 1250	2.3E+03	3.5E+03	N/A	N/A		NO	NUT
	7782-49-2	Selenium	8.8E-01 J	2.4E+00 J	UG/L	CAS07-MW05-0111	2/5	2.5 - 2.5	2.4E+00	N/A	1.8E+01 N	5.0E+01	MCL	NO	BSL
	7440-23-5	Sodium	7.3E+03	2.1E+04	UG/L	CAS07-MW05-0111	5/5	1250 - 1250	2.1E+04	9.9E+03	N/A	N/A		NO	NUT
	7440-62-2	Vanadium	1.5E+00 J	1.5E+00 J	UG/L	CAS07-MW07-0111	1/5	3.12 - 3.12	1.5E+00	2.6E+01	1.8E+01 N	N/A		NO	BSL
	7440-66-6	Zinc	2.1E+00 J	9.9E+00	UG/L	CAS07-MW03-0111	4/5	5 - 25	9.9E+00	4.5E+00	1.1E+03 N	5.0E+03	SMCL	NO	BSL
	7429-90-5	Aluminum, Dissolved	1.5E+01 J	1.7E+01 J	UG/L	CAS07-MW04-0111	2/5	50 - 250	1.7E+01	1.0E+02	3.7E+03 N	50 - 200	SMCL	NO	BSL
	7440-38-2	**Arsenic, Dissolved**	**2.6E+00**	**3.6E+00**	**UG/L**	**CAS07-MW07-0111**	**2/5**	**2.5 - 2.5**	**3.6E+00**	**1.4E+00**	**4.5E-02 C**	**1.0E+01**	**MCL**	**YES**	**ASL**
	7440-39-3	Barium, Dissolved	2.1E+01	4.1E+01	UG/L	CAS07-MW05-0111	5/5	10 - 10	4.1E+01	1.3E+02	7.3E+02 N	2.0E+03	MCL	NO	BSL
	7440-43-9	Cadmium, Dissolved	6.5E-01 J	1.1E+00 J	UG/L	CAS07-MW03-0111 : CAS07-MW06-0111 : CAS07-MW06P-0111	5/5	1.25 - 1.25	1.1E+00	1.8E-01	1.8E+00 N	N/A		NO	BSL
	7440-70-2	Calcium, Dissolved	8.6E+04	1.4E+05	UG/L	CAS07-MW05-0111	5/5	1250 - 6250	1.4E+05	1.5E+05	N/A	N/A		NO	NUT
	7440-47-3	Chromium, Dissolved	8.2E-01 J	2.5E+00	UG/L	CAS07-MW05-0111	2/5	2.5 - 2.5	2.5E+00	6.0E+00	4.3E-02 C	1.0E+02	MCL	NO	BBK
	7440-48-4	**Cobalt, Dissolved**	**1.8E+00 J**	**4.6E+00**	**UG/L**	**CAS07-MW03-0111**	**3/5**	**3.12 - 3.12**	**4.6E+00**	**7.0E-01**	**1.1E+00 N**	**N/A**		**YES**	**ASL**
	7439-89-6	Iron, Dissolved	8.2E+00 J	3.4E+02	UG/L	CAS07-MW03-0111	2/5	25 - 25	3.4E+02	6.3E+02	2.6E+03 N	N/A		NO	BSL
	7439-95-4	Magnesium, Dissolved	2.0E+03	6.5E+03	UG/L	CAS07-MW05-0111	5/5	1250 - 1250	6.5E+03	3.9E+03	N/A	N/A		NO	NUT
	7439-96-5	**Manganese, Dissolved**	**1.8E+01**	**2.1E+02**	**UG/L**	**CAS07-MW04-0111**	**5/5**	**3.75 - 3.75**	**2.1E+02**	**5.0E+01**	**8.8E+01 N**	**N/A**		**YES**	**ASL**
	7440-02-0	Nickel, Dissolved	1.8E+00 J	4.6E+00	UG/L	CAS07-MW03-0111	5/5	2.5 - 2.5	4.6E+00	1.2E+01	7.3E+01 N	N/A		NO	BSL
	7440-09-7	Potassium, Dissolved	1.2E+03 J	2.2E+03	UG/L	CAS07-MW05-0111	5/5	1250 - 1250	2.2E+03	1.7E+03	N/A	N/A		NO	NUT
	7782-49-2	Selenium, Dissolved	2.3E+00 J	2.3E+00 J	UG/L	CAS07-MW05-0111	1/5	2.5 - 2.5	2.3E+00	9.1E+00	1.8E+01 N	5.0E+01	MCL	NO	BSL
	7440-23-5	Sodium, Dissolved	7.4E+03	2.1E+04	UG/L	CAS07-MW05-0111	5/5	1250 - 1250	2.1E+04	1.0E+04	N/A	N/A		NO	NUT
	7440-66-6	Zinc, Dissolved	1.8E+00 J	1.2E+01	UG/L	CAS07-MW03-0111	2/5	5 - 25	1.2E+01	N/A	1.1E+03 N	5.0E+03	SMCL	NO	BSL

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 7

Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values from CAX/Yorktown groundwater background sample group (CC and CC-YE); values represent the 95% UTL.

[4] Oak Ridge National Laboratory (ORNL). June 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites. [Online].
Available: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm

RSL value for technical-HCH used as surrogate for delta-BHC.

RSL value for technical chlordane used as surrogate for gamma-chlordane.

RSL value for 2,3,7,8-TCDD (dioxin) was adjusted using the TEF for the individual congeners. Van den Berg, M., et al. 2006. 'Toxic Equivalency Factors (TEFs) for PCBs, PCDDs, PCDFs, for Humans and Wildlife.' Environmental Health Perspectives. 106:775-92

RSL value for Chromium(VI) used as surrogate for chromium.

RSL value for Manganese (water) used as surrogate for manganese.

RSL value for endosulfan used as surrogate for endosulfan II.

Rationale Codes

[5]

Selection Reason:	Above Screening Levels (ASL)
Deletion Reason:	No Toxicity Information (NTX)
	Essential Nutrient (NUT)
	Below Screening Level (BSL)
	Below Background (BBK)

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered

J = Estimated Value

K = Biased High

L = Biased Low

C = Carcinogenic

C* = where: N RSL < 100X C RSL

C** - where N RSL < 10x C RSL

N = Noncarcinogenic

MCL = Maximum Contaminant Level from EPA's National Primary Drinking Water Standards

SMCL = Secondary Maximum Contaminant Level

UG/L = microgram per liter

TEQ = Toxicity equivalent

Table 2.3 Supplement A

Calculation of 2,3,7,8-TCDD Equivalent Concentrations - Groundwater

Site 7

MCB Camp Lejeune, North Carolina

StationID		**CAS07-MW03**			**CAS07-MW04**			**CAS07-MW05**			**CAS07-MW06**			**CAS07-MW07**		
SampleID		**CAS07-MW03-0111**			**CAS07-MW04-0111**			**CAS07-MW05-0111**			**CAS07-MW06-0111**			**CAS07-MW07-0111**		
SampleDate		**1/25/2011**			**1/25/2011**			**1/25/2011**			**1/25/2011**			**1/25/2011**		
Analyte	**TEF[1]**	**Conc. (ng/L)**	**Data Qualifier**	**Equivalent Conc.**	**Conc. (ng/L)**	**Data Qualifier**	**Equivalent Conc.**	**Conc. (ng/L)**	**Data Qualifier**	**Equivalent Conc.**	**Conc. (ng/L)**	**Data Qualifier**	**Equivalent Conc.**	**Conc. (ng/L)**	**Data Qualifier**	**Equivalent Conc.**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.01	8.4E-04	U		1.4E-03	J	1.4E-05	6.9E-04	U	6.9E-06	8.8E-04	U		8.3E-04	U	
1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.01	6.0E-04	J	6.0E-06	3.3E-04	U		3.9E-04	U	3.9E-06	4.6E-04	U		4.6E-04	U	
2,3,4,7,8-Pentachlorodibenzofuran	0.3	4.3E-04	J	1.3E-04	3.1E-04	U		4.0E-04	U	1.2E-04	6.4E-04	U		5.0E-04	U	
Octachlorodibenzo-p-dioxin	0.0003	8.2E-03	J	2.5E-06	6.1E-02	J	1.8E-05	7.9E-04	U	2.4E-07	3.1E-03	J	9.3E-07	1.0E-02	J	3.0E-06
Total 2,3,7,8-TCDD equivalents				1.4E-04			3.2E-05		(2)	1.2E-04			9.3E-07			3.0E-06

	ng/L	ug/L
Minimum equivalent concentration =	9.3E-07	9.3E-10
Maximum equivalent concentration =	1.4E-04	1.4E-07

Notes:

UG/L = micrograms per liter

U = Not Detected

J = Estimated Value

[1] TEF from *Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin [TCDD] and Related Compounds* , National Academy of Sciences review Draft. EPA/600/P-00/001Cb. December 2003.

[2] In cases where there were no detects in a sample, each congener detection limit was converted to the TEQ concentration (multiplied the detection limits by the TEF), and the highest calculated TEQ concentration for the sample was selected as representative of the sample.

TABLE 2.3a

Step 2 Groundwater Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site 7 - Groundwater

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Tap Water RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Volatile Organic Compounds (ug/L)								
Bromodichloromethane	1 / 5	5.3E-01 J	CAS07-MW06P-0111	1.2E-01	1E-06	NA	4E-06	NA
Chloroform	2 / 5	7.6E-01 J	CAS07-MW06-0111	1.9E-01	1E-06	NA	4E-06	NA
Dibromochloromethane	2 / 5	6.1E-01 J	CAS07-MW06-0111	1.5E-01	1E-06	NA	4E-06	NA
Tetrachloroethene	1 / 5	4.7E-01 J	CAS07-MW07-0111	1.1E-01	1E-06	NA	4E-06	NA
Trichloroethene	3 / 5	8.6E+01	CAS07-MW07-0111	2.0E+00	1E-06	NA	4E-05	NA
Vinyl chloride	1 / 5	3.3E-01 J	CAS07-MW07-0111	1.6E-02	1E-06	NA	2E-05	NA
Semivolatile Organic Compounds (ug/L)								
2,4-Dinitrotoluene	4 / 5	1.1E+00	CAS07-MW04-0111	2.2E-01	1E-06	NA	5E-06	NA
Explosives (ug/L)								
RDX	4 / 5	6.5E-01 J	CAS07-MW04-0111	6.1E-01	1E-06	NA	1E-06	NA
Metals (ug/L)								
Arsenic	2 / 5	4.3E+00	CAS07-MW07-0111	4.5E-02	1E-06	NA	1E-04	NA
Manganese	5 / 5	2.2E+02	CAS07-MW04-0111	8.8E+02	1	0.2	NA	CNS
Dissolved Metals (ug/L)								
Arsenic, Dissolved	2 / 5	3.6E+00	CAS07-MW07-0111	4.5E-02	1E-06	NA	8E-05	NA
Cobalt, Dissolved	3 / 5	4.6E+00	CAS07-MW03-0111	1.1E+01	1	0.4	NA	Thyroid
Manganese, Dissolved	5 / 5	2.1E+02	CAS07-MW04-0111	8.8E+02	1	0.2	NA	CNS
Cumulative Corresponding Hazard Index[c]						**0.2**		
Cumulative Corresponding Cancer Risk[d]							**2E-04**	
							Total CNS/Neurological HI =	**0.2**
							Total Thyroid HI =	**0.4**

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central nervous System

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

µg/L = micrograms per liter

NA = Not available/not applicable

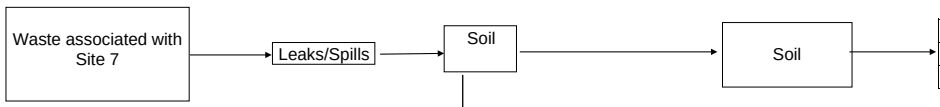
TABLE 2.3b
Risk Ratio Screening for Groundwater, 95% UCL Concentration
Cheatham Annex Areas of Concern, Williamsburg, Virginia
Site 7 - Groundwater

Analyte	Detection Frequency	95% UCL		95% UCL Rationale	Tap Water RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Volatile Organic Compounds (ug/L)									
Bromodichloromethane	1 / 5	5.3E-01	Max	6	1.2E-01	1E-06	NA	4E-06	NA
Chloroform	2 / 5	7.2E-01	95% KM-t	4	1.9E-01	1E-06	NA	4E-06	NA
Dibromochloromethane	2 / 5	5.4E-01	95% KM-t	4	1.5E-01	1E-06	NA	4E-06	NA
Tetrachloroethene	1 / 5	4.7E-01	Max	6	1.1E-01	1E-06	NA	4E-06	NA
Trichloroethene	3 / 5	8.6E+01	Max	1, 5	2.0E+00	1E-06	NA	4E-05	NA
Vinyl chloride	1 / 5	3.3E-01	Max	6	1.6E-02	1E-06	NA	2E-05	NA
Semivolatile Organic Compounds (ug/L)									
2,4-Dinitrotoluene	4 / 5	8.7E-01	95% KM-t	1, 2, 3	2.2E-01	1E-06	NA	4E-06	NA
Explosives (ug/L)									
RDX	4 / 5	5.0E-01	95% KM-t	1, 2, 3	6.1E-01	1E-06	NA	8E-07	NA
Metals (ug/L)									
Arsenic	2 / 5	4.0E+00	95% KM-t	4	4.5E-02	1E-06	NA	9E-05	NA
Dissolved Metals (ug/L)									
Arsenic	2 / 5	3.3E+00	95% KM-t	4	4.5E-02	1E-06	NA	7E-05	NA
Cumulative Corresponding Hazard Index[c]							**NA**		
Cumulative Corresponding Cancer Risk[d]								**2E-04**	

Notes:
[a] Corresponding Hazard Index equals 95% UCL concentration divided by the RSL divided by the acceptable risk level.
[b] Corresponding Cancer Risk equals 95% UCL concentration divided by the RSL divided by the acceptable risk level
[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.
[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.
Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.
Constituents selected as COPCs are indicated by shading.
COPC = Chemical of Potential Concern
HI = Hazard Index
NA = Not available/not applicable
ug/L = micrograms per liter

ProUCL, Version 4.1.00 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA. May 2010. ProUCL, Version 4.1. Prepared by Lockheed Martin Environmental Services).
Options: Maximum detected concentration (Max); 95% Kaplan-Meier (t) UCL (95% KM-t); 95% Student's-t UCL (95% Stud-t)

Upper Confidence Limit (UCL) Rationale:
(1) Shapiro-Wilk W Test/Lilliefors test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.
(3) Test indicates data are gamma distributed.
(4) Distribution tests are inconclusive
(5) Max value used because 95% UCL greater than max.
(6) Only detected in one sample, maximum detected concentration used.



	Potential Human Receptors				
	Current/Future		Future		
Exposure Route	**Trespassers**	**Industrial Worker**	**Residents**	**Industrial Worker**	**Construction Worker**
Ingestion	X	X	X	X	X
Dermal Contact	X	X	X	X	X
Inhalation	X	X	X	X	X
Ingestion	NA	NA	X	X	NA
Dermal Contact	NA	NA	X	NA	X
Inhalation	NA	NA	X	NA	X

NA - Not Applicable or pathway is incomplete
X - Potentially complete exposure pathways

FIGURE A-1
Conceptual Site Model for HHRA
Site 7
Cheatham Annex, Williamsburg, Virginia

Appendix B
Ecological Risk Screening

APPENDIX B

Ecological Risk Screening

An ecological risk screening was performed to determine the potential for ecological risks associated with direct exposure to site soil (0 to 24 inches) and potential ecological risks in receiving water bodies (York River) from groundwater transport at Site 7. The results of the ecological risk screening provide a preliminary indication of potential ecological risks from exposure to chemicals of potential concern (COPCs) identified at Site 7, and are used to help determine whether the site requires further evaluation (e.g., a baseline risk assessment or additional data collection) or if risks are acceptable.

B.1 Ecological Conceptual Site Model

The ecological conceptual site model (CSM) provides a brief summary of site conditions, potential contaminant migration pathways, and exposure pathways to potential receptors. Section 3.2.2 of the SI report provide details on the physical setting and history of Site 7.

Site 7 is approximately 1 acre in size and is located immediately adjacent to the York River. Site 7 was forested prior to the 2007-2008 removal action. However, as part of the removal action, the excavation area was cleared of trees and brush. Currently, the portions of the site surrounding the removal area are forested, with the removal area consisting of successional old field habitat. The site gradient is fairly level with a nearly vertical drop (approximately 15 feet) along the eastern boundary to the York River shoreline. Other than the York River, there are no wetlands or water bodies on, or immediately adjacent to, Site 7.

Complete exposure pathways exist to lower trophic level terrestrial receptors (i.e., plants and soil invertebrates). Although the site is relatively small (approximately 1 acre), exposures to upper trophic level receptors (i.e., birds and mammals) are possible and were also evaluated. There is the potential for groundwater transport and subsequent discharge from the site to the York River (brackish to marine water body).

B.2 Ecological Risk Screening Methodology

The ecological risk screening was conducted using a two step process within the overall decision analysis process described in Section 1.1.1 of the SI report, which is comprised of three steps. The ERA process falls within Steps 2a and 2b of this overall process.

If a CERCLA-related release was suspected (Step 1 of the overall decision process), site-specific analytical data for detected constituents were compared to conservative ecological screening values and background 95 percent upper tolerance limits (UTLs), where available (Step 2a). Medium-specific screening values used in the assessment, which were based upon lower trophic level exposures (upper tophic level exposures were evaluated separately), are contained in **Tables B-1** (soil) and **B-2** (surface water; used to screen groundwater).

Soil screenings were conducted using 36 of the 47 2008 post-removal samples (which represents all post-removal samples that are within the 0- to 24-inch depth range relative to

the current [backfilled] site elevation); samples of the backfill material, however, were not included in the evaluation. This depth range was selected since ecological exposures are generally considered to be confined to the top two feet of the soil column. The samples used in the screening were within 24 inches (the depth of potential ecological exposures) of the current ground elevation (following backfilling) and were below the backfill material (i.e., soil in areas where less than 24 inches of backfill were placed). Thus, the use of these data is conservative since the samples are covered by backfill, which likely contains lower chemical concentrations, but less than 24 inches of backfill were present, which means that some ecological exposures to these samples are still possible.

Although ecological receptors do not typically have direct exposure to groundwater, surface water screening values were compared to analytical groundwater data in order to provide a conservative evaluation of the potential for significant contaminant transport via groundwater to downgradient receiving water bodies. The surface water values used to screen groundwater considered the salinity of the receiving water body (York River) to determine whether to apply freshwater or marine values. As such, marine values were used, where available, although freshwater values were extrapolated to the site if marine values were not available. Although both total and dissolved groundwater data are included in the screening tables, only dissolved metals data are considered when selecting COPCs because chemicals in groundwater are most likely to travel dissolved in water rather than adhered to particles since they must travel through soil pores or fractured rock. Similarly, when groundwater discharges to a water body (at which time ecological exposures become possible), the bulk of the discharged chemicals are likely to be dissolved in water since the discharge must pass through the pores in the underlying sediments. Thus, the dissolved concentrations are likely to be more representative of what would be transported via the groundwater than the total concentrations. Once discharged, the dissolved metal fraction in water (filtered samples) is more representative of the bioavailable fraction to aquatic receptors than the total metal fraction (unfiltered samples) (USEPA, 1996). This is reflected in how the most recent Ambient Water Quality Criteria have been developed for many metals, that is, they are based upon the dissolved fraction (USEPA, 2009).

The background UTLs were facility-specific values derived for Yorktown/CAX. Surface soil UTL values were used in the evaluation. The background UTL values for groundwater were for the Yorktown-Eastover aquifer.

If the maximum detected concentration exceeded both ecological screening values and background UTLs, exceeded either screening values or UTLs if only one of the two were available for a constituent, or neither a screening value or UTL was available, the constituent was retained as an initial COPC for that medium. This constituted Step 2a of the decision process and also corresponds to a screening level ERA (which is Step 2 of the ERA process outlined in USEPA [1997] and NAVFAC [2003]).

Food web exposures (for detected bioaccumulative constituents) for upper trophic level receptors were also modeled for terrestrial habitats at Site 7. Terrestrial receptors used were: (1) meadow vole; (2) short-tailed shrew; (3) red fox; (4) American robin; (5) mourning dove; and (6) red-tailed hawk. Initial food web COPCs were selected by first comparing maximum surface soil concentrations with the lower of the available bird and mammal Eco-SSLs. These Eco-SSL values are listed in **Table B-3**. Chemicals that exceeded the Eco-SSLs based upon the maximum surface soil concentration were retained for site-specific food web

modeling. Those that did not were not evaluated further for terrestrial food web exposures. The initial food web COPCs were selected based upon a comparison of maximum exposure doses (calculated using maximum surface soil concentrations) from site-specific food web modeling with the No Observed Adverse Effect Level (NOAEL) based ingestion toxicity reference values (TRVs). Those chemicals with an exposure dose exceeding the NOAEL-based ingestion TRV were identified as initial COPCs. This constituted Step 2a of the decision process.

For the screening value and background exceedances, and food web exceedances, that are likely attributable to a historic CERCLA-related release, an evaluation of the data using more realistic assumptions was conducted. This more realistic evaluation (Step 2b of the decision process) was performed to help ensure appropriate perspective is considered regarding the release such that informed decisions on the need for further investigation or action can be made (which is Step 3 of the decision process). Step 2b of the decision process corresponds to the first step of a baseline ERA (which is Step 3A of the ERA process outlined in NAVFAC [2003]).

Where there were exceedances of the ecological screening values/background and/or the ingestion-based (food web) TRVs, more realistic evaluations considered the following types of information:

- The size of the site
- The type and quality of the habitat present on the site and in surrounding areas, and the potential receptors likely to be present
- The frequency and magnitude of screening value and background exceedances
- Average exposure concentrations and, for food web modeling, more realistic measures of accumulation factors and exposure parameters
- Ingestion-based (food web) COPCs were based upon a comparison of mean and 95% UCL exposure doses with ingestion TRVs based upon the NOAEL, Maximum Acceptable Toxicant Concentration (MATC), and Lowest Observed Adverse Effect Level (LOAEL). An exceedance of the 95% UCL-based MATC was considered an unacceptable risk at the refined screening stage.
- The spatial pattern of exceedances
- Additional screening values from the literature, where applicable
- Other site-specific factors that might be relevant to assessing potential exposures (e.g., soil type, bioavailability, fate, transport properties)

When more realistic evaluations of the available data were conducted, the rationale for those evaluations is included in the discussion. It is recognized that these more realistic evaluations may have uncertainty due to the limited amount of data generally available at the SI stage. However, these additional risk evaluations provide yet another line of evidence that, when considered with all other site-specific information and evaluations, increase the level of confidence by which conclusions for each site are drawn.

B.3 Ecological Risk Screening Results

The ecological risk screening was performed for surface soil (0 to 24 inches), terrestrial food web exposures, and groundwater.

B.3.1 Surface Soil

Eight inorganics (aluminum, arsenic, iron, lead, manganese, mercury, selenium, and thallium) and one organic (endrin) exceeded screening values based upon maximum detected concentrations and, except for mercury, also exceeded background UTLs, where available (**Tables B-4 and B-5**). Thus, aluminum, arsenic, iron , lead, manganese, selenium, thallium, and endrin were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQs for aluminum, arsenic, iron, lead, manganese, and thallium were less than one. Thus, these constituents were not identified as refined COPCs.
- Although the mean HQ (1.01) exceeded one for endrin, it did so by only a very small amount. Since endrin exceeded the screening value in only 1 of 36 soil samples, at a maximum HQ of just 1.23, potential risks associated with this chemical are very low and this constituent was not identified as a refined COPC.
- The mean HQ for selenium (3.44) exceeded one. However, this constituent is not likely to be site related since it was not detected in 2004 (pre-removal) surface and subsurface soil samples (all samples were flagged U or B). In addition, the screening value used is based upon potential impacts to plants. Soil screening values for other receptors (e.g., 4.10 mg/kg for soil invertebrates) are not exceeded (maximum selenium concentrations in soil are 2.90 mg/kg). Thus, selenium is not likely to constitute a risk to ecological receptors at the site above naturally occurring levels and this constituent was not identified as a refined COPC.

No refined COPCs were identified in soil. Thus, there are no unacceptable ecological risks associated with this medium.

B.3.2 Terrestrial Food Web

Chromium, copper, lead, selenium, and zinc exceeded bird and/or mammal Eco-SSLs based upon the maximum detected soil concentration (**Table B-6**) and were retained for site-specific food web modeling, along with mercury, endrin, and dioxins (which were detected but lacked Eco-SSLs).

HQs from site-specific food web modeling based upon maximum exposure doses for each upper trophic level terrestrial receptor are listed in **Table B-7** (calculations are shown in **Tables B-8 through B-13**). Based upon a comparison to NOAELs, chromium, mercury, lead, and selenium had HQs exceeding one for one or more receptors. Thus, these four chemicals were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- HQs based upon 95% UCL exposure doses for each upper trophic level terrestrial receptor that had at least one exceedance based upon maximum exposure doses are listed in **Table B-14** (calculations are shown in **Tables B-15 through B-17**). No chemical had a HQ that exceeded one based upon the NOAEL, MATC, or LOAEL.
- Because there were no exceedances based upon 95% UCL exposure doses, mean exposure doses were not calculated. No refined COPCs were identified for terrestrial food web exposures and risks from this exposure pathway are considered acceptable.

B.3.3 Groundwater

Two metals (aluminum and manganese) exceeded screening values based upon maximum detected concentrations in unfiltered samples. Aluminum did not exceed background UTLs nor did it exceed screening values in filtered samples (**Tables B-18 and B-19**). Manganese exceeded both background UTLs and screening values in filtered samples. Thus, manganese was identified as an initial COPC. Two pesticides (4,4'-DDD and gamma-chlordane) also exceeded screening values based upon maximum detected concentrations.Bromodichloromethane and dibromochloromethane were detected in at least one groundwater sample but screening values were not available. Thus, 4,4'-DDD, gamma-chlordane, bromodichloromethane, and dibromochloromethane were also identified as initial COPCs (**Tables B-18 and B-19**).

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQs for manganese and 4,4'-DDD did not exceed one. The mean ratio of site concentrations to site-specific upgradient concentrations also did not exceed one for manganese (4,4'-DDD was not detected in upgradient wells). Thus, these constituents were not identified as refined COPCs.
- The mean HQ for gamma-chlordane (2.31) exceeded one. However, gamma-chlordane was detected in upgradient wells at generally similar concentrations (the mean ratio between site and upgradient samples was 1.29). Thus, this constituent is not likely to be site related and was not identified as a refined COPC.
- Bromodichloromethane and dibromochloromethane were identified as initial COPCs because they were detected and screening values were not available. The maximum concentrations of these chemicals in groundwater (0.53 and 0.61 µg/L, respectively) were lower than marine-based screening values for other, similar VOCs (**Table B-2**). Thus, neither of these constituents was identified as a refined COPC.

No refined COPCs were identified for groundwater. Thus, there are no unacceptable ecological risks associated with this medium.

B.4 Ecological Risk Screening Conclusion

No refined COPCs were identified for Site 7 soils or groundwater, or for terrestrial food web exposures. Thus, no unacceptable ecological risks are associated with the site.

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Ecological Risk Screening Tables

Table B-1
Ecological Screening Values (ESVs) for Soil
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Chemical	ESV	Units	Reference	Comments
Inorganics				
Aluminum	pH < 5.5	--	USEPA 2003a	Eco-SSL
Antimony	78.0	mg/kg	USEPA 2005a	Eco-SSL - Invertebrate
Arsenic	18.0	mg/kg	USEPA 2005b	Eco-SSL - Plant
Barium	330	mg/kg	USEPA 2005c	Eco-SSL - Invertebrate
Beryllium	40.0	mg/kg	USEPA 2005d	Eco-SSL - Invertebrate
Cadmium	32.0	mg/kg	USEPA 2005e	Eco-SSL - Plant
Chromium	64.0	mg/kg	CCME 2007	Soil Quality Guideline
Cobalt	13.0	mg/kg	USEPA 2005f	Eco-SSL - Plant
Copper	70.0	mg/kg	USEPA 2007a	Eco-SSL - Plant
Cyanide	15.8	mg/kg	MHSPE 2000	Geomean of target/intervention - complex
Iron	pH < 5 or >8	--	USEPA 2003b	Eco-SSL
Lead	120	mg/kg	USEPA 2005g	Eco-SSL - Plant
Manganese	220	mg/kg	USEPA 2007b	Eco-SSL - Plant
Mercury	0.10	mg/kg	Efroymson et al. 1997b	Invertebrate
Nickel	38.0	mg/kg	USEPA 2007c	Eco-SSL - Plant
Selenium	0.52	mg/kg	USEPA 2007d	Eco-SSL - Plant
Silver	560	mg/kg	USEPA 2006a	Eco-SSL - Plant
Thallium	1.00	mg/kg	Efroymson et al. 1997a	Plant
Vanadium	130	mg/kg	CCME 2007	Soil Quality Guideline
Zinc	120	mg/kg	USEPA 2007e	Eco-SSL - Invertebrate
Pesticides/PCBs				
4,4'-DDD	583	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
4,4'-DDE	114	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
4,4'-DDT	100	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Aldrin	3.63	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
alpha-BHC	226	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
alpha-Chlordane	11.0	ug/kg	MHSPE 2000	Geomean of target/intervention
Aroclor-1016	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
Aroclor-1221	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
Aroclor-1232	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
Aroclor-1242	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5

Table B-1
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Chemical	ESV	Units	Reference	Comments
Aroclor-1248	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
Aroclor-1254	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
Aroclor-1260	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
beta-BHC	342	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
delta-BHC	226	ug/kg	alpha-BHC	
Dieldrin	10.5	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Endosulfan I	6.32	ug/kg	MHSPE 2000	Geomean of target/intervention
Endosulfan II	6.32	ug/kg	MHSPE 2000	Geomean of target/intervention
Endosulfan sulfate	6.32	ug/kg	Endosulfan	
Endrin	1.95	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Endrin aldehyde	1.95	ug/kg	Endrin	
Endrin ketone	1.95	ug/kg	Endrin	
gamma-BHC (Lindane)	7.75	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
gamma-Chlordane	11.0	ug/kg	MHSPE 2000	Geomean of target/intervention
Heptachlor	52.9	ug/kg	MHSPE 2000	Geomean of target/intervention
Heptachlor epoxide	52.9	ug/kg	Heptachlor	
Methoxychlor	500	ug/kg	Beyer 1990	B value
Toxaphene	500	ug/kg	Beyer 1990	B value
Semivolatile Organic Compounds				
1,1-Biphenyl	13,600	ug/kg	Efroymson et al. 1997a	EC50 (68,000); UF of 5
1,2,3-Trichlorobenzene	1,150	ug/kg	Efroymson et al. 1997b	LC50 of 115,000; UF of 100
1,2,4-Trichlorobenzene	1,270	ug/kg	Efroymson et al. 1997b	LC50 of 127,000; UF of 100
1,2-Dichlorobenzene	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
1,3-Dichlorobenzene	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
1,4-Dichlorobenzene	1,280	ug/kg	Efroymson et al. 1997b	LC50 of 128,000; UF of 100
2,4,5-Trichlorophenol	1,350	ug/kg	Efroymson et al. 1997a	Plant NOEC
2,4,6-Trichlorophenol	580	ug/kg	Efroymson et al. 1997b	LC50 of 58,000; UF of 100
2,4-Dichlorophenol	500	ug/kg	Beyer 1990; CCME 2007	B value; IRC
2,4-Dimethylphenol	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
2,4-Dinitrophenol	20,000	ug/kg	Efroymson et al. 1997a	Plant NOEC
2,4-Dinitrotoluene	11,000	ug/kg	NRCC 2006	Plant/Invertebrate
2,6-Dinitrotoluene	8,500	ug/kg	NRCC 2006	Plant/Invertebrate

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Chemical	ESV	Units	Reference	Comments
2-Chloronaphthalene	LMW PAH	--	--	
2-Chlorophenol	500	ug/kg	Beyer 1990; CCME 2007	B value; IRC
2-Methylnaphthalene	LMW PAH	--	--	
2-Methylphenol	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
2-Nitrophenol	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
4,6-Dinitro-2-methylphenol	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
4-Chloro-3-methylphenol	500	ug/kg	Beyer 1990; CCME 2007	B value; IRC
4-Chloroaniline	500	ug/kg	MHSPE 2000	Geomean of target/intervention
4-Methylphenol	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
4-Nitrophenol	380	ug/kg	Efroymson et al. 1997b	LC50 of 38,000; UF of 100
Acenaphthene	LMW PAH	--	--	
Acenaphthylene	LMW PAH	--	--	
Anthracene	LMW PAH	--	--	
Atrazine	11.9	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Benzo(a)anthracene	HMW PAH	--	--	
Benzo(a)pyrene	HMW PAH	--	--	
Benzo(b)fluoranthene	HMW PAH	--	--	
Benzo(g,h,i)perylene	HMW PAH	--	--	
Benzo(k)fluoranthene	HMW PAH	--	--	
bis(2-Ethylhexyl)phthalate	30,000	ug/kg	CCME 2007	Plant; IRC
Butylbenzylphthalate	30,000	ug/kg	CCME 2007	Plant; IRC
Chrysene	HMW PAH	--	--	
Dibenz(a,h)anthracene	HMW PAH	--	--	
Diethylphthalate	26,800	ug/kg	Efroymson et al. 1997a	EC50 (134,000); UF of 5
Dimethyl phthalate	10,640	ug/kg	Efroymson et al. 1997b	LC50 of 1,064,000; UF of 100
Di-n-butylphthalate	40,000	ug/kg	Efroymson et al. 1997a	LOEC (200,000); UF of 5
Di-n-octylphthalate	30,000	ug/kg	CCME 2007	Plant; IRC
Fluoranthene	LMW PAH	--	--	
Fluorene	LMW PAH	--	--	
Hexachlorobenzene	1,000	ug/kg	Beyer 1990	B value
Hexachlorocyclopentadiene	2,000	ug/kg	Efroymson et al. 1997a	LOEC (10,000); UF of 5
Indeno(1,2,3-cd)pyrene	HMW PAH	--	--	

Table B-1
Ecological Screening Values (ESVs) for Soil
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Chemical	ESV	Units	Reference	Comments
Naphthalene	LMW PAH	--	--	
Nitrobenzene	2,260	ug/kg	Efroymson et al. 1997b	LC50 of 226,000; UF of 100
n-Nitrosodiphenylamine	1,090	ug/kg	Efroymson et al. 1997b	LC50 of 109,000; UF of 100
PAH (HMW)	18,000	ug/kg	USEPA 2007f	Eco-SSL - Invertebrate
PAH (LMW)	29,000	ug/kg	USEPA 2007f	Eco-SSL - Invertebrate
Pentachlorophenol	5,000	ug/kg	USEPA 2007g	Eco-SSL - Plant
Phenanthrene	LMW PAH	--	--	
Phenol	1,880	ug/kg	Efroymson et al. 1997b	LC50 of 188,000; UF of 100
Pyrene	HMW PAH	--	--	
Volatile Organic Compounds				
1,1,1-Trichloroethane	1,025	ug/kg	MHSPE 2000	Geomean of target/intervention
1,1,2,2-Tetrachloroethane	5,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
1,1,2-Trichloroethane	2,000	ug/kg	MHSPE 2000	Geomean of target/intervention
1,1-Dichloroethane	548	ug/kg	MHSPE 2000	Geomean of target/intervention
1,1-Dichloroethene	173	ug/kg	MHSPE 2000	Geomean of target/intervention
1,2,3-Trichlorobenzene	1,150	ug/kg	Efroymson et al. 1997b	LC50 of 115,000; UF of 100
1,2,4-Trichlorobenzene	1,270	ug/kg	Efroymson et al. 1997b	LC50 of 127,000; UF of 100
1,2-Dibromoethane	300	ug/kg	CCME 2007	IRC
1,2-Dichlorobenzene	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
1,2-Dichloroethane	2,190	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
1,2-Dichloropropane	38,800	ug/kg	Efroymson et al. 1997b	LC50 of 3,880,000; UF of 100
1,3-Dichlorobenzene	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
1,4-Dichlorobenzene	1,280	ug/kg	Efroymson et al. 1997b	LC50 of 128,000; UF of 100
Benzene	1,140	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Bromoform	300	ug/kg	CCME 2007	Plant; IRC
Carbon tetrachloride	3,400	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Chlorobenzene	2,400	ug/kg	Efroymson et al. 1997b	LC50 of 240,000; UF of 100
Chloroethane	5,000	ug/kg	CCME 2007	IRC
Chloroform	1,844	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Chloromethane	5,000	ug/kg	CCME 2007	IRC
cis-1,2-Dichloroethene	447	ug/kg	MHSPE 2000	Geomean of target/intervention
cis-1,3-Dichloropropene	5,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC

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Chemical	ESV	Units	Reference	Comments
Cyclohexane	6,000	ug/kg	Beyer 1990	B value
Ethylbenzene	1,815	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Methylene chloride	1,250	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Styrene	64,000	ug/kg	Efroymson et al. 1997a	EC50 (320,000); UF of 5
Tetrachloroethene	179	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Toluene	40,000	ug/kg	Efroymson et al. 1997a	EC50 (200,000); UF of 5
trans-1,2-Dichloroethene	447	ug/kg	MHSPE 2000	Geomean of target/intervention
trans-1,3-Dichloropropene	5,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
Trichloroethene	500	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Vinyl chloride	412	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Xylene, total	1,300	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Explosives				
2,4,6-Trinitrotoluene	10,000	ug/kg	Talmage et al. 1999	Plant
2,4-Dinitrotoluene	11,000	ug/kg	NRCC 2006	Plant/Invertebrate
2,6-Dinitrotoluene	8,500	ug/kg	NRCC 2006	Plant/Invertebrate
2-Amino-4,6-dinitrotoluene	80,000	ug/kg	Talmage et al. 1999	Plant
4-Amino-2,6-dinitrotoluene	80,000	ug/kg	2-Amino-4,6-dinitrotoluene	Plant
HMX	10,000	ug/kg	Talmage et al. 1999	Invertebrate
Nitrobenzene	2,260	ug/kg	Efroymson et al. 1997b	LC50 of 226,000; UF of 100
Perchlorate	1,000	ug/kg	USEPA 2002	Invertebrate
RDX	10,000	ug/kg	Talmage et al. 1999	Invertebrate
Tetryl	10,000	ug/kg	Talmage et al. 1999	Plant
Dioxin/Furans				
2,3,7,8-TCDD (dioxin)	4.00	pg/g	CCME 2007	Soil Quality Guideline

Table B-2
Ecological Screening Values (ESVs) for Water
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Chemical	ESV	Units	Type	Reference	Comments[1]
Inorganics (Total)					
Aluminum	87.0	ug/L	Fresh	USEPA 2009	AWQC
Antimony	500	ug/L	Marine	USEPA 2006b	
Arsenic	36.0	ug/L	Marine	USEPA 2009	AWQC
Barium	200	ug/L	Marine	Buchman 2008	
Beryllium	100	ug/L	Marine	Buchman 2008	
Cadmium	8.85	ug/L	Marine	USEPA 2009	AWQC
Chromium	50.4	ug/L	Marine	USEPA 2009	AWQC
Cobalt	23.0	ug/L	Fresh	Suter and Tsao 1996	SCV
Copper	3.73	ug/L	Marine	USEPA 2009	AWQC
Cyanide	1.00	ug/L	Marine	USEPA 2009	AWQC
Iron	1,000	ug/L	Fresh	USEPA 2009	AWQC
Lead	8.52	ug/L	Marine	USEPA 2009	AWQC
Manganese	100	ug/L	Marine	Buchman 2008	
Mercury	1.11	ug/L	Marine	USEPA 2009	AWQC
Nickel	8.28	ug/L	Marine	USEPA 2009	AWQC
Selenium	71.1	ug/L	Marine	USEPA 2009	AWQC
Silver	0.23	ug/L	Marine	USEPA 2001	
Thallium	21.3	ug/L	Marine	USEPA 2001	
Vanadium	50.0	ug/L	Marine	Buchman 2008	
Zinc	85.6	ug/L	Marine	USEPA 2009	AWQC
Dissolved Metals					
Aluminum	87.0	ug/L	Fresh	USEPA 2009	AWQC
Antimony	500	ug/L	Marine	USEPA 2006b	
Arsenic	36.0	ug/L	Marine	USEPA 2009	AWQC
Barium	200	ug/L	Marine	Buchman 2008	
Beryllium	100	ug/L	Marine	Buchman 2008	
Cadmium	8.80	ug/L	Marine	USEPA 2009	AWQC
Chromium	50.0	ug/L	Marine	USEPA 2009	AWQC
Cobalt	23.0	ug/L	Fresh	Suter and Tsao 1996	SCV
Copper	3.10	ug/L	Marine	USEPA 2009	AWQC
Iron	1,000	ug/L	Fresh	USEPA 2009	AWQC

Table B-2
Ecological Screening Values (ESVs) for Water
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Chemical	ESV	Units	Type	Reference	Comments[1]
Lead	8.10	ug/L	Marine	USEPA 2009	AWQC
Manganese	100	ug/L	Marine	Buchman 2008	
Mercury	0.94	ug/L	Marine	USEPA 2009	AWQC
Nickel	8.20	ug/L	Marine	USEPA 2009	AWQC
Selenium	71.0	ug/L	Marine	USEPA 2009	AWQC
Silver	0.23	ug/L	Marine	USEPA 2001	
Thallium	21.3	ug/L	Marine	USEPA 2001	
Vanadium	50.0	ug/L	Marine	Buchman 2008	
Zinc	81.0	ug/L	Marine	USEPA 2009	AWQC
Pesticides/PCBs					
4,4'-DDD	0.025	ug/L	Marine	USEPA 2001	
4,4'-DDE	0.14	ug/L	Marine	USEPA 2001	
4,4'-DDT	0.0065	ug/L	Marine	USEPA 2006b	
Aldrin	0.13	ug/L	Marine	USEPA 2001	
alpha-BHC	25.0	ug/L	Marine	USEPA 2006b	
alpha-Chlordane	0.004	ug/L	Marine	USEPA 2009	FRV - AWQC
Aroclor-1016	0.03	ug/L	Marine	USEPA 2009	FRV - AWQC
Aroclor-1221	0.03	ug/L	Marine	USEPA 2009	FRV - AWQC
Aroclor-1232	0.03	ug/L	Marine	USEPA 2009	FRV - AWQC
Aroclor-1242	0.03	ug/L	Marine	USEPA 2009	FRV - AWQC
Aroclor-1248	0.03	ug/L	Marine	USEPA 2009	FRV - AWQC
Aroclor-1254	0.03	ug/L	Marine	USEPA 2009	FRV - AWQC
Aroclor-1260	0.03	ug/L	Marine	USEPA 2009	FRV - AWQC
beta-BHC	25.0	ug/L	Marine	alpha-BHC	
delta-BHC	25.0	ug/L	Marine	alpha-BHC	
Dieldrin	0.11	ug/L	Marine	USEPA 1996	FCV
Endosulfan I	0.0087	ug/L	Marine	USEPA 2009	AWQC
Endosulfan II	0.0087	ug/L	Marine	USEPA 2009	AWQC
Endosulfan sulfate	0.0087	ug/L	Marine	USEPA 2009	AWQC
Endrin	0.01	ug/L	Marine	USEPA 1996	FCV
Endrin aldehyde	0.01	ug/L	Marine	Endrin	
Endrin ketone	0.01	ug/L	Marine	Endrin	

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Ecological Screening Values (ESVs) for Water
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Chemical	ESV	Units	Type	Reference	Comments[1]
gamma-BHC (Lindane)	0.016	ug/L	Marine	USEPA 2001	
gamma-Chlordane	0.004	ug/L	Marine	USEPA 2009	FRV - AWQC
Heptachlor	0.0036	ug/L	Marine	USEPA 2009	FRV - AWQC
Heptachlor epoxide	0.0036	ug/L	Marine	USEPA 2009	FRV - AWQC
Methoxychlor	0.03	ug/L	Marine	USEPA 2009	AWQC
Toxaphene	0.21	ug/L	Marine	USEPA 1996	FCV
Semivolatile Organic Compounds					
1,1-Biphenyl	14.0	ug/L	Fresh	USEPA 1996	SCV
1,2,3-Trichlorobenzene	8.00	ug/L	Fresh	USEPA 2006b	
1,2,4-Trichlorobenzene	5.40	ug/L	Marine	USEPA 2006b	
1,2-Dichlorobenzene	42.0	ug/L	Marine	USEPA 2006b	
1,3-Dichlorobenzene	28.5	ug/L	Marine	USEPA 2001	
1,4-Dichlorobenzene	19.9	ug/L	Marine	USEPA 2001	
2,4,5-Trichlorophenol	12.0	ug/L	Marine	USEPA 2006b	
2,4,6-Trichlorophenol	61.0	ug/L	Marine	USEPA 2006b	
2,4-Dichlorophenol	11.0	ug/L	Fresh	USEPA 2006b	SCV
2,4-Dimethylphenol	100	ug/L	Fresh	Buchman 2008	
2,4-Dinitrophenol	48.5	ug/L	Marine	USEPA 2001	
2,4-Dinitrotoluene	480	ug/L	Marine	Nipper et al. 2001	NOEC; algae
2,6-Dinitrotoluene	1,000	ug/L	Marine	Nipper et al. 2001	NOEC; algae
2-Chloronaphthalene	0.40	ug/L	Fresh	Buchman 2008	
2-Chlorophenol	265	ug/L	Marine	USEPA 2006b	
2-Methylnaphthalene	330	ug/L	Fresh	Buchman 2008	
2-Methylphenol	1,020	ug/L	Marine	USEPA 2006b	
2-Nitrophenol	2,940	ug/L	Marine	USEPA 2006b	
3,3'-Dichlorobenzidine	73.0	ug/L	Marine	USEPA 2006b	
4,6-Dinitro-2-methylphenol	2.30	ug/L	Fresh	USEPA 2001	
4-Bromophenyl-phenylether	1.50	ug/L	Fresh	USEPA 1996	SCV
4-Chloro-3-methylphenol	0.30	ug/L	Fresh	USEPA 2001	
4-Chloroaniline	232	ug/L	Fresh	USEPA 2006b	
4-Methylphenol	543	ug/L	Fresh	USEPA 2006b	
4-Nitrophenol	71.7	ug/L	Marine	USEPA 2001	

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Ecological Screening Values (ESVs) for Water
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Chemical	ESV	Units	Type	Reference	Comments[1]
Acenaphthene	40.0	ug/L	Marine	USEPA 1996	FCV
Acenaphthylene	4,840	ug/L	Fresh	Buchman 2008	
Anthracene	0.18	ug/L	Marine	USEPA 2006b	
Atrazine	10.0	ug/L	Marine	Buchman 2008	
Benzo(a)anthracene	0.027	ug/L	Fresh	Suter and Tsao 1996	SCV
Benzo(a)pyrene	0.014	ug/L	Fresh	Suter and Tsao 1996	SCV
Benzo(b)fluoranthene	9.07	ug/L	Fresh	Buchman 2008	
Benzo(g,h,i)perylene	7.64	ug/L	Fresh	Buchman 2008	
Benzo(k)fluoranthene	9.07	ug/L	Fresh	Benzo(b)fluoranthene value	
Benzoic acid	42.0	ug/L	Fresh	Suter and Tsao 1996	SCV
Benzyl alcohol	8.60	ug/L	Fresh	Suter and Tsao 1996	SCV
bis(2-Chloroethyl)ether	1,900	ug/L	Fresh	Buchman 2008	
bis(2-Ethylhexyl)phthalate	360	ug/L	Marine	Buchman 2008	
Butylbenzylphthalate	29.4	ug/L	Marine	USEPA 2001	
Dibenzofuran	65.0	ug/L	Marine	USEPA 2006b	
Diethylphthalate	75.9	ug/L	Marine	USEPA 2001	
Dimethyl phthalate	580	ug/L	Marine	USEPA 2001	
Di-n-butylphthalate	3.40	ug/L	Marine	USEPA 2001	
Di-n-octylphthalate	22.0	ug/L	Fresh	USEPA 2006b	
Fluoranthene	11.0	ug/L	Marine	USEPA 1996	FCV
Fluorene	3.90	ug/L	Fresh	USEPA 1996	SCV
Hexachlorobenzene	3.68	ug/L	Fresh	Buchman 2008	
Hexachlorobutadiene	0.32	ug/L	Marine	USEPA 2001	
Hexachlorocyclopentadiene	0.07	ug/L	Marine	USEPA 2001	
Hexachloroethane	9.40	ug/L	Marine	USEPA 2001	
Indeno(1,2,3-cd)pyrene	4.31	ug/L	Fresh	Buchman 2008	
Isophorone	129	ug/L	Marine	USEPA 2001	
Naphthalene	23.5	ug/L	Marine	USEPA 2001	
Nitrobenzene	66.8	ug/L	Marine	USEPA 2001	
n-Nitroso-di-n-propylamine	120	ug/L	Marine	USEPA 2006b	
n-Nitrosodiphenylamine	33,000	ug/L	Marine	USEPA 2001	
Pentachlorophenol	7.90	ug/L	Marine	USEPA 2009	AWQC

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Chemical	ESV	Units	Type	Reference	Comments[1]
Phenanthrene	8.30	ug/L	Marine	USEPA 1996	FCV
Phenol	58.0	ug/L	Marine	USEPA 2001	
Pyrene	0.24	ug/L	Marine	USEPA 2006b	
Volatile Organic Compounds					
1,1,1-Trichloroethane	312	ug/L	Marine	USEPA 2001	
1,1,2,2-Tetrachloroethane	90.2	ug/L	Marine	USEPA 2001	
1,1,2-Trichloroethane	550	ug/L	Marine	USEPA 2006b	
1,1-Dichloroethane	47.0	ug/L	Fresh	Suter and Tsao 1996	SCV
1,1-Dichloroethene	2,240	ug/L	Marine	USEPA 2001	
1,2,3-Trichlorobenzene	8.00	ug/L	Fresh	USEPA 2006b	
1,2,4-Trichlorobenzene	5.40	ug/L	Marine	USEPA 2006b	
1,2-Dichlorobenzene	42.0	ug/L	Marine	USEPA 2006b	
1,2-Dichloroethane	1,130	ug/L	Marine	USEPA 2001	
1,2-Dichloropropane	2,400	ug/L	Marine	USEPA 2001	
1,2-Dichloroethene (total)	680	ug/L	Marine	USEPA 2006b	
1,3-Dichlorobenzene	28.5	ug/L	Marine	USEPA 2001	
1,4-Dichlorobenzene	19.9	ug/L	Marine	USEPA 2001	
2-Butanone	14,000	ug/L	Fresh	Suter and Tsao 1996	SCV
2-Hexanone	99.0	ug/L	Fresh	Suter and Tsao 1996	SCV
4-Methyl-2-pentanone	123,000	ug/L	Marine	USEPA 2006b	
Acetone	564,000	ug/L	Marine	USEPA 2006b	
Benzene	110	ug/L	Marine	USEPA 2006b	
Bromoform	640	ug/L	Marine	USEPA 2001	
Bromomethane	120	ug/L	Marine	USEPA 2001	
Carbon disulfide	0.92	ug/L	Fresh	Suter and Tsao 1996	SCV
Carbon tetrachloride	1,500	ug/L	Marine	USEPA 2001	
Chlorobenzene	25.0	ug/L	Marine	USEPA 2006b	
Chloroform	815	ug/L	Marine	USEPA 2001	
Chloromethane	2,700	ug/L	Marine	USEPA 2001	
cis-1,2-Dichloroethene	680	ug/L	Marine	USEPA 2006b	
cis-1,3-Dichloropropene	7.90	ug/L	Marine	USEPA 2001	
Cumene (isopropylbenzene)	2.60	ug/L	Fresh	USEPA 2006b	

Table B-2
Ecological Screening Values (ESVs) for Water
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Chemical	ESV	Units	Type	Reference	Comments[1]
Ethylbenzene	25.0	ug/L	Marine	USEPA 2006b	
Methylene chloride	2,560	ug/L	Marine	USEPA 2001	
Methyl-tert-butyl ether (MTBE)	5,000	ug/L	Marine	Buchman 2008	
m- and p-Xylene	19.0	ug/L	Marine	USEPA 2006b	
o-Xylene	19.0	ug/L	Marine	USEPA 2006b	
Styrene	910	ug/L	Marine	USEPA 2006b	
Tetrachloroethene	45.0	ug/L	Marine	USEPA 2001	
Toluene	215	ug/L	Marine	USEPA 2006b	
trans-1,2-Dichloroethene	680	ug/L	Marine	USEPA 2006b	
trans-1,3-Dichloropropene	7.90	ug/L	Marine	USEPA 2001	
Trichloroethene	1,940	ug/L	Marine	USEPA 2006b	
Vinyl chloride	930	ug/L	Fresh	USEPA 2006b	FCV
Xylene, total	19.0	ug/L	Marine	USEPA 2006b	
Explosives					
1,3,5-Trinitrobenzene	15.0	ug/L	Marine	Nipper et al. 2001	NOEC; algae
1,3-Dinitrobenzene	180	ug/L	Marine	Nipper et al. 2001	NOEC; algae
2,4,6-Trinitrotoluene	100	ug/L	Marine	USEPA 2006b	
2,4-Dinitrotoluene	480	ug/L	Marine	Nipper et al. 2001	NOEC; algae
2,6-Dinitrotoluene	1,000	ug/L	Marine	Nipper et al. 2001	NOEC; algae
2-Amino-4,6-dinitrotoluene	19.0	ug/L	Fresh	Talmage et al. 1999	SCV
2-Nitrotoluene	3,400	ug/L	Fresh	NAVFAC 2007	
3,5-Dinitroaniline	59.0	ug/L	Fresh	Talmage et al. 1999	SCV
3-Nitrotoluene	750	ug/L	Fresh	USEPA 2006b	
4-Amino-2,6-dinitrotoluene	19.0	ug/L	Fresh	2-Amino-4,6-dinitrotoluene	
4-Nitrotoluene	1,900	ug/L	Fresh	USEPA 2006b	
HMX	330	ug/L	Fresh	Talmage et al. 1999	SCV
Nitrobenzene	66.8	ug/L	Marine	USEPA 2001	
Nitroglycerine	138	ug/L	Fresh	USEPA 2006b	
Nitroguanidine	220	ug/L	Fresh	NAVFAC 2007	NOEC
Perchlorate	9,300	ug/L	Fresh	Dean et al. 2004	Chronic (CCC)
PETN	85,000	ug/L	Fresh	USEPA 2006b	
RDX	5,000	ug/L	Marine	Nipper et al. 2001	NOEC; algae

Table B-2
Ecological Screening Values (ESVs) for Water
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Chemical	ESV	Units	Type	Reference	Comments[1]
Tetryl	8.00	ug/L	Marine	Nipper et al. 2001	NOEC; polychaete
Dioxin/Furans					
2,3,7,8-TCDD (dioxin)	0.002	ng/L	Fresh	Buchman 2008	LOEC and UF of 5

1 - AWQC - Ambient Water Quality Criterion; FCV - Final Chronic Value; FRV - Final Residue Value; NOEC - No Observed Effect Concentration; SCV - Secondary Chronic Value; LOEC - Lowest Observed Effect Concentration

Table B-3
Eco-SSL Values for Birds and Mammals (Detected Bioaccumulative Chemicals)
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Chemical	Bird	Mammal	Units	Reference
Metals				
Arsenic	43.0	46.0	mg/kg	USEPA 2005b
Cadmium	0.77	0.36	mg/kg	USEPA 2005e
Chromium	26.0	34.0	mg/kg	USEPA 2008
Copper	28.0	49.0	mg/kg	USEPA 2007a
Lead	11.0	56.0	mg/kg	USEPA 2005g
Nickel	210	130	mg/kg	USEPA 2007c
Selenium	1.20	0.63	mg/kg	USEPA 2007d
Zinc	46.0	79.0	mg/kg	USEPA 2007e
Organics				
PAHs - HMW	--	1.10	mg/kg	USEPA 2007f

Table B-4
Ecological Screening Statistics - Site 7 Soil
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Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Inorganics (MG/KG)																			
Aluminum	-- - --	36 / 36	4,010	17,300	NWSY-90-7-SC-FLR-173	8,462	2,613	9,197	8,129	pH < 5.5	2 / 5	--	12,200	3 / 36	1.42	YES	mean pH > 5.5		NO
Antimony	0.54 - 14.0	2 / 36	0.23	0.29	NWSY-90-7-SC-FLR-173	2.03	1.53	2.46	1.65	78.0	0 / 36	0.004	--	-- / --	--	NO	--	--	NO
Arsenic	-- - --	36 / 36	1.10	24.3	NWSY-90-7-SC-PER-148	2.44	3.81	3.51	1.85	18.0	1 / 36	1.35	6.36	1 / 36	3.82	YES	0.19	0.14	NO
Barium	-- - --	36 / 36	17.8	250	NWSY-90-7-SC-PER-148	62.0	37.4	72.5	55.5	330	0 / 36	0.76	--	-- / --	--	NO	--	--	NO
Beryllium	-- - --	36 / 36	0.39	1.60	NWSY-90-7-SC-PER-154	0.75	0.28	0.83	0.70	40.0	0 / 36	0.04	--	-- / --	--	NO	--	--	NO
Cadmium	0.21 - 2.30	1 / 36	0.12	0.12	NWSY-90-7-SC-PER-148	0.23	0.23	0.29	0.17	32.0	0 / 36	0.004	--	-- / --	--	NO	--	--	NO
Calcium [2]	-- - --	36 / 36	418	24,800	NWSY-90-7-SC-PER-148	1,651	3,992	2,776	992	NSV	-- / --	NSV	--	-- / --	--	NO	--	--	NO
Chromium	-- - --	36 / 36	5.10	39.0	NWSY-90-7-SC-FLR-173	10.0	6.70	11.9	8.75	64.0	0 / 36	0.61	--	-- / --	--	NO	--	--	NO
Cobalt	-- - --	36 / 36	1.10	5.80	NWSY-90-7-SC-PER-188	2.60	0.96	2.87	2.46	13.0	0 / 36	0.45	--	-- / --	--	NO	--	--	NO
Copper	-- - --	36 / 36	1.30	42.7	NWSY-90-7-SC-PER-148	6.76	8.96	9.29	4.61	70.0	0 / 36	0.61	--	-- / --	--	NO	--	--	NO
Cyanide	0.12 - 0.16	2 / 36	0.24	0.33	NWSY-90-7-SC-PER-148	0.081	0.052	0.095	0.074	15.8	0 / 36	0.02	--	-- / --	--	NO	--	--	NO
Iron	-- - --	36 / 36	3,640	57,800	NWSY-90-7-SC-FLR-173	8,693	9,428	11,348	6,807	5 < pH > 8	1 / 5	--	19,900	1 / 36	2.90	YES	mean pH in range		NO
Lead	5.80 - 5.80	35 / 36	1.80	204	NWSY-90-7-SC-FLR-144	24.9	37.6	35.5	13.0	120	1 / 36	1.70	17.4	12 / 36	11.7	YES	0.30	0.21	NO
Magnesium [2]	-- - --	36 / 36	170	1,320	NWSY-90-7-SC-PER-148	566	211	625	533	NSV	-- / --	NSV	--	-- / --	--	NO	--	--	NO
Manganese	-- - --	36 / 36	14.4	466	NWSY-90-7-SC-PER-148	112	95.7	139	76.7	220	4 / 36	2.12	324	1 / 36	1.44	YES	0.63	0.51	NO
Mercury	0.085 - 0.092	32 / 36	0.013	0.10	NWSY-90-7-SC-PER-153	0.037	0.019	0.042	0.033	0.10	1 / 36	1.00	0.111	0 / 36	0.90	NO	--	--	NO
Nickel	-- - --	36 / 36	2.20	7.00	NWSY-90-7-SC-PER-188	3.86	1.05	4.15	3.74	38.0	0 / 36	0.18	--	-- / --	--	NO	--	--	NO
Selenium	5.60 - 24.0	31 / 36	0.26	2.90	NWSY-90-7-SC-FLR-173	1.79	3.10	2.66	0.90	0.52	20 / 36	5.58	0.51	20 / 36	5.69	YES	5.12	3.44	NO[3]
Thallium	0.53 - 2.70	9 / 36	0.37	1.60	NWSY-90-7-SC-FLR-173	0.57	0.42	0.69	0.46	1.00	3 / 36	1.60	--	-- / --	--	YES	0.69	0.57	NO
Vanadium	-- - --	36 / 36	7.20	63.1	NWSY-90-7-SC-FLR-173	15.6	10.5	18.6	13.6	130	0 / 36	0.49	--	-- / --	--	NO	--	--	NO
Zinc	-- - --	36 / 36	8.20	119	NWSY-90-7-SC-PER-148	22.7	21.7	28.8	17.9	120	0 / 36	0.99	--	-- / --	--	NO	--	--	NO
Pesticide/Polychlorinated Biphenyls (UG/KG)																			
Endrin	3.60 - 4.70	1 / 36	2.40	2.40	NWSY-90-7-SC-PER-132	1.98	0.15	2.02	1.97	1.95	1 / 36	1.23	--	-- / --	--	YES	1.04	1.01	NO[3]
Semivolatile Organic Compounds (UG/KG)																			
Benzo(a)anthracene	57.0 - 76.0	1 / 36	18.4	18.4	NWSY-90-7-SC-FLR-144	31.2	3.05	32.1	31.0	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Benzo(b)fluoranthene	57.0 - 76.0	1 / 36	16.6	16.6	NWSY-90-7-SC-FLR-144	31.1	3.27	32.1	30.9	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
bis(2-Ethylhexyl)phthalate	360 - 480	1 / 36	256	256	NWSY-90-7-SC-FLR-146	199	16.7	204	198	30,000	0 / 36	0.01	--	-- / --	--	NO	--	--	NO
Chrysene	57.0 - 76.0	1 / 36	22.5	22.5	NWSY-90-7-SC-FLR-144	31.3	2.60	32.0	31.2	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
PAH (HMW)	368 - 494	1 / 36	365	365	NWSY-90-7-SC-FLR-144	209	30.1	218	208	18,000	0 / 36	0.02	--	-- / --	--	NO	--	--	NO
Volatile Organic Compounds (UG/KG)																			
Methylene chloride	11.0 - 123	1 / 36	42.2	42.2	NWSY-90-7-SC-PER-186	18.8	13.9	22.7	14.6	1,250	0 / 36	0.03	--	-- / --	--	NO	--	--	NO
o-Xylene	4.70 - 13.0	1 / 36	7.30	7.30	NWSY-90-7-SC-PER-178	3.79	1.03	4.08	3.69	1,300	0 / 36	0.01	--	-- / --	--	NO	--	--	NO
Dioxin/Furans (PG/G)																			
2,3,7,8-TCDD (dioxin)	0.071 - 1.13	6 / 36	0.10	0.27	NWSY-90-7-SC-FLR-139	0.13	0.098	0.16	0.11	4.00	0 / 36	0.07	--	-- / --	--	NO	--	--	NO
Other Parameters																			
pH	-- - --	5 / 5	4.85	6.36	CAS07-SS05-0024-0111	5.64	0.61	6.23	5.62	--	-- / --	--	--	-- / --	--	--	--	--	--

NSV - No Screening Value
1 - Count of detected samples exceeding or equaling Screening Value
2 - Macronutrient - Not considered to be a COPC
3 - See text

Table B-5
Exceedances - Site 7 Soil
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Cheatham Annex, Williamsburg, Virginia

Chemical	Soil ESV	95% UTL	CAS07-SO001	CAS07-SO002		CAS07-SO005	CAS07-SO006
			NWSY-90-7-SC-PER-132	NWSY-90-7-SC-PER-135	NWSY-90-7-SC-PER-183	NWSY-90-7-SC-FLR-138	NWSY-90-7-SC-FLR-139
			02/28/08	02/28/08	04/09/08	02/28/08	02/28/08
Inorganics (MG/KG)							
Aluminum	pH < 5.5	12,200	11,200	6,710	9,730	14,100	6,880
Antimony	78.0	--	3.7 UL	3.4 UL	13 UL	0.54 B	3.4 UL
Arsenic	18.0	6.36	4.3 L	1.5	2.6	2.0	1.5
Barium	330	--	24.2 J	57.7 J	90.4	51.7 J	101 J
Beryllium	40.0	--	0.47	0.97	1.3	0.6	1.1
Cadmium	32.0	--	0.25 UL	0.23 U	0.9 U	1.2 U	0.23 U
Chromium	64.0	--	23.3 J	5.1 J	7.4	16.3 J	7.6 J
Cobalt	13.0	--	1.1 J	3.3	5.1 J	1.9 J	2.8 J
Copper	70.0	--	7.5 J	3.3 J	2.9 J	3.5 J	12.9 J
Cyanide	15.8	--	0.14 U	0.13 U	0.14 U	0.14 U	0.14 U
Iron	pH < 5 or >8	19,900	11,100	4,050	5,750	15,400	3,640
Lead	120	17.4	20.2 J	6.9 J	10 J	6.6 J	84.3 J
Manganese	220	324	16.1 J	126 J	258	20.1 J	169 J
Mercury	0.10	0.111	0.044 K	0.021 K	0.025 J	0.036 K	0.043 K
Nickel	38.0	--	2.5	3.7	6 J	3.7	4.9
Selenium	0.52	0.51	1 L	0.47 J	22 U	1.2 J	0.37 J
Thallium	1.00	--	0.38 J	0.57 U	2.2 U	0.87	0.57 U
Vanadium	130	--	34.3 J	8.1 J	10.5 J	28.5 J	7.2 J
Zinc	120	--	22.9 J	14.2 J	15.3	11.3 J	51.2 J
Pesticide/PCBs (UG/KG)							
Endrin	1.95	--	2.4 J	3.8 U	3.9 U	3.9 U	3.8 U
Semivolatile Organic Compounds (UG/KG)							
Benzo(a)anthracene	HMW PAH	--	67 U	61 U	63 U	63 U	62 U
Benzo(b)fluoranthene	HMW PAH	--	67 U	61 U	63 U	63 U	62 U
bis(2-Ethylhexyl)phthalate	30,000	--	420 U	380 U	390 U	390 U	380 U
Chrysene	HMW PAH	--	67 U	61 U	63 U	63 U	62 U
PAH (HMW)	18,000	--	438 U	399 U	407 U	407 U	403 U
Volatile Organic Compounds (UG/KG)							
Methylene chloride	1,250	--	25.6 B	69.2 B	69.4 B	70.7 B	51.1 B
o-Xylene	1,300	--	4.7 U	7.4 U	7.7 U	8.1 U	6.9 U
Explosives (UG/KG)							
No Detections	--	--	NA	NA	NA	NA	NA
Dioxin/Furans (PG/G)							
2,3,7,8-TCDD (dioxin)	4.00	--	0.248 U	0.138 U	0.119 J	0.19 U	0.267 J
Other Parameters							
pH	--	--	NA	NA	NA	NA	NA

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

Table B-5
Exceedances - Site 7 Soil
Site7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Soil ESV	95% UTL	CAS07-SO007	CAS07-SO008			CAS07-SO009
			NWSY-90-7-SC-FLR-140	NWSY-90-7-SC-PER-143	NWSY-90-7-SC-PER-184	NWSY-90-7-SC-PER-185	NWSY-90-7-SC-FLR-144
			02/28/08	02/28/08	04/09/08	04/09/08	02/28/08
Inorganics (MG/KG)							
Aluminum	pH < 5.5	12,200	11,000	7,400	7,350	8,900	7,220
Antimony	78.0	--	3.3 UL	3.5 UL	3.4 UL	0.23 L	3.3 UL
Arsenic	18.0	6.36	1.2	1.4	1.8	1.9	1.8
Barium	330	--	42.2 J	69.1 J	57.6	53.7	90.1 J
Beryllium	40.0	--	0.39	0.91	0.39	0.41	0.85
Cadmium	32.0	--	1.1 U	0.23 U	0.22 U	0.22 U	0.22 U
Chromium	64.0	--	15.3 J	7.6 J	7.4	10	11.6 J
Cobalt	13.0	--	2 J	2.9	2.1 J	2.3 J	2.4 J
Copper	70.0	--	3.7 J	5.2 J	2.9	7	39.6 J
Cyanide	15.8	--	0.13 U	0.14 U	0.13 U	0.13 U	0.14 U
Iron	pH < 5 or >8	19,900	17,000	3,680	6,200	7,850	7,120
Lead	120	17.4	2.2 J	81.9 J	13.6	37.3	204 J
Manganese	220	324	15 J	114 J	30.4	69.2	184 J
Mercury	0.10	0.111	0.047 K	0.031 K	0.025 J	0.08 J	0.043 K
Nickel	38.0	--	2.5	3.9	3.5	3.9	4.6
Selenium	0.52	0.51	1.2 J	0.26 J	5.6 U	5.5 U	0.58 J
Thallium	1.00	--	1.00	0.58 U	2.2 U	2.2 U	0.56 U
Vanadium	130	--	26.1 J	7.5 J	12.7	15.7	10.2 J
Zinc	120	--	12.5 J	23.2 J	13.2	26.6	79.4 J
Pesticide/PCBs (UG/KG)							
Endrin	1.95	--	3.9 U	3.8 U	3.9 U	3.8 U	3.9 U
Semivolatile Organic Compounds (UG/KG)							
Benzo(a)anthracene	HMW PAH	--	62 U	63 U	62 U	62 U	18.4 J
Benzo(b)fluoranthene	HMW PAH	--	62 U	63 U	62 U	62 U	16.6 J
bis(2-Ethylhexyl)phthalate	30,000	--	380 U	390 U	380 U	390 U	380 U
Chrysene	HMW PAH	--	62 U	63 U	62 U	62 U	22.5 J
PAH (HMW)	18,000	--	403 U	407 U	403 U	403 U	365 J
Volatile Organic Compounds (UG/KG)							
Methylene chloride	1,250	--	36 B	43.3 B	60.2 B	50 B	56.3 B
o-Xylene	1,300	--	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Explosives (UG/KG)							
No Detections	--	--	NA	NA	NA	NA	NA
Dioxin/Furans (PG/G)							
2,3,7,8-TCDD (dioxin)	4.00	--	0.182 U	0.201 U	0.109 U	0.135 J	0.189 U
Other Parameters							
pH	--	--	NA	NA	NA	NA	NA

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

Table B-5
Exceedances - Site 7 Soil
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Cheatham Annex, Williamsburg, Virginia

Chemical	Soil ESV	95% UTL	CAS07-SO010	CAS07-SO011	CAS07-SO012	CAS07-SO013	
			NWSY-90-7-SC-FLR-145	NWSY-90-7-SC-FLR-146	NWSY-90-7-SC-FLR-147	NWSY-90-7-SC-PER-148	NWSY-90-7-SC-PER-149
			02/28/08	02/28/08	02/28/08	02/28/08	02/28/08
Inorganics (MG/KG)							
Aluminum	pH < 5.5	12,200	6,370	7,140	8,830 J	6,990 J	7,630 J
Antimony	78.0	--	3.4 UL	3.3 UL	3.2 UL	4.1 UL	3.5 UL
Arsenic	18.0	6.36	1.1	2.1	1.8 L	24.3	1.9
Barium	330	--	44.5 J	57.5 J	48.3 J	250 J	56.8 J
Beryllium	40.0	--	0.52	0.75	0.57	0.94	0.7
Cadmium	32.0	--	0.23 U	0.22 U	0.21 UL	0.12 J	0.24 U
Chromium	64.0	--	5.3 J	6.8 J	8.7 J	18 J	6.3 J
Cobalt	13.0	--	2.3 J	2.2 J	2.2 L	2 J	2.1 J
Copper	70.0	--	2.4 J	9.8 J	2.6	42.7	3.6
Cyanide	15.8	--	0.14 U	0.13 U	0.13 U	0.33	0.15 U
Iron	pH < 5 or >8	19,900	4,450	4,690	8,060 J	4,240 J	4,730 J
Lead	120	17.4	8 J	41.5 J	6.4 J	42.1 J	11.5 J
Manganese	220	324	50.3 J	122 J	92.9 J	466 J	89.4 J
Mercury	0.10	0.111	0.019 K	0.037 K	0.027 K	0.048 K	0.026 K
Nickel	38.0	--	3.2	4.1	3.2 J	6.6 J	3.7 J
Selenium	0.52	0.51	0.41 J	0.63 J	0.77 L	0.33 J	0.52 J
Thallium	1.00	--	0.57 U	0.56 U	0.53 UL	2.7 U	0.59 U
Vanadium	130	--	9.5 J	10 J	15.5 J	16.3 J	11.2 J
Zinc	120	--	10.2 J	29 J	9.8 L	119	20.3
Pesticide/PCBs (UG/KG)							
Endrin	1.95	--	3.8 U	3.8 U	3.6 U	4.7 U	4.1 U
Semivolatile Organic Compounds (UG/KG)							
Benzo(a)anthracene	HMW PAH	--	61 U	60 U	59 U	76 U	66 U
Benzo(b)fluoranthene	HMW PAH	--	61 U	60 U	59 U	76 U	66 U
bis(2-Ethylhexyl)phthalate	30,000	--	380 U	256 J	370 U	480 U	410 U
Chrysene	HMW PAH	--	61 U	60 U	59 U	76 U	66 U
PAH (HMW)	18,000	--	399 U	390 U	381 U	494 U	429 U
Volatile Organic Compounds (UG/KG)							
Methylene chloride	1,250	--	57.3 B	77.9 B	87.9 B	123 B	13.1 B
o-Xylene	1,300	--	5.7 U	8.4 U	8 U	13 UJ	6.5 U
Explosives (UG/KG)							
No Detections	--	--	NA	NA	NA	NA	NA
Dioxin/Furans (PG/G)							
2,3,7,8-TCDD (dioxin)	4.00	--	0.175 U	0.104 J	0.102 J	0.289 U	0.104 U
Other Parameters							
pH	--	--	NA	NA	NA	NA	NA

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

Table B-5
Exceedances - Site 7 Soil
Site7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Soil ESV	95% UTL	CAS07-SO014			CAS07-SO015	
			NWSY-90-7-SC-PER-150	NWSY-90-7-SC-PER-151	NWSY-90-7-SC-PER-152	NWSY-90-7-SC-PER-153	NWSY-90-7-SC-PER-154
			02/28/08	02/28/08	02/28/08	02/28/08	02/28/08
Inorganics (MG/KG)							
Aluminum	pH < 5.5	12,200	7,760 J	7,190 J	7,300 J	7,150 J	4,010 J
Antimony	78.0	--	4.2 UL	3.4 UL	3.5 UL	3.6 UL	3.2 UL
Arsenic	18.0	6.36	2.0	1.5	1.4	1.6	3.5
Barium	330	--	42 J	54 J	54.3 J	54.6 J	17.8 J
Beryllium	40.0	--	0.5	0.69	0.61	0.74	1.6
Cadmium	32.0	--	0.28 U	0.23 U	0.23 U	0.24 U	1.1 U
Chromium	64.0	--	7.7 J	5 J	5.6 J	5.9 J	16.2 J
Cobalt	13.0	--	1.9 J	2.1 J	1.8 J	2.1 J	4
Copper	70.0	--	4.9	3	2.7	3.8	4.8
Cyanide	15.8	--	0.24	0.13 U	0.14 U	0.15 U	0.13 U
Iron	pH < 5 or >8	19,900	6,760 J	4,010 J	4,410 J	5,150 J	19,800 J
Lead	120	17.4	15.6 J	10.3 J	8.1 J	11.8 J	1.8 J
Manganese	220	324	102 J	204 J	110 J	125 J	100 J
Mercury	0.10	0.111	0.058 K	0.03 K	0.019 K	0.1 K	0.092 U
Nickel	38.0	--	3.9 J	3.4 J	3.2 J	3.4 J	2.8 J
Selenium	0.52	0.51	0.82 J	0.63 J	0.48 J	0.47 J	1.7 J
Thallium	1.00	--	0.71 U	0.57 U	0.58 U	0.6 U	1.4
Vanadium	130	--	18.4 J	9.3 J	10.2 J	10.6 J	18.6 J
Zinc	120	--	23.3	13.7	11.6	18.5	16.4
Pesticide/PCBs (UG/KG)							
Endrin	1.95	--	4.6 U	4 U	3.9 U	4.1 U	3.6 U
Semivolatile Organic Compounds (UG/KG)							
Benzo(a)anthracene	HMW PAH	--	76 U	63 U	63 U	66 U	59 U
Benzo(b)fluoranthene	HMW PAH	--	76 U	63 U	63 U	66 U	59 U
bis(2-Ethylhexyl)phthalate	30,000	--	480 U	400 U	390 U	410 U	370 U
Chrysene	HMW PAH	--	76 U	63 U	63 U	66 U	59 U
PAH (HMW)	18,000	--	494 U	412 U	407 U	429 U	381 U
Volatile Organic Compounds (UG/KG)							
Methylene chloride	1,250	--	14.8 B	11 B	9.8 B	13.5 B	14.8 B
o-Xylene	1,300	--	13 U	6.4 U	6.9 U	6.8 U	6.9 U
Explosives (UG/KG)							
No Detections	--	--	NA	NA	NA	NA	NA
Dioxin/Furans (PG/G)							
2,3,7,8-TCDD (dioxin)	4.00	--	0.217 J	0.088 U	0.15 U	0.272 U	0.457 U
Other Parameters							
pH	--	--	NA	NA	NA	NA	NA

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

Table B-5
Exceedances - Site 7 Soil
Site7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Soil ESV	95% UTL	CAS07-SO016		CAS07-SO018		CAS07-SO019	
			NWSY-90-7-SC-PER-159	NWSY-90-7-SC-PER-186	NWSY-90-7-SC-PER-161	NWSY-90-7-SC-PER-162	NWSY-90-7-SC-PER-163	NWSY-90-7-SC-PER-164
			02/29/08	04/09/08	02/29/08	02/29/08	02/29/08	02/29/08
Inorganics (MG/KG)								
Aluminum	pH < 5.5	12,200	6,220 J	6,060	7,500 J	8,460 J	5,550 J	7,000 J
Antimony	78.0	--	3.2 UL	3.6 UL	3.2 UL	3.3 UL	3.3 UL	3.4 UL
Arsenic	18.0	6.36	1.4	1.2	1.4	1.4	1.3	1.4
Barium	330	--	42.6 J	44.9	69.1 J	51.4 J	54 J	50.4 J
Beryllium	40.0	--	0.39	0.39	0.89	0.48	0.66	0.73
Cadmium	32.0	--	0.21 U	0.24 U	0.22 U	0.22 U	0.22 U	0.22 U
Chromium	64.0	--	7 J	5.5	5.4 J	8.3 J	5.5 J	6.2 J
Cobalt	13.0	--	1.6 J	2.1 J	2.6 J	1.9 J	2.5 J	2.3 J
Copper	70.0	--	3.4 J	1.3 J	3.5 J	2.5 J	6 J	1.5 J
Cyanide	15.8	--	0.12 U	0.13 U	0.13 U	0.14 U	0.13 U	0.14 U
Iron	pH < 5 or >8	19,900	6,480 J	4,280	4,360 J	8,230 J	4,050 J	5,550 J
Lead	120	17.4	10.8 J	6.6 K	14.7 J	9.2 J	34.4 J	4.8 J
Manganese	220	324	31.6 J	50.9	149 J	37.4 J	143 J	63.5 J
Mercury	0.10	0.111	0.015 K	0.023 J	0.019 K	0.085 U	0.046 K	0.019 K
Nickel	38.0	--	2.2 J	3	3.8 J	3 J	3.6 J	3.2 J
Selenium	0.52	0.51	0.51 J	6 U	0.41 J	0.78 J	0.62 J	0.59 J
Thallium	1.00	--	0.37 J	2.4 U	0.54 U	0.55 U	1.1 U	0.56 U
Vanadium	130	--	12.4 J	8.9	9.1 J	15.9 J	9.4 J	11 J
Zinc	120	--	8.3 J	8.3	13.9 J	9.2 J	31.7 J	8.2 J
Pesticide/PCBs (UG/KG)								
Endrin	1.95	--	3.6 U	4 U	3.7 U	3.8 U	3.8 U	3.9 U
Semivolatile Organic Compounds (UG/KG)								
Benzo(a)anthracene	HMW PAH	--	57 U	65 U	60 U	61 U	60 U	62 U
Benzo(b)fluoranthene	HMW PAH	--	57 U	65 U	60 U	61 U	60 U	62 U
bis(2-Ethylhexyl)phthalate	30,000	--	360 U	400 U	380 U	380 U	380 U	390 U
Chrysene	HMW PAH	--	57 U	65 U	60 U	61 U	60 U	62 U
PAH (HMW)	18,000	--	368 U	420 U	390 U	394 U	390 U	403 U
Volatile Organic Compounds (UG/KG)								
Methylene chloride	1,250	--	33.1 B	42.2	37.7 B	25 B	42.7 B	15.2 B
o-Xylene	1,300	--	6.7 U	6.4 U	6.5 U	6.3 U	8.1 U	7.5 U
Explosives (UG/KG)								
No Detections	--	--	NA	NA	NA	NA	NA	NA
Dioxin/Furans (PG/G)								
2,3,7,8-TCDD (dioxin)	4.00	--	0.0712 U	0.113 U	0.623 U	0.187 U	1.13 U	0.127 U
Other Parameters								
pH	--	--	NA	NA	NA	NA	NA	NA

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

Table B-5
Exceedances - Site 7 Soil
Site7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Soil ESV	95% UTL	CAS07-SO021	CAS07-SO022	CAS07-SO023		
			NWSY-90-7-SC-FLR-166	NWSY-90-7-SC-FLR-167	NWSY-90-7-SC-PER-169	NWSY-90-7-SC-PER-170	NWSY-90-7-SC-PER-187
			02/29/08	02/29/08	02/29/08	02/29/08	04/09/08
Inorganics (MG/KG)							
Aluminum	pH < 5.5	12,200	7,140	8,190 J	9,100 J	8,610 J	8,390
Antimony	78.0	--	3.5	3.3 UL	3.3 UL	3.4 UL	14 UL
Arsenic	18.0	6.36	1.6	2.1	1.4	1.5	1.8 J
Barium	330	--	64.8	64.9 J	47.2 J	47.7 J	80.3
Beryllium	40.0	--	0.93	0.53	0.61	0.58	1 J
Cadmium	32.0	--	0.23	0.22 U	0.88 U	0.92 U	0.95 U
Chromium	64.0	--	5.9	10.1 J	9.6 J	9.5 J	6.8
Cobalt	13.0	--	2.9	2.6 J	2.2 J	2 J	4.1 J
Copper	70.0	--	14.3	3.7 J	2.1 J	2.2 J	5.1 J
Cyanide	15.8	--	0.14	0.13 U	0.13 U	0.14 U	0.14 U
Iron	pH < 5 or >8	19,900	3,900	10,200 J	8,820 J	8,750 J	5,070
Lead	120	17.4	58.5	4 J	6.3 J	8 J	18.9 J
Manganese	220	324	196	33.2 J	27.7 J	29 J	241
Mercury	0.10	0.111	0.042	0.088 U	0.031 K	0.043 K	0.088 U
Nickel	38.0	--	4.6	3.1 J	3.7 J	3.4 J	5.2 J
Selenium	0.52	0.51	0.51	0.67 J	0.73 J	0.63 J	24 U
Thallium	1.00	--	0.58	0.55 U	0.33 J	0.41 J	2.4 U
Vanadium	130	--	9.5	18.7 J	17.4 J	16.9 J	9.6 J
Zinc	120	--	39.3	9.4 J	9.4 J	9.9 J	21.2
Pesticide/PCBs (UG/KG)							
Endrin	1.95	--	4	3.7 U	3.8 U	3.9 U	4.1 U
Semivolatile Organic Compounds (UG/KG)							
Benzo(a)anthracene	HMW PAH	--	64	59 U	61 U	62 U	64 U
Benzo(b)fluoranthene	HMW PAH	--	64	59 U	61 U	62 U	64 U
bis(2-Ethylhexyl)phthalate	30,000	--	400	370 U	380 U	390 U	400 U
Chrysene	HMW PAH	--	64	59 U	61 U	62 U	64 U
PAH (HMW)	18,000	--	416	381 U	394 U	403 U	416 U
Volatile Organic Compounds (UG/KG)							
Methylene chloride	1,250	--	11	25.7 B	21.8 B	12.1 B	29.7 B
o-Xylene	1,300	--	7.6	6.1 U	6.3 U	6.8 U	6.9 U
Explosives (UG/KG)							
No Detections	--	--	NA	NA	NA	NA	NA
Dioxin/Furans (PG/G)							
2,3,7,8-TCDD (dioxin)	4.00	--	0.506	0.348 U	0.176 U	0.163 U	0.205 U
Other Parameters							
pH	--	--	NA	NA	NA	NA	NA

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

Table B-5
Exceedances - Site 7 Soil
Site7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Soil ESV	95% UTL	CAS07-SO024			CAS07-SO025	CAS07-SO026
			NWSY-90-7-SC-PER-172	NWSY-90-7-SC-PER-188	NWSY-90-7-SC-PER-193	NWSY-90-7-SC-FLR-173	NWSY-90-7-SC-FLR-174
			02/29/08	04/09/08	04/09/08	02/29/08	02/29/08
Inorganics (MG/KG)							
Aluminum	pH < 5.5	12,200	7,080 J	9,730	11,900	17,300 J	10,600 J
Antimony	78.0	--	3.4 UL	14 UL	14 UL	0.29 L	3.4 UL
Arsenic	18.0	6.36	1.4	2.3	2.9	2.6	1.8
Barium	330	--	60.8 J	83.4	98.5	25.5 J	49.9 J
Beryllium	40.0	--	0.98	1.2	1.3	0.67	0.57
Cadmium	32.0	--	0.23 U	0.91 U	0.96 U	2.3 U	0.23 U
Chromium	64.0	--	5.2 J	6.3	8.1	39 J	11.8 J
Cobalt	13.0	--	4.1	5 J	5.8 J	2 J	2.1 J
Copper	70.0	--	6.5 J	5.5 J	6.4	2.9 J	3.4 J
Cyanide	15.8	--	0.14 U	0.13 U	0.14 U	0.14 U	0.13 U
Iron	pH < 5 or >8	19,900	3,800 J	4,820	5,820	57,800 J	10,700 J
Lead	120	17.4	20.4 J	12.8 J	13.9 J	5.8 U	7.5 J
Manganese	220	324	157 J	225	270	17 J	22.1 J
Mercury	0.10	0.111	0.025 K	0.027 J	0.027 J	0.014 K	0.026 K
Nickel	38.0	--	4 J	5.6 J	7 J	3.2 J	3.7 J
Selenium	0.52	0.51	0.36 J	23 U	24 U	2.9 J	0.81 J
Thallium	1.00	--	0.57 U	2.3 U	2.4 U	1.6	0.57
Vanadium	130	--	7.8 J	9.2 J	11.8 J	63.1 J	21 J
Zinc	120	--	17.4 J	14.9	19.6	15.3 J	20.2 J
Pesticide/PCBs (UG/KG)							
Endrin	1.95	--	3.9 U	4 U	4.1 U	4 U	3.8 U
Semivolatile Organic Compounds (UG/KG)							
Benzo(a)anthracene	HMW PAH	--	62 U	64 U	63 U	63 U	59 U
Benzo(b)fluoranthene	HMW PAH	--	62 U	64 U	63 U	63 U	59 U
bis(2-Ethylhexyl)phthalate	30,000	--	390 U	400 U	400 U	390 U	370 U
Chrysene	HMW PAH	--	62 U	64 U	63 U	63 U	59 U
PAH (HMW)	18,000	--	403 U	416 U	412 U	407 U	386 U
Volatile Organic Compounds (UG/KG)							
Methylene chloride	1,250	--	13.3 B	25.5 B	24.6 B	15.4 B	17.9 B
o-Xylene	1,300	--	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Explosives (UG/KG)							
No Detections	--	--	NA	NA	NA	NA	NA
Dioxin/Furans (PG/G)							
2,3,7,8-TCDD (dioxin)	4.00	--	0.188 U	0.233 U	0.187 U	0.174 U	0.121 U
Other Parameters							
pH	--	--	NA	NA	NA	NA	NA

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

Table B-5
Exceedances - Site 7 Soil
Site7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Soil ESV	95% UTL	CAS07-SO027		CAS07-SO028			CAS07-SO035
			NWSY-90-7-SC-PER-175	NWSY-90-7-SC-PER-176	NWSY-90-7-SC-PER-177	NWSY-90-7-SC-PER-178	NWSY-90-7-SC-PER-179	CAS07-SS01-0024-0111
			02/29/08	02/29/08	02/29/08	02/29/08	02/29/08	01/25/11
Inorganics (MG/KG)								
Aluminum	pH < 5.5	12,200	13,500 J	9,590	6,810	7,910	7,840	NA
Antimony	78.0	--	3.3 UL	3.3 UL	4.1 UL	3.5 UL	3.3 UL	NA
Arsenic	18.0	6.36	1.1	1.5	2.0	1.3	1.1	NA
Barium	330	--	33.2 J	52.6	76	54.6	53.1	NA
Beryllium	40.0	--	0.43	0.69	0.9	0.75	0.77	NA
Cadmium	32.0	--	0.88 U	0.22 U	0.27 U	0.23 U	0.22 U	NA
Chromium	64.0	--	19 J	10	6.7	6.7	6.6	NA
Cobalt	13.0	--	2 J	2.4 J	2.8 J	2.9	2.9	NA
Copper	70.0	--	2.6 J	3.4	8.9	2.5	2.7	NA
Cyanide	15.8	--	0.14 U	0.14 U	0.16 U	0.14 U	0.14 U	NA
Iron	pH < 5 or >8	19,900	18,000 J	8,480	4,240	5,300	5,230	NA
Lead	120	17.4	3.1 J	7.2 J	62.9 J	6.5 J	7 J	NA
Manganese	220	324	14.4 J	36.2	166	56.7	57.3	NA
Mercury	0.10	0.111	0.041 K	0.013 K	0.071 K	0.022 K	0.023 K	NA
Nickel	38.0	--	3.3 J	4	4.2	4.1	4	NA
Selenium	0.52	0.51	1.5 J	0.7 J	0.66 J	0.42 J	0.38 J	NA
Thallium	1.00	--	0.44 J	0.55 U	0.68 U	0.58 U	0.55 U	NA
Vanadium	130	--	29 J	17.9	9.6	11.6	11.2	NA
Zinc	120	--	11.3 J	13.5 J	35.5 J	9.6 J	9.7 J	NA
Pesticide/PCBs (UG/KG)								
Endrin	1.95	--	3.9 U	3.8 U	4.6 U	3.9 U	3.9 U	NA
Semivolatile Organic Compounds (UG/KG)								
Benzo(a)anthracene	HMW PAH	--	62 U	61 U	73 U	62 U	62 U	NA
Benzo(b)fluoranthene	HMW PAH	--	62 U	61 U	73 U	62 U	62 U	NA
bis(2-Ethylhexyl)phthalate	30,000	--	390 U	380 U	460 U	390 U	390 U	NA
Chrysene	HMW PAH	--	62 U	61 U	73 U	62 U	62 U	NA
PAH (HMW)	18,000	--	403 U	399 U	477 U	403 U	403 U	NA
Volatile Organic Compounds (UG/KG)								
Methylene chloride	1,250	--	11.2 B	16.5 B	13.5 B	16.7 B	15.3 B	NA
o-Xylene	1,300	--	5.5 U	6 U	6.4 U	7.3 J	6.1 UJ	NA
Explosives (UG/KG)								
No Detections	--	--	NA	NA	NA	NA	NA	NA
Dioxin/Furans (PG/G)								
2,3,7,8-TCDD (dioxin)	4.00	--	0.132 U	0.153 U	0.19 U	0.136 U	0.181 U	NA
Other Parameters								
pH	--	--	NA	NA	NA	NA	NA	6.11 H3

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

Table B-5
Exceedances - Site 7 Soil
Site7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Soil ESV	95% UTL	CAS07-SO036	CAS07-SO037	CAS07-SO038	CAS07-SO039	
			CAS07-SS02-0024-0111	CAS07-SS03-0024-0111	CAS07-SS04-0024-0111	CAS07-SS05-0024-0111	CAS07-SS05P-0024-0111
			01/25/11	01/25/11	01/25/11	01/25/11	01/25/11
Inorganics (MG/KG)							
Aluminum	pH < 5.5	12,200	NA	NA	NA	NA	NA
Antimony	78.0	--	NA	NA	NA	NA	NA
Arsenic	18.0	6.36	NA	NA	NA	NA	NA
Barium	330	--	NA	NA	NA	NA	NA
Beryllium	40.0	--	NA	NA	NA	NA	NA
Cadmium	32.0	--	NA	NA	NA	NA	NA
Chromium	64.0	--	NA	NA	NA	NA	NA
Cobalt	13.0	--	NA	NA	NA	NA	NA
Copper	70.0	--	NA	NA	NA	NA	NA
Cyanide	15.8	--	NA	NA	NA	NA	NA
Iron	pH < 5 or >8	19,900	NA	NA	NA	NA	NA
Lead	120	17.4	NA	NA	NA	NA	NA
Manganese	220	324	NA	NA	NA	NA	NA
Mercury	0.10	0.111	NA	NA	NA	NA	NA
Nickel	38.0	--	NA	NA	NA	NA	NA
Selenium	0.52	0.51	NA	NA	NA	NA	NA
Thallium	1.00	--	NA	NA	NA	NA	NA
Vanadium	130	--	NA	NA	NA	NA	NA
Zinc	120	--	NA	NA	NA	NA	NA
Pesticide/PCBs (UG/KG)							
Endrin	1.95	--	NA	NA	NA	NA	NA
Semivolatile Organic Compounds (UG/KG)							
Benzo(a)anthracene	HMW PAH	--	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	HMW PAH	--	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	30,000	--	NA	NA	NA	NA	NA
Chrysene	HMW PAH	--	NA	NA	NA	NA	NA
PAH (HMW)	18,000	--	NA	NA	NA	NA	NA
Volatile Organic Compounds (UG/KG)							
Methylene chloride	1,250	--	NA	NA	NA	NA	NA
o-Xylene	1,300	--	NA	NA	NA	NA	NA
Explosives (UG/KG)							
No Detections	--	--	NA	NA	NA	NA	NA
Dioxin/Furans (PG/G)							
2,3,7,8-TCDD (dioxin)	4.00	--	NA	NA	NA	NA	NA
Other Parameters							
pH	--	--	5.27 H3	4.85 H3	5.62 H3	6.3 H3	6.36 H3

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

Table B-6
Screening Statistics - Surface Soil - Mammal/Bird Eco-SSLs
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Maximum Concentration Detected	95% UCL (Norm)	Arithmetic Mean	Mammal Eco-SSL	Frequency of Exceedance	Maximum Hazard Quotient	95% UCL Hazard Quotient	Mean Hazard Quotient	Bird Eco-SSL	Frequency of Exceedance	Maximum Hazard Quotient	95% UCL Hazard Quotient	Mean Hazard Quotient
Inorganics (MG/KG)															
Arsenic	-- - --	36 / 36	24.3	3.51	2.44	46.0	0 / 36	0.53	0.08	0.05	43.0	0 / 36	0.57	0.08	0.06
Cadmium	0.21 - 2.30	1 / 36	0.12	0.29	0.23	0.36	0 / 36	0.33	0.82	0.64	0.77	0 / 36	0.16	0.38	0.30
Chromium	-- - --	36 / 36	39.0	11.9	10.0	34.0	1 / 36	1.15	0.35	0.30	26.0	1 / 36	1.50	0.46	0.39
Copper	-- - --	36 / 36	42.7	9.29	6.76	49.0	0 / 36	0.87	0.19	0.14	28.0	2 / 36	1.53	0.33	0.24
Lead	5.80 - 5.80	35 / 36	204	35.5	24.9	56.0	5 / 36	3.64	0.63	0.45	11.0	17 / 36	18.5	3.23	2.27
Nickel	-- - --	36 / 36	7.00	4.15	3.86	130	0 / 36	0.05	0.03	0.03	210	0 / 36	0.03	0.02	0.02
Selenium	5.60 - 24.0	31 / 36	2.90	2.66	1.79	0.63	16 / 36	4.60	4.22	2.84	1.20	5 / 36	2.42	2.22	1.49
Zinc	-- - --	36 / 36	119	28.8	22.7	79.0	2 / 36	1.51	0.37	0.29	46.0	3 / 36	2.59	0.63	0.49
Semivolatile Organic Compounds (UG/KG)															
PAH (HMW)	368 - 494	1 / 36	365	218	209	1,100	0 / 36	0.33	0.20	0.19	--	-- - --	--	--	--

Shaded cells indicate HQ > 1

Table B-7
Hazard Quotients for Terrestrial Food Web Exposures - Initial (Maximum)
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Meadow Vole			Short-tailed Shrew			Red Fox			American Robin			Mourning Dove			Red-tailed Hawk		
	NOAEL HQ	MATC HQ	LOAEL HQ	NOAEL HQ	MATC HQ	LOAEL HQ	NOAEL HQ	MATC HQ	LOAEL HQ	NOAEL HQ	MATC HQ	LOAEL HQ	NOAEL HQ	MATC HQ	LOAEL HQ	NOAEL HQ	MATC HQ	LOAEL HQ
Metals																		
Chromium	2.81E-01	1.26E-01	5.62E-02	6.30E+00	2.82E+00	1.26E+00	1.51E-01	6.73E-02	3.01E-02	2.49E+00	1.11E+00	4.98E-01	3.79E-01	1.69E-01	7.57E-02	5.30E-02	2.37E-02	1.06E-02
Copper	1.75E-01	1.36E-01	1.05E-01	4.50E-01	3.49E-01	2.70E-01	5.97E-02	5.25E-02	4.62E-02	3.63E-01	2.10E-01	1.21E-01	5.05E-01	2.92E-01	1.69E-01	1.49E-01	8.63E-02	4.99E-02
Lead	2.43E-01	1.77E-01	1.28E-01	2.27E+00	1.65E+00	1.20E+00	2.07E-01	1.50E-01	1.09E-01	1.13E+00	5.07E-01	2.27E-01	1.85E+00	1.31E+00	9.27E-01	1.61E-01	7.22E-02	3.23E-02
Mercury	4.66E-01	2.08E-01	9.32E-02	7.60E+00	3.40E+00	1.52E+00	2.63E-02	2.04E-02	1.58E-02	2.26E-01	1.45E-01	9.24E-02	4.66E-02	3.29E-02	2.33E-02	1.62E-03	1.03E-03	6.61E-04
Selenium	8.68E-01	6.76E-01	5.26E-01	1.50E+00	1.17E+00	9.11E-01	2.59E-01	2.02E-01	1.57E-01	4.92E-01	2.66E-01	1.44E-01	1.17E+00	8.29E-01	5.87E-01	9.25E-02	5.01E-02	2.71E-02
Zinc	1.05E-01	4.69E-02	2.10E-02	6.70E-01	2.99E-01	1.34E-01	7.74E-02	3.46E-02	1.55E-02	3.85E-01	1.72E-01	7.70E-02	2.14E-01	9.57E-02	4.28E-02	7.55E-02	3.38E-02	1.51E-02
Pesticides																		
Endrin	8.17E-04	3.66E-04	1.63E-04	5.76E-03	2.58E-03	1.15E-03	1.09E-03	4.87E-04	2.18E-04	2.53E-02	1.13E-02	5.05E-03	1.28E-02	5.73E-03	2.56E-03	8.87E-03	3.97E-03	1.77E-03
Dioxin/Furans																		
2,3,7,8-TCDD (dioxin)	5.43E-03	1.72E-03	5.43E-04	7.30E-02	2.31E-02	7.30E-03	6.67E-03	2.11E-03	6.67E-04	2.35E-03	7.43E-04	2.35E-04	6.78E-04	2.15E-04	6.78E-05	3.94E-04	1.25E-04	3.94E-05

Shaded cells indicate HQ > 1

Table B-8
Summary of Meadow Vole Exposure Doses - Initial (Maximum)
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Maximum Surface Soil Concentration (mg/kg)	Soil-Worm BAF	Terrestrial Invertebrate Concentration (mg/kg dw)	Soil-Plant BAF	Terrestrial Plant Concentration (mg/kg dw)	Maximum Surface Water Concentration (mg/L)	Dietary Intake (mg/kg/day)	NOAEL TRV (mg/kg/d)	MATC TRV (mg/kg/d)	LOAEL TRV (mg/kg/d)	NOAEL HQ	MATC HQ	LOAEL HQ
Metals													
Chromium	39.0	3.162	1.23E+02	0.084	3.27E+00	0	6.74E-01	2.40	5.37	12.0	2.81E-01	1.26E-01	5.62E-02
Copper	42.7	Regression	1.44E+01	Regresson	8.57E+00	0	9.81E-01	5.60	7.23	9.34	1.75E-01	1.36E-01	1.05E-01
Lead	204	Regression	5.88E+01	Regresson	5.24E+00	0	1.14E+00	4.70	6.47	8.90	2.43E-01	1.77E-01	1.28E-01
Mercury	0.10	20.63	2.06E+00	Regresson	1.06E-01	0	1.49E-02	0.032	0.072	0.16	4.66E-01	2.08E-01	9.32E-02
Selenium	2.90	Regression	2.02E+00	Regresson	1.64E+00	0	1.74E-01	0.20	0.26	0.33	8.68E-01	6.76E-01	5.26E-01
Zinc	119	Regression	4.10E+02	Regresson	6.85E+01	0	7.90E+00	75.4	169	377	1.05E-01	4.69E-02	2.10E-02
Pesticides													
Endrin	0.00240	3.600	8.64E-03	0.535	1.28E-03	0	1.50E-04	0.18	0.41	0.92	8.17E-04	3.66E-04	1.63E-04
Dioxin/Furans													
2,3,7,8-TCDD (dioxin)	0.00000027	Regression	5.81E-07	0.135	3.62E-08	0	5.43E-09	0.000001	0.000003	0.00001	5.43E-03	1.72E-03	5.43E-04

$$DI_x = \frac{[[\sum_i (FIR)(FC_{xi})(PDF_i)] + [(FIR)(SC_x)(PDS)] + [(WIR)(WC_x)]]}{BW}$$

DI =	Chemical-specific	= Dietary intake for chemical (mg chemical/kg body weight/day)
FIR =	0.0031	= Food ingestion rate (kg/day dry weight)
FCxi =	Chemical-specific	= Concentration of chemical in food item (soil invertebrates, dry weight basis)
PDFi =	0.020	= Proportion of diet composed of food item (soil invertebrates)
FCxi =	Chemical-specific	= Concentration of chemical in food item (terrestrial plants, dry weight basis)
PDFi =	0.956	= Proportion of diet composed of food item (terrestrial plants)
SCx =	Chemical-specific	= Concentration of chemical in soil (mg/kg, dry weight)
PDS =	0.024	= Proportion of diet composed of soil
WIR =	0.0133	= Water ingestion rate (L/day)
WC =	Chemical-specific	= Concentration of chemical in water (mg/L)
BW =	0.0300	= Body weight (kg)

Table B-9
Summary of Short-Tailed Shrew Exposure Doses - Initial (Maximum)
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Maximum Surface Soil Concentration (mg/kg)	Soil-Worm BAF	Terrestrial Invertebrate Concentration (mg/kg dw)	Soil-Plant BAF	Terrestrial Plant Concentration (mg/kg dw)	Maximum Surface Water Concentration (mg/L)	Dietary Intake (mg/kg/day)	NOAEL TRV (mg/kg/d)	MATC TRV (mg/kg/d)	LOAEL TRV (mg/kg/d)	NOAEL HQ	MATC HQ	LOAEL HQ
Metals													
Chromium	39.0	3.162	1.23E+02	0.084	3.27E+00	0	1.51E+01	2.40	5.37	12.0	6.30E+00	2.82E+00	1.26E+00
Copper	42.7	Regression	1.44E+01	Regresson	8.57E+00	0	2.52E+00	5.60	7.23	9.34	4.50E-01	3.49E-01	2.70E-01
Lead	204	Regression	5.88E+01	Regresson	5.24E+00	0	1.06E+01	4.70	6.47	8.90	2.27E+00	1.65E+00	1.20E+00
Mercury	0.10	20.63	2.06E+00	Regresson	1.06E-01	0	2.43E-01	0.032	0.072	0.16	7.60E+00	3.40E+00	1.52E+00
Selenium	2.90	Regression	2.02E+00	Regresson	1.64E+00	0	3.01E-01	0.20	0.26	0.33	1.50E+00	1.17E+00	9.11E-01
Zinc	119	Regression	4.10E+02	Regresson	6.85E+01	0	5.05E+01	75.4	169	377	6.70E-01	2.99E-01	1.34E-01
Pesticides													
Endrin	0.00240	3.600	8.64E-03	0.535	1.28E-03	0	1.06E-03	0.18	0.41	0.92	5.76E-03	2.58E-03	1.15E-03
Dioxin/Furans													
2,3,7,8-TCDD (dioxin)	0.00000027	Regression	5.81E-07	0.135	3.62E-08	0	7.30E-08	0.000001	0.000003	0.00001	7.30E-02	2.31E-02	7.30E-03

$$DI_x = \frac{[[\sum_i (FIR)(FC_{xi})(PDF_i)] + [(FIR)(SC_x)(PDS)] + [(WIR)(WC_x)]]}{BW}$$

DI = Chemical-specific = Dietary intake for chemical (mg chemical/kg body weight/day)
FIR = 0.0019 = Food ingestion rate (kg/day dry weight)
FCxi = Chemical-specific = Concentration of chemical in food item (soil invertebrates, dry weight basis)
PDFi = 0.823 = Proportion of diet composed of food item (soil invertebrates)
FCxi = Chemical-specific = Concentration of chemical in food item (terrestrial plants, dry weight basis)
PDFi = 0.047 = Proportion of diet composed of food item (terrestrial plants)
SCx = Chemical-specific = Concentration of chemical in soil (mg/kg, dry weight)
PDS = 0.130 = Proportion of diet composed of soil
WIR = 0.0048 = Water ingestion rate (L/day)
WC = Chemical-specific = Concentration of chemical in water (mg/L)
BW = 0.0133 = Body weight (kg)

Table B-10
Summary of Red Fox Exposure Doses - Initial (Maximum)
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Maximum Surface Soil Concentration (mg/kg)	Soil-Worm BAF	Terrestrial Invertebrate Concentration (mg/kg dw)	Soil-Plant BAF	Terrestrial Plant Concentration (mg/kg dw)	Herbivore Soil-Mammal BAF	Herbivore Small Mammal Concentration (mg/kg dw)	Insectivore Soil-Mammal BAF	Insectivore Small Mammal Concentration (mg/kg dw)	Maximum Surface Water Concentration (mg/L)	Dietary Intake (mg/kg/day)	NOAEL TRV (mg/kg/d)	MATC TRV (mg/kg/d)	LOAEL TRV (mg/kg/d)	NOAEL HQ	MATC HQ	LOAEL HQ
Metals																	
Chromium	39.0	3.162	1.23E+02	0.084	3.27E+00	Regresson	3.42E+00	Regresson	3.42E+00	0	3.61E-01	2.40	5.37	12.0	1.51E-01	6.73E-02	3.01E-02
Copper	42.7	Regression	1.44E+01	Regresson	8.57E+00	Regresson	1.33E+01	Regresson	1.60E+01	0	6.98E-01	11.7	13.3	15.1	5.97E-02	5.25E-02	4.62E-02
Lead	204	Regression	5.88E+01	Regresson	5.24E+00	Regresson	8.53E+00	Regresson	2.16E+01	0	9.72E-01	4.70	6.47	8.90	2.07E-01	1.50E-01	1.09E-01
Mercury	0.10	20.63	2.06E+00	Regresson	1.06E-01	0.192	1.92E-02	0.192	1.92E-02	0	3.94E-03	0.15	0.19	0.25	2.63E-02	2.04E-02	1.58E-02
Selenium	2.90	Regression	2.02E+00	Regresson	1.64E+00	Regresson	9.85E-01	Regresson	9.85E-01	0	5.19E-02	0.20	0.26	0.33	2.59E-01	2.02E-01	1.57E-01
Zinc	119	Regression	4.10E+02	Regresson	6.85E+01	Regresson	1.10E+02	Regresson	1.32E+02	0	5.83E+00	75.4	169	377	7.74E-02	3.46E-02	1.55E-02
Pesticides																	
Endrin	0.00240	3.600	8.64E-03	0.535	1.28E-03	See footnote	1.46E-03	See footnote	7.48E-03	0	2.01E-04	0.18	0.41	0.92	1.09E-03	4.87E-04	2.18E-04
Dioxin/Furans																	
2,3,7,8-TCDD (dioxin)	0.00000027	Regression	5.81E-07	0.135	3.62E-08	Regresson	1.34E-07	Regresson	1.34E-07	0	6.67E-09	0.000001	0.000003	0.00001	6.67E-03	2.11E-03	6.67E-04

It was assumed that the concentration of each chemical in the small mammal's tissues was equal to the chemical concentration in its diet, that is, a diet to whole-body BAF of 1.0 was assumed

$$DI_x = \frac{[[\sum_i (FIR)(FC_{xi})(PDF_i)] + [(FIR)(SC_x)(PDS)] + [(WIR)(WC_x)]]}{BW}$$

DI = Chemical-specific = Dietary intake for chemical (mg chemical/kg body weight/day)
FIR = 0.1476 = Food ingestion rate (kg/day dry weight)
FCxi = Chemical-specific = Concentration of chemical in food item (soil invertebrates, dry weight basis)
PDFi = 0.028 = Proportion of diet composed of food item (soil invertebrates)
FCxi = Chemical-specific = Concentration of chemical in food item (terrestrial plants, dry weight basis)
PDFi = 0.070 = Proportion of diet composed of food item (terrestrial plants)
FCxi = Chemical-specific = Concentration of chemical in food item (small mammals, dry weight basis)
PDFi = 0.874 = Proportion of diet composed of food item (small mammals)
SCx = Chemical-specific = Concentration of chemical in soil (mg/kg, dry weight)
PDS = 0.028 = Proportion of diet composed of soil
WIR = 0.4115 = Water ingestion rate (L/day)
WC = Chemical-specific = Concentration of chemical in water (mg/L)
BW = 3.17 = Body weight (kg)

Table B-11
Summary of American Robin Exposure Doses - Initial (Maximum)
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Maximum Surface Soil Concentration (mg/kg)	Soil-Worm BAF	Terrestrial Invertebrate Concentration (mg/kg dw)	Soil-Plant BAF	Terrestrial Plant Concentration (mg/kg dw)	Maximum Surface Water Concentration (mg/L)	Dietary Intake (mg/kg/day)	NOAEL TRV (mg/kg/d)	MATC TRV (mg/kg/d)	LOAEL TRV (mg/kg/d)	NOAEL HQ	MATC HQ	LOAEL HQ
Metals													
Chromium	39.0	3.162	1.23E+02	0.084	3.27E+00	0	6.62E+00	2.66	5.95	13.3	2.49E+00	1.11E+00	4.98E-01
Copper	42.7	Regression	1.44E+01	Regresson	8.57E+00	0	1.47E+00	4.05	7.00	12.1	3.63E-01	2.10E-01	1.21E-01
Lead	204	Regression	5.88E+01	Regresson	5.24E+00	0	4.37E+00	3.85	8.61	19.3	1.13E+00	5.07E-01	2.27E-01
Mercury	0.10	20.63	2.06E+00	Regresson	1.06E-01	0	1.11E-01	0.49	0.77	1.20	2.26E-01	1.45E-01	9.24E-02
Selenium	2.90	Regression	2.02E+00	Regresson	1.64E+00	0	2.16E-01	0.44	0.81	1.50	4.92E-01	2.66E-01	1.44E-01
Zinc	119	Regression	4.10E+02	Regresson	6.85E+01	0	2.54E+01	66.1	148	331	3.85E-01	1.72E-01	7.70E-02
Pesticides													
Endrin	0.00240	3.600	8.64E-03	0.535	1.28E-03	0	5.26E-04	0.021	0.047	0.104	2.53E-02	1.13E-02	5.05E-03
Dioxin/Furans													
2,3,7,8-TCDD (dioxin)	0.00000027	Regression	5.81E-07	0.135	3.62E-08	0	3.29E-08	0.000014	0.000044	0.00014	2.35E-03	7.43E-04	2.35E-04

$$DI_x = \frac{[[\sum_i (FIR)(FC_{xi})(PDF_i)] + [(FIR)(SC_x)(PDS)] + [(WIR)(WC_x)]]}{BW}$$

DI =	Chemical-specific	= Dietary intake for chemical (mg chemical/kg body weight/day)
FIR =	0.0074	= Food ingestion rate (kg/day dry weight)
FCxi =	Chemical-specific	= Concentration of chemical in food item (soil invertebrates, dry weight basis)
PDFi =	0.435	= Proportion of diet composed of food item (soil invertebrates)
FCxi =	Chemical-specific	= Concentration of chemical in food item (terrestrial plants, dry weight basis)
PDFi =	0.519	= Proportion of diet composed of food item (terrestrial plants)
SCx =	Chemical-specific	= Concentration of chemical in soil (mg/kg, dry weight)
PDS =	0.046	= Proportion of diet composed of soil
WIR =	0.0129	= Water ingestion rate (L/day)
WC =	Chemical-specific	= Concentration of chemical in water (mg/L)
BW =	0.0635	= Body weight (kg)

Table B-12
Summary of Mourning Dove Exposure Doses - Initial (Maximum)
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Maximum Surface Soil Concentration (mg/kg)	Soil-Worm BAF	Terrestrial Invertebrate Concentration (mg/kg dw)	Soil-Plant BAF	Terrestrial Plant Concentration (mg/kg dw)	Maximum Surface Water Concentration (mg/L)	Dietary Intake (mg/kg/day)	NOAEL TRV (mg/kg/d)	MATC TRV (mg/kg/d)	LOAEL TRV (mg/kg/d)	NOAEL HQ	MATC HQ	LOAEL HQ
Metals													
Chromium	39.0	3.162	1.23E+02	0.084	3.27E+00	0	1.01E+00	2.66	5.95	13.3	3.79E-01	1.69E-01	7.57E-02
Copper	42.7	Regression	1.44E+01	Regresson	8.57E+00	0	2.05E+00	4.05	7.00	12.1	5.05E-01	2.92E-01	1.69E-01
Lead	204	Regression	5.88E+01	Regresson	5.24E+00	0	3.02E+00	1.63	2.31	3.26	1.85E+00	1.31E+00	9.27E-01
Mercury	0.10	20.63	2.06E+00	Regresson	1.06E-01	0	2.10E-02	0.45	0.64	0.90	4.66E-02	3.29E-02	2.33E-02
Selenium	2.90	Regression	2.02E+00	Regresson	1.64E+00	0	3.40E-01	0.29	0.41	0.58	1.17E+00	8.29E-01	5.87E-01
Zinc	119	Regression	4.10E+02	Regresson	6.85E+01	0	1.41E+01	66.1	148	331	2.14E-01	9.57E-02	4.28E-02
Pesticides													
Endrin	0.00240	3.600	8.64E-03	0.535	1.28E-03	0	2.67E-04	0.021	0.047	0.104	1.28E-02	5.73E-03	2.56E-03
Dioxin/Furans													
2,3,7,8-TCDD (dioxin)	0.00000027	Regression	5.81E-07	0.135	3.62E-08	0	9.50E-09	0.000014	0.000044	0.00014	6.78E-04	2.15E-04	6.78E-05

$$DI_x = \frac{[[\sum_i (FIR)(FC_{xi})(PDF_i)] + [(FIR)(SC_x)(PDS)] + [(WIR)(WC_x)]]}{BW}$$

DI =	Chemical-specific	= Dietary intake for chemical (mg chemical/kg body weight/day)
FIR =	0.0209	= Food ingestion rate (kg/day dry weight)
FCxi =	Chemical-specific	= Concentration of chemical in food item (soil invertebrates, dry weight basis)
PDFi =	0.000	= Proportion of diet composed of food item (soil invertebrates)
FCxi =	Chemical-specific	= Concentration of chemical in food item (terrestrial plants, dry weight basis)
PDFi =	0.950	= Proportion of diet composed of food item (terrestrial plants)
SCx =	Chemical-specific	= Concentration of chemical in soil (mg/kg, dry weight)
PDS =	0.050	= Proportion of diet composed of soil
WIR =	0.0175	= Water ingestion rate (L/day)
WC =	Chemical-specific	= Concentration of chemical in water (mg/L)
BW =	0.1050	= Body weight (kg)

Table B-13
Summary of Red-tailed Hawk Exposure Doses - Initial (Maximum)
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Maximum Surface Soil Concentration (mg/kg)	Soil-Worm BAF	Terrestrial Invertebrate Concentration (mg/kg dw)	Soil-Plant BAF	Terrestrial Plant Concentration (mg/kg dw)	Herbivore Soil-Mammal BAF	Herbivore Small Mammal Concentration (mg/kg dw)	Insectivore Soil-Mammal BAF	Insectivore Small Mammal Concentration (mg/kg dw)	Maximum Surface Water Concentration (mg/L)	Dietary Intake (mg/kg/day)	NOAEL TRV (mg/kg/d)	MATC TRV (mg/kg/d)	LOAEL TRV (mg/kg/d)	NOAEL HQ	MATC HQ	LOAEL HQ
Metals																	
Chromium	39.0	3.162	1.23E+02	0.084	3.27E+00	Regresson	3.42E+00	Regresson	3.42E+00	0	1.41E-01	2.66	5.95	13.3	5.30E-02	2.37E-02	1.06E-02
Copper	42.7	Regression	1.44E+01	Regresson	8.57E+00	Regresson	1.33E+01	Regresson	1.60E+01	0	6.04E-01	4.05	7.00	12.1	1.49E-01	8.63E-02	4.99E-02
Lead	204	Regression	5.88E+01	Regresson	5.24E+00	Regresson	8.53E+00	Regresson	2.16E+01	0	6.22E-01	3.85	8.61	19.3	1.61E-01	7.22E-02	3.23E-02
Mercury	0.10	20.63	2.06E+00	Regresson	1.06E-01	0.192	1.92E-02	0.192	1.92E-02	0	7.93E-04	0.49	0.77	1.20	1.62E-03	1.03E-03	6.61E-04
Selenium	2.90	Regression	2.02E+00	Regresson	1.64E+00	Regresson	9.85E-01	Regresson	9.85E-01	0	4.07E-02	0.44	0.81	1.50	9.25E-02	5.01E-02	2.71E-02
Zinc	119	Regression	4.10E+02	Regresson	6.85E+01	Regresson	1.10E+02	Regresson	1.32E+02	0	4.99E+00	66.1	148	331	7.55E-02	3.38E-02	1.51E-02
Pesticides																	
Endrin	0.00240	3.600	8.64E-03	0.535	1.28E-03	See footnote	1.46E-03	See footnote	7.48E-03	0	1.85E-04	0.021	0.047	0.104	8.87E-03	3.97E-03	1.77E-03
Dioxin/Furans																	
2,3,7,8-TCDD (dioxin)	0.00000027	Regression	5.81E-07	0.135	3.62E-08	Regresson	1.34E-07	Regresson	1.34E-07	0	5.52E-09	0.000014	0.000044	0.00014	3.94E-04	1.25E-04	3.94E-05

It was assumed that the concentration of each chemical in the small mammal's tissues was equal to the chemical concentration in its diet, that is, a diet to whole-body BAF of 1.0 was assumed

$$DI_x = \frac{[[\sum_i (FIR)(FC_{xi})(PDF_i)] + [(FIR)(SC_x)(PDS)] + [(WIR)(WC_x)]]}{BW}$$

DI = Chemical-specific = Dietary intake for chemical (mg chemical/kg body weight/day)
FIR = 0.0395 = Food ingestion rate (kg/day dry weight)
FCxi = Chemical-specific = Concentration of chemical in food item (soil invertebrates, dry weight basis)
PDFi = 0.000 = Proportion of diet composed of food item (soil invertebrates)
FCxi = Chemical-specific = Concentration of chemical in food item (terrestrial plants, dry weight basis)
PDFi = 0.000 = Proportion of diet composed of food item (terrestrial plants)
FCxi = Chemical-specific = Concentration of chemical in food item (small mammals, dry weight basis)
PDFi = 1.000 = Proportion of diet composed of food item (small mammals)
SCx = Chemical-specific = Concentration of chemical in soil (mg/kg, dry weight)
PDS = 0.000 = Proportion of diet composed of soil
WIR = 0.0680 = Water ingestion rate (L/day)
WC = Chemical-specific = Concentration of chemical in water (mg/L)
BW = 0.957 = Body weight (kg)

Table B-14
Hazard Quotients for Terrestrial Food Web Exposures - Refined (95% UCL)
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Short-tailed Shrew			American Robin			Mourning Dove		
	NOAEL HQ	MATC HQ	LOAEL HQ	NOAEL HQ	MATC HQ	LOAEL HQ	NOAEL HQ	MATC HQ	LOAEL HQ
Metals									
Chromium	1.74E-01	7.78E-02	3.48E-02	6.62E-02	2.96E-02	1.32E-02	5.54E-02	2.48E-02	1.11E-02
Copper	1.48E-01	1.14E-01	8.85E-02	1.24E-01	7.19E-02	4.16E-02	1.69E-01	9.77E-02	5.66E-02
Lead	3.11E-01	2.26E-01	1.64E-01	1.65E-01	7.38E-02	3.30E-02	3.10E-01	2.19E-01	1.55E-01
Mercury	1.38E-01	6.19E-02	2.77E-02	8.49E-03	5.42E-03	3.47E-03	2.01E-02	1.42E-02	1.00E-02
Selenium	8.76E-01	6.82E-01	5.31E-01	2.80E-01	1.52E-01	8.22E-02	7.44E-01	5.27E-01	3.73E-01
Zinc	2.55E-01	1.14E-01	5.10E-02	1.40E-01	6.27E-02	2.80E-02	6.53E-02	2.92E-02	1.31E-02
Pesticides									
Endrin	3.03E-03	1.35E-03	6.06E-04	1.31E-02	5.86E-03	2.62E-03	7.53E-03	3.37E-03	1.51E-03
Dioxin/Furans									
2,3,7,8-TCDD (dioxin)	2.46E-02	7.77E-03	2.46E-03	7.85E-04	2.48E-04	7.85E-05	2.79E-04	8.82E-05	2.79E-05

Shaded cells indicate HQ > 1

Table B-15
Summary of Short-Tailed Shrew Exposure Doses - Refined (95% UCL)
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	95% UCL Surface Soil Concentration (mg/kg)	Soil-Worm BAF	Terrestrial Invertebrate Concentration (mg/kg dw)	Soil-Plant BAF	Terrestrial Plant Concentration (mg/kg dw)	95% UCL Surface Water Concentration (mg/L)	Dietary Intake (mg/kg/day)	NOAEL TRV (mg/kg/d)	MATC TRV (mg/kg/d)	LOAEL TRV (mg/kg/d)	NOAEL HQ	MATC HQ	LOAEL HQ
Metals													
Chromium	11.9	0.320	3.82E+00	0.041	4.89E-01	0	4.17E-01	2.40	5.37	12.0	1.74E-01	7.78E-02	3.48E-02
Copper	9.29	Regression	9.61E+00	Regresson	4.70E+00	0	8.27E-01	5.60	7.23	9.34	1.48E-01	1.14E-01	8.85E-02
Lead	35.5	Regression	1.43E+01	Regresson	1.96E+00	0	1.46E+00	4.70	6.47	8.90	3.11E-01	2.26E-01	1.64E-01
Mercury	0.042	1.186	5.03E-02	Regresson	6.62E-02	0	4.43E-03	0.032	0.072	0.16	1.38E-01	6.19E-02	2.77E-02
Selenium	2.66	Regression	1.90E+00	Regresson	1.50E+00	0	1.75E-01	0.20	0.26	0.33	8.76E-01	6.82E-01	5.31E-01
Zinc	28.8	Regression	2.58E+02	Regresson	3.12E+01	0	1.92E+01	75.4	169	377	2.55E-01	1.14E-01	5.10E-02
Pesticides													
Endrin	0.00202	3.600	7.27E-03	0.535	1.08E-03	0	5.57E-04	0.18	0.41	0.92	3.03E-03	1.35E-03	6.06E-04
Dioxin/Furans													
2,3,7,8-TCDD (dioxin)	0.00000016	Regression	3.11E-07	0.135	2.13E-08	0	2.46E-08	0.000001	0.000003	0.00001	2.46E-02	7.77E-03	2.46E-03

$$DI_x = \frac{[[\sum_i (FIR)(FC_{xi})(PDF_i)] + [(FIR)(SC_x)(PDS)] + [(WIR)(WC_x)]]}{BW}$$

DI =	Chemical-specific	= Dietary intake for chemical (mg chemical/kg body weight/day)
FIR =	0.0015	= Food ingestion rate (kg/day dry weight)
FCxi =	Chemical-specific	= Concentration of chemical in food item (soil invertebrates, dry weight basis)
PDFi =	0.823	= Proportion of diet composed of food item (soil invertebrates)
FCxi =	Chemical-specific	= Concentration of chemical in food item (terrestrial plants, dry weight basis)
PDFi =	0.047	= Proportion of diet composed of food item (terrestrial plants)
SCx =	Chemical-specific	= Concentration of chemical in soil (mg/kg, dry weight)
PDS =	0.130	= Proportion of diet composed of soil
WIR =	0.0038	= Water ingestion rate (L/day)
WC =	Chemical-specific	= Concentration of chemical in water (mg/L)
BW =	0.0169	= Body weight (kg)

Table B-16
Summary of American Robin Exposure Doses - Refined (95% UCL)
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	95% UCL Surface Soil Concentration (mg/kg)	Soil-Worm BAF	Terrestrial Invertebrate Concentration (mg/kg dw)	Soil-Plant BAF	Terrestrial Plant Concentration (mg/kg dw)	95% UCL Surface Water Concentration (mg/L)	Dietary Intake (mg/kg/day)	NOAEL TRV (mg/kg/d)	MATC TRV (mg/kg/d)	LOAEL TRV (mg/kg/d)	NOAEL HQ	MATC HQ	LOAEL HQ
Metals													
Chromium	11.9	0.320	3.82E+00	0.041	4.89E-01	0	1.76E-01	2.66	5.95	13.3	6.62E-02	2.96E-02	1.32E-02
Copper	9.29	Regression	9.61E+00	Regresson	4.70E+00	0	5.04E-01	4.05	7.00	12.1	1.24E-01	7.19E-02	4.16E-02
Lead	35.5	Regression	1.43E+01	Regresson	1.96E+00	0	6.35E-01	3.85	8.61	19.3	1.65E-01	7.38E-02	3.30E-02
Mercury	0.042	1.186	5.03E-02	Regresson	6.62E-02	0	4.16E-03	0.49	0.77	1.20	8.49E-03	5.42E-03	3.47E-03
Selenium	2.66	Regression	1.90E+00	Regresson	1.50E+00	0	1.23E-01	0.44	0.81	1.50	2.80E-01	1.52E-01	8.22E-02
Zinc	28.8	Regression	2.58E+02	Regresson	3.12E+01	0	9.26E+00	66.1	148	331	1.40E-01	6.27E-02	2.80E-02
Pesticides													
Endrin	0.00202	3.600	7.27E-03	0.535	1.08E-03	0	2.73E-04	0.021	0.047	0.104	1.31E-02	5.86E-03	2.62E-03
Dioxin/Furans													
2,3,7,8-TCDD (dioxin)	0.00000016	Regression	3.11E-07	0.135	2.13E-08	0	1.10E-08	0.000014	0.000044	0.00014	7.85E-04	2.48E-04	7.85E-05

$$DI_x = \frac{[[\sum_i (FIR)(FC_{xi})(PDF_i)] + [(FIR)(SC_x)(PDS)] + [(WIR)(WC_x)]]}{BW}$$

DI =	Chemical-specific	= Dietary intake for chemical (mg chemical/kg body weight/day)
FIR =	0.0055	= Food ingestion rate (kg/day dry weight)
FCxi =	Chemical-specific	= Concentration of chemical in food item (soil invertebrates, dry weight basis)
PDFi =	0.435	= Proportion of diet composed of food item (soil invertebrates)
FCxi =	Chemical-specific	= Concentration of chemical in food item (terrestrial plants, dry weight basis)
PDFi =	0.519	= Proportion of diet composed of food item (terrestrial plants)
SCx =	Chemical-specific	= Concentration of chemical in soil (mg/kg, dry weight)
PDS =	0.046	= Proportion of diet composed of soil
WIR =	0.0106	= Water ingestion rate (L/day)
WC =	Chemical-specific	= Concentration of chemical in water (mg/L)
BW =	0.077	= Body weight (kg)

Table B-17
Summary of Mourning Dove Exposure Doses - Refined (95% UCL)
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	95% UCL Surface Soil Concentration (mg/kg)	Soil-Worm BAF	Terrestrial Invertebrate Concentration (mg/kg dw)	Soil-Plant BAF	Terrestrial Plant Concentration (mg/kg dw)	95% UCL Surface Water Concentration (mg/L)	Dietary Intake (mg/kg/day)	NOAEL TRV (mg/kg/d)	MATC TRV (mg/kg/d)	LOAEL TRV (mg/kg/d)	NOAEL HQ	MATC HQ	LOAEL HQ
Metals													
Chromium	11.9	0.320	3.82E+00	0.041	4.89E-01	0	1.47E-01	2.66	5.95	13.3	5.54E-02	2.48E-02	1.11E-02
Copper	9.29	Regression	9.61E+00	Regresson	4.70E+00	0	6.84E-01	4.05	7.00	12.1	1.69E-01	9.77E-02	5.66E-02
Lead	35.5	Regression	1.43E+01	Regresson	1.96E+00	0	5.06E-01	1.63	2.31	3.26	3.10E-01	2.19E-01	1.55E-01
Mercury	0.042	1.186	5.03E-02	Regresson	6.62E-02	0	9.03E-03	0.45	0.64	0.90	2.01E-02	1.42E-02	1.00E-02
Selenium	2.66	Regression	1.90E+00	Regresson	1.50E+00	0	2.16E-01	0.29	0.41	0.58	7.44E-01	5.27E-01	3.73E-01
Zinc	28.8	Regression	2.58E+02	Regresson	3.12E+01	0	4.32E+00	66.1	148	331	6.53E-02	2.92E-02	1.31E-02
Pesticides													
Endrin	0.00202	3.600	7.27E-03	0.535	1.08E-03	0	1.57E-04	0.021	0.047	0.104	7.53E-03	3.37E-03	1.51E-03
Dioxin/Furans													
2,3,7,8-TCDD (dioxin)	0.00000016	Regression	3.11E-07	0.135	2.13E-08	0	3.91E-09	0.000014	0.000044	0.00014	2.79E-04	8.82E-05	2.79E-05

$$DI_x = \frac{[[\sum_i (FIR)(FC_{xi})(PDF_i)] + [(FIR)(SC_x)(PDS)] + [(WIR)(WC_x)]]}{BW}$$

DI =	Chemical-specific	= Dietary intake for chemical (mg chemical/kg body weight/day)
FIR =	0.0176	= Food ingestion rate (kg/day dry weight)
FCxi =	Chemical-specific	= Concentration of chemical in food item (soil invertebrates, dry weight basis)
PDFi =	0.000	= Proportion of diet composed of food item (soil invertebrates)
FCxi =	Chemical-specific	= Concentration of chemical in food item (terrestrial plants, dry weight basis)
PDFi =	0.950	= Proportion of diet composed of food item (terrestrial plants)
SCx =	Chemical-specific	= Concentration of chemical in soil (mg/kg, dry weight)
PDS =	0.050	= Proportion of diet composed of soil
WIR =	0.0148	= Water ingestion rate (L/day)
WC =	Chemical-specific	= Concentration of chemical in water (mg/L)
BW =	0.1265	= Body weight (kg)

Table B-18
Ecological Screening Statistics - Site 7 Groundwater
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	Maximum Upgradient	Mean Upgradient	Maximum Ratio	Mean Ratio	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Inorganics (UG/L)																							
Aluminum	24.7 - 158	3 / 5	60.3	298	CAS07-MW07-0111	142	129	265	85.6	87.0	2 / 5	3.43	2,230	0 / 5	0.13	NO	--	--	--	--	--	--	NO
Arsenic	1.50 - 1.50	2 / 5	3.15	4.26	CAS07-MW07-0111	1.93	1.67	3.52	1.41	36.0	0 / 5	0.12	--	-- / --	--	NO	--	--	--	--	--	--	NO
Barium	-- - --	5 / 5	22.3	41.5	CAS07-MW05-0111	30.6	6.95	37.2	30.0	200	0 / 5	0.21	--	-- / --	--	NO	--	--	--	--	--	--	NO
Cadmium	-- - --	5 / 5	0.72	1.17	CAS07-MW06-0111	0.98	0.19	1.16	0.96	8.85	0 / 5	0.13	--	-- / --	--	NO	--	--	--	--	--	--	NO
Calcium [2]	-- - --	5 / 5	84,700	140,000	CAS07-MW05-0111	105,180	21,224	125,414	103,608	NSV	-- / --	NSV	--	-- / --	--	NO	--	--	--	--	--	--	NO
Chromium	1.00 - 1.00	3 / 5	1.67	2.49	CAS07-MW05-0111	1.52	0.99	2.46	1.21	50.4	0 / 5	0.05	--	-- / --	--	NO	--	--	--	--	--	--	NO
Cobalt	2.50 - 2.50	4 / 5	1.43	4.28	CAS07-MW03-0111	2.56	1.41	3.90	2.26	23.0	0 / 5	0.19	--	-- / --	--	NO	--	--	--	--	--	--	NO
Copper	2.00 - 2.00	2 / 5	1.12	2.04	CAS07-MW06-0111	1.23	0.45	1.67	1.18	3.73	0 / 5	0.55	--	-- / --	--	NO	--	--	--	--	--	--	NO
Iron	15.0 - 28.5	3 / 5	104	603	CAS07-MW07-0111	212	255	455	74.1	1,000	0 / 5	0.60	--	-- / --	--	NO	--	--	--	--	--	--	NO
Magnesium [2]	-- - --	5 / 5	2,080	6,490	CAS07-MW05-0111	3,266	1,867	5,046	2,945	NSV	-- / --	NSV	--	-- / --	--	NO	--	--	--	--	--	--	NO
Manganese	-- - --	5 / 5	18.5	216	CAS07-MW04-0111	83.2	76.5	156	61.5	100	1 / 5	2.16	57.9	2 / 5	3.73	YES	135	89.0	1.60	0.94	1.56	0.83	NO
Nickel	-- - --	5 / 5	2.61	3.94	CAS07-MW03-0111	2.93	0.57	3.47	2.89	8.28	0 / 5	0.48	--	-- / --	--	NO	--	--	--	--	--	--	NO
Potassium [2]	-- - --	5 / 5	1,130	2,260	CAS07-MW05-0111	1,596	434	2,009	1,552	NSV	-- / --	NSV	--	-- / --	--	NO	--	--	--	--	--	--	NO
Selenium	1.25 - 1.25	2 / 5	0.88	2.40	CAS07-MW05-0111	1.03	0.77	1.77	0.88	71.1	0 / 5	0.03	--	-- / --	--	NO	--	--	--	--	--	--	NO
Sodium [2]	-- - --	5 / 5	7,270	21,100	CAS07-MW05-0111	12,148	6,057	17,923	11,066	NSV	-- / --	NSV	--	-- / --	--	NO	--	--	--	--	--	--	NO
Vanadium	2.50 - 2.50	1 / 5	1.46	1.46	CAS07-MW07-0111	1.29	0.094	1.38	1.29	50.0	0 / 5	0.03	--	-- / --	--	NO	--	--	--	--	--	--	NO
Zinc	12.5 - 12.5	4 / 5	2.13	9.91	CAS07-MW03-0111	4.71	3.36	7.91	3.89	85.6	0 / 5	0.12	--	-- / --	--	NO	--	--	--	--	--	--	NO
Dissolved Metals (UG/L)																							
Aluminum	25.0 - 161	2 / 5	15.4	16.9	CAS07-MW04-0111	41.1	35.8	75.2	29.1	87.0	0 / 5	0.19	--	-- / --	--	NO	--	--	--	--	--	--	NO
Arsenic	1.50 - 1.50	2 / 5	2.56	3.55	CAS07-MW07-0111	1.67	1.31	2.92	1.31	36.0	0 / 5	0.10	--	-- / --	--	NO	--	--	--	--	--	--	NO
Barium	-- - --	5 / 5	20.7	41.3	CAS07-MW05-0111	29.9	7.39	37.0	29.2	200	0 / 5	0.21	--	-- / --	--	NO	--	--	--	--	--	--	NO
Cadmium	-- - --	5 / 5	0.65	1.12	CAS07-MW03-0111	0.95	0.19	1.13	0.93	8.80	0 / 5	0.13	--	-- / --	--	NO	--	--	--	--	--	--	NO
Calcium [2]	-- - --	5 / 5	85,900	141,000	CAS07-MW05-0111	104,480	21,718	125,186	102,859	NSV	-- / --	NSV	--	-- / --	--	NO	--	--	--	--	--	--	NO
Chromium	1.00 - 1.00	2 / 5	0.82	2.52	CAS07-MW05-0111	0.97	0.88	1.81	0.76	50.0	0 / 5	0.05	--	-- / --	--	NO	--	--	--	--	--	--	NO
Cobalt	2.50 - 2.50	3 / 5	1.84	4.59	CAS07-MW03-0111	2.49	1.50	3.92	2.16	23.0	0 / 5	0.20	--	-- / --	--	NO	--	--	--	--	--	--	NO
Copper	2.00 - 2.00	0 / 5	--	--	--	1.00	0.0	1.00	1.00	3.10	-- / --	0.65	--	-- / --	--	NO	--	--	--	--	--	--	NO
Iron	15.0 - 30.2	2 / 5	8.22	338	CAS07-MW03-0111	75.3	147	215	18.8	1,000	0 / 5	0.34	--	-- / --	--	NO	--	--	--	--	--	--	NO
Magnesium [2]	-- - --	5 / 5	1,970	6,520	CAS07-MW05-0111	3,226	1,923	5,059	2,879	NSV	-- / --	NSV	--	-- / --	--	NO	--	--	--	--	--	--	NO
Manganese	-- - --	5 / 5	18.3	208	CAS07-MW04-0111	82.0	73.1	152	61.3	100	1 / 5	2.08	49.5	4 / 5	4.20	YES	137	91.7	1.52	0.90	1.52	0.82	NO
Nickel	-- - --	5 / 5	1.80	4.58	CAS07-MW03-0111	2.64	1.14	3.72	2.48	8.20	0 / 5	0.56	--	-- / --	--	NO	--	--	--	--	--	--	NO
Potassium [2]	-- - --	5 / 5	1,170	2,240	CAS07-MW05-0111	1,536	426	1,942	1,494	NSV	-- / --	NSV	--	-- / --	--	NO	--	--	--	--	--	--	NO
Selenium	1.25 - 1.25	1 / 5	2.29	2.29	CAS07-MW05-0111	0.96	0.74	1.67	0.81	71.0	0 / 5	0.03	--	-- / --	--	NO	--	--	--	--	--	--	NO
Sodium [2]	-- - --	5 / 5	7,370	21,000	CAS07-MW05-0111	12,026	6,092	17,834	10,926	NSV	-- / --	NSV	--	-- / --	--	NO	--	--	--	--	--	--	NO
Vanadium	2.50 - 2.50	0 / 5	--	--	--	1.25	0.0	1.25	1.25	50.0	-- / --	0.05	--	-- / --	--	NO	--	--	--	--	--	--	NO
Zinc	2.50 - 12.5	2 / 5	1.83	12.0	CAS07-MW03-0111	4.52	4.68	8.98	2.93	81.0	0 / 5	0.15	--	-- / --	--	NO	--	--	--	--	--	--	NO
Pesticide/Polychlorinated Biphenyls (UG/L)																							
4,4'-DDD	0.0094 - 0.010	2 / 5	0.0099	0.040	CAS07-MW04-0111	0.013	0.015	0.027	0.0086	0.025	1 / 5	1.59	--	-- / --	--	YES	Not detected				1.10	0.52	NO
alpha-BHC	0.0093 - 0.010	1 / 5	0.0053	0.0053	CAS07-MW04-0111	0.0049	2.79E-04	0.0052	0.0049	25.0	0 / 5	0.0002	--	-- / --	--	NO	--	--	--	--	--	--	NO
delta-BHC	0.0093 - 0.010	1 / 5	0.0056	0.0056	CAS07-MW03-0111	0.0050	3.79E-04	0.0053	0.0050	25.0	0 / 5	0.0002	--	-- / --	--	NO	--	--	--	--	--	--	NO
Endosulfan II	0.0094 - 0.010	2 / 5	0.0058	0.0071	CAS07-MW07-0111	0.0055	0.0010	0.0065	0.0054	0.0087	0 / 5	0.82	--	-- / --	--	NO	--	--	--	--	--	--	NO
gamma-Chlordane	0.0094 - 0.010	2 / 5	0.0065	0.025	CAS07-MW04-0111	0.0093	0.0089	0.018	0.0072	0.0040	2 / 5	6.28	--	-- / --	--	YES	0.0092	0.0072	2.73	1.29	4.43	2.31	NO[3]
Semivolatile Organic Compounds (UG/L)																							
2,4-Dinitrotoluene	0.15 - 0.15	4 / 5	0.099	1.09	CAS07-MW04-0111	0.47	0.42	0.86	0.30	480	0 / 5	0.002	--	-- / --	--	NO	--	--	--	--	--	--	NO
2,6-Dinitrotoluene	0.15 - 0.16	1 / 5	0.39	0.39	CAS07-MW04-0111	0.14	0.14	0.27	0.11	1,000	0 / 5	0.0004	--	-- / --	--	NO	--	--	--	--	--	--	NO
Volatile Organic Compounds (UG/L)																							
Acetone	5.00 - 5.00	1 / 5	4.73	4.73	CAS07-MW04-0111	2.95	1.00	3.90	2.84	564,000	0 / 5	0.00001	--	-- / --	--	NO	--	--	--	--	--	--	NO
Bromodichloromethane	0.50 - 0.50	1 / 5	0.53	0.53	CAS07-MW06-0111	0.31	0.12	0.42	0.29	NSV	-- / --	NSV	--	-- / --	--	YES	Not detected		--	--	NSV	NSV	NO[3]
Chloroform	0.50 - 0.50	2 / 5	0.61	0.76	CAS07-MW06-0111	0.42	0.24	0.66	0.37	815	0 / 5	0.001	--	-- / --	--	NO	--	--	--	--	--	--	NO
cis-1,2-Dichloroethene	0.50 - 0.50	2 / 5	2.27	7.26	CAS07-MW07-0111	2.06	3.04	4.95	0.76	680	0 / 5	0.01	--	-- / --	--	NO	--	--	--	--	--	--	NO
Dibromochloromethane	0.50 - 0.50	2 / 5	0.35	0.61	CAS07-MW06-0111	0.34	0.16	0.49	0.32	NSV	-- / --	NSV	--	-- / --	--	YES	Not detected		--	--	NSV	NSV	NO[3]
Tetrachloroethene	0.50 - 0.50	1 / 5	0.47	0.47	CAS07-MW07-0111	0.29	0.10	0.39	0.28	45.0	0 / 5	0.01	--	-- / --	--	NO	--	--	--	--	--	--	NO
Toluene	0.50 - 0.50	1 / 5	0.28	0.28	CAS07-MW04-0111	0.26	0.013	0.27	0.26	215	0 / 5	0.001	--	-- / --	--	NO	--	--	--	--	--	--	NO
trans-1,2-Dichloroethene	0.50 - 0.50	1 / 5	0.44	0.44	CAS07-MW03-0111	0.29	0.087	0.37	0.28	680	0 / 5	0.001	--	-- / --	--	NO	--	--	--	--	--	--	NO
Trichloroethene	0.50 - 0.50	3 / 5	0.52	86.4	CAS07-MW07-0111	17.7	38.4	54.3	1.29	1,940	0 / 5	0.04	--	-- / --	--	NO	--	--	--	--	--	--	NO
Vinyl chloride	0.50 - 0.50	1 / 5	0.33	0.33	CAS07-MW07-0111	0.27	0.036	0.30	0.26	930	0 / 5	0.0004	--	-- / --	--	NO	--	--	--	--	--	--	NO

Table B-18
Ecological Screening Statistics - Site 7 Groundwater
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	Maximum Upgradient	Mean Upgradient	Maximum Ratio	Mean Ratio	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Explosives (UG/L)																							
1,3,5-Trinitrobenzene	0.15 - 0.16	1 / 5	0.13	0.13	CAS07-MW04-0111	0.089	0.024	0.11	0.087	15.0	0 / 5	0.01	--	-- / --	--	NO	--	--	--	--	--	--	NO
2,4,6-Trinitrotoluene	0.15 - 0.16	1 / 5	0.21	0.21	CAS07-MW06-0111	0.11	0.061	0.16	0.096	100	0 / 5	0.002	--	-- / --	--	NO	--	--	--	--	--	--	NO
2-Amino-4,6-dinitrotoluene	0.15 - 0.16	1 / 5	0.12	0.12	CAS07-MW06-0111	0.086	0.018	0.10	0.085	19.0	0 / 5	0.01	--	-- / --	--	NO	--	--	--	--	--	--	NO
3-Nitrotoluene	0.13 - 0.15	2 / 5	0.14	0.14	CAS07-MW07-0111	0.098	0.039	0.14	0.092	750	0 / 5	0.0002	--	-- / --	--	NO	--	--	--	--	--	--	NO
4-Amino-2,6-dinitrotoluene	0.15 - 0.16	1 / 5	0.20	0.20	CAS07-MW06-0111	0.10	0.056	0.16	0.095	19.0	0 / 5	0.01	--	-- / --	--	NO	--	--	--	--	--	--	NO
HMX	0.15 - 0.16	3 / 5	0.11	0.53	CAS07-MW04-0111	0.19	0.19	0.37	0.14	330	0 / 5	0.002	--	-- / --	--	NO	--	--	--	--	--	--	NO
Nitroglycerin	0.39 - 0.40	1 / 5	0.23	0.23	CAS07-MW04-0111	0.20	0.017	0.22	0.20	138	0 / 5	0.002	--	-- / --	--	NO	--	--	--	--	--	--	NO
PETN	0.39 - 0.40	3 / 5	0.25	0.46	CAS07-MW04-0111	0.28	0.11	0.38	0.26	85,000	0 / 5	0.00001	--	-- / --	--	NO	--	--	--	--	--	--	NO
RDX	0.15 - 0.15	4 / 5	0.13	0.65	CAS07-MW04-0111	0.28	0.22	0.49	0.22	5,000	0 / 5	0.0001	--	-- / --	--	NO	--	--	--	--	--	--	NO
Dioxin/Furans (NG/L)																							
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.00069 - 0.00088	1 / 5	0.00136	0.00136	CAS07-MW04-0111	0.00060	0.00043	0.00100	0.00051	TEQ	-- / --	--	--	-- / --	--	NO	--	--	--	--	--	--	NO
1,2,3,4,7,8-Hexachlorodibenzofuran	0.00033 - 0.00046	1 / 5	0.00060	0.00060	CAS07-MW03-0111	0.00028	0.00018	0.00045	0.00025	TEQ	-- / --	--	--	-- / --	--	NO	--	--	--	--	--	--	NO
2,3,4,7,8-Pentachlorodibenzofuran	0.00031 - 0.00064	1 / 5	0.00043	0.00043	CAS07-MW03-0111	0.00027	0.00011	0.00037	0.00025	TEQ	-- / --	--	--	-- / --	--	NO	--	--	--	--	--	--	NO
Octachlorodibenzo-p-dioxin	0.00079 - 0.00079	4 / 5	0.00311	0.06060	CAS07-MW04-0111	0.01648	0.02497	0.04028	0.00572	TEQ	-- / --	--	--	-- / --	--	NO	--	--	--	--	--	--	NO
Dioxin TEQ (fish TEFs)	-- - --	4 / 5	0.00101	0.00124	CAS07-MW06-0111	0.00115	--	--	--	0.002	0 / 5	0.62	--	-- / --	--	NO	--	--	--	--	--	--	NO

NSV - No Screening Value
1 - Count of detected samples exceeding or equaling Screening Value
2 - Macronutrient - Not considered to be a COPC
3 - See text

Table B-19
Exceedances - Site 7 Groundwater
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Surface Water ESV	95% UTL Yorktown Eastover	CAS07-MW03	CAS07-MW04	CAS07-MW05	CAS07-MW06		CAS07-MW07
			CAS07-MW03-0111	CAS07-MW04-0111	CAS07-MW05-0111	CAS07-MW06-0111	CAS07-MW06P-0111	CAS07-MW07-0111
			01/25/11	01/28/11	01/25/11	01/24/11	01/24/11	01/24/11
Inorganics (UG/L)								
Aluminum	87.0	2,230	24.7 B	262	158 B	59.9	60.3	298
Arsenic	36.0	--	1.5 U	3.15	1.5 U	1.5 U	1.5 U	4.26
Barium	200	--	28.6	22.3	41.5	28.3	29.4	31.1
Cadmium	8.85	--	1.1 J	1.05 J	0.861 J	1.14 J	1.17 J	0.716 J
Chromium	50.4	--	1 U	2.45 J	2.49 J	1 U	1 U	1.67 J
Cobalt	23.0	--	4.28	3.84	2.5 U	1.84 J	2 J	1.43 J
Copper	3.73	--	2 U	1.12 J	2 U	2.04 J	2 U	2 U
Iron	1,000	--	15 U	333	28.5 B	89.2	104	603
Manganese	100	57.9	57.1	216	18.5	56.9	55.9	67.7
Nickel	8.28	--	3.94	2.7	2.63	2.48 J	2.61	2.76
Selenium	71.1	--	1.25 U	1.25 U	2.4 J	0.878 J	1.25 U	1.25 U
Vanadium	50.0	--	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	1.46 J
Zinc	85.6	--	9.91	2.13 J	12.5 U	1.98 J	2.17 J	3.11 J
Dissolved Metals (UG/L)								
Aluminum	87.0	--	161 B	16.9 J	160 B	14.9 J	15.4 J	25 U
Arsenic	36.0	--	1.5 U	2.56	1.5 U	1.5 U	1.5 U	3.55
Barium	200	--	29.1	20.7	41.3	28.2	27.7	30.4
Cadmium	8.80	--	1.12 J	0.949 J	0.896 J	1.12 J	1.12 J	0.652 J
Chromium	50.0	--	0.818 J	1 U	2.52	1 U	1 U	1 U
Cobalt	23.0	--	4.59	3.53	2.5 U	1.84 J	1.84 J	2.5 U
Iron	1,000	--	338	8.22 J	30.2 B	15 U	15 U	15 U
Manganese	100	49.5	58.5	208	18.3	55	53.9	70.4
Nickel	8.20	--	4.58	1.8 J	2.65	2.25 J	2.27 J	1.89 J
Selenium	71.0	--	1.25 U	1.25 U	2.29 J	1.25 U	1.25 U	1.25 U
Zinc	81.0	--	12.0	2.5 U	12.5 U	1.83 J	1.54 J	2.5 U
Pesticide/Polychlorinated Biphenyls (UG/L)								
4,4'-DDD	0.025	--	0.00943 U	0.0398 J	0.0102 U	0.0098 UJ	0.00926 UJ	0.00992 J
alpha-BHC	25.0	--	0.00943 U	0.00531 J	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
delta-BHC	25.0	--	0.00558 J	0.00943 UJ	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
Endosulfan II	0.0087	--	0.00943 U	0.00943 UJ	0.0102 U	0.0098 UJ	0.00575 J	0.00714 J
gamma-Chlordane	0.004	--	0.00943 U	0.0251 J	0.0102 U	0.0098 UJ	0.00926 UJ	0.00646 J
Semivolatile Organic Compounds (UG/L)								
2,4-Dinitrotoluene	480	--	0.582 J	1.09	0.154 U	0.412 J	0.481 J	0.0987 J
2,6-Dinitrotoluene	1,000	--	0.154 U	0.39	0.154 U	0.151 U	0.154 U	0.162 U

Table B-19
Exceedances - Site 7 Groundwater
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Surface Water ESV	95% UTL Yorktown Eastover	CAS07-MW03	CAS07-MW04	CAS07-MW05	CAS07-MW06		CAS07-MW07
			CAS07-MW03-0111	CAS07-MW04-0111	CAS07-MW05-0111	CAS07-MW06-0111	CAS07-MW06P-0111	CAS07-MW07-0111
			01/25/11	01/28/11	01/25/11	01/24/11	01/24/11	01/24/11
Volatile Organic Compounds (UG/L)								
Acetone	564,000	--	5 U	4.73 J	5 U	5 U	5 U	5 U
Bromodichloromethane	NSV	--	0.5 U	0.5 U	0.5 U	0.46 J	0.528 J	0.5 U
Chloroform	815	--	0.5 U	0.614 J	0.5 U	0.757 J	0.628 J	0.5 U
cis-1,2-Dichloroethene	680	--	2.27 J	0.5 U	0.5 U	0.5 U	0.5 U	7.26
Dibromochloromethane	NSV	--	0.5 U	0.5 U	0.5 U	0.609 J	0.555 J	0.345 J
Tetrachloroethene	45.0	--	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.474 J
Toluene	215	--	0.5 U	0.28 J	0.5 U	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	680	--	0.444 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	1,940	--	1.27 J	0.5 U	0.5 U	0.274 J	0.518 J	86.4
Vinyl chloride	930	--	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.33 J
Explosives (UG/L)		--						
1,3,5-Trinitrobenzene	15.0	--	0.154 U	0.132 J	0.154 U	0.151 U	0.154 U	0.162 U
2,4,6-Trinitrotoluene	100	--	0.154 U	0.157 U	0.154 U	0.151 U	0.214 J	0.162 U
2-Amino-4,6-dinitrotoluene	19.0	--	0.154 U	0.157 U	0.154 U	0.0796 J	0.118 J	0.162 U
3-Nitrotoluene	750	--	0.138 B	0.125 B	0.154 U	0.138 J	0.154 U	0.143 J
4-Amino-2,6-dinitrotoluene	19.0	--	0.154 U	0.157 U	0.154 U	0.188 J	0.204 J	0.162 U
HMX	330	--	0.122 J	0.532 J	0.154 U	0.114 J	0.109 J	0.162 U
Nitroglycerin	138	--	0.385 U	0.231 J	0.385 U	0.377 U	0.385 U	0.404 U
PETN	85,000	--	0.251 J	0.463 J	0.385 U	0.288 J	0.269 J	0.404 U
RDX	5,000	--	0.133 J	0.651 J	0.263 J	0.151 U	0.154 U	0.282 J
Dioxin/Furans (NG/L)								
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	TEQ	--	0.00084 U	0.00136 J	0.00069 U	0.00079 U	0.00088 U	0.00083 U
1,2,3,4,7,8-Hexachlorodibenzofuran	TEQ	--	0.00060 J	0.00033 U	0.00039 U	0.00046 U	0.00046 U	0.00046 U
2,3,4,7,8-Pentachlorodibenzofuran	TEQ	--	0.00043 J	0.00031 U	0.00040 U	0.00050 U	0.00064 U	0.00050 U
Octachlorodibenzo-p-dioxin	TEQ	--	0.00817 J	0.06060 J	0.00079 U	0.00204 J	0.00311 J	0.01010 J
Dioxin TEQ (fish TEFs)	0.002	--	0.00124 J	0.00101 J	0.00101 U	0.00117 J	0.00124 J	0.00121 J

Notes:

Grey highlighting indicates value greater than screening value
Yellow highlighting indicates value equal to screening value

Bold indicates detections
NA - Not analyzed
NSV - No Screening Value

Equals or exceeds Background UTL

Appendix C
Boring Logs

PROJECT NUMBER: 379183.SI.SI	BORING NUMBER: CAS07-MW01	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Cheatham Annex (CAX) Site 07 Site Inspection, Williamsburg, VA LOCATION : (3636955.1 N, 12032809.8 E)

GROUND ELEVATION : 20.65 ft (WGS 84) DRILLING CONTRACTOR : Parratt-Wolff Inc.\K. White

DRILLING METHOD AND EQUIPMENT : Track mounted CME-55, 4.25-inch I.D. hollow stem augers, 4ft macro core sampler, 4ft acetate liners

WATER LEVELS : 16.8 ft below ground surface START : 1/18/2011 END : 1/18/2011 LOGGER : T. Stewart

DEPTH BELOW GROUND SURFACE (ft) AND ELEVATION	DEPTH OF LITHOLOGIC CHANGE (ft)	SAMPLE ID (TIME)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
20.7	1.3	Not Sampled	**SILTY SAND (SM)** 0.0-1.3' - 10YR 4/2, Dark grayish brown, moist to wet, (loose), low plasticity, organic rich, bark, abundant roots, gradational change to sandy clay		The DTW measurements are from observations in soil sample cores collected during drilling. The DTW measurements were subtracted from a surveyed reference datum (natural ground) to obtain groundwater elevations relative to the World Geodectic System of 1984 (WGS84). All elevation references and potentiometric indications in this figure are based on a survey conducted by Michael Surveying & Mapping, PC of Newport News, VA on April 4, 2011.
5 15.7	5.5	Not Sampled	**CLAYEY SAND (SC)** 1.3-5.5' - 7.5YR 6/8 and 10YR 4/2, reddish yellow and yellowish brown, dry to moist, (very stiff), high plasticity, very fine to fine grained, 5-10% black seams throughout (roots)		
	8.0	Not Sampled	**CLAY (CH)** 5.5-8.0' - 5Y 7/2, Light gray, dry, (very stiff), high plasticity, 5-10% very fine to medium grained sand stringers, yellow sand 6.5-8.0' - trace dusky red marbling		
10 10.7	11.7	Not Sampled	**CLAY (CL)** 8.0-11.7' - 5Y 7/2, Light gray, dry, (very stiff), medium plasticity, mottled 20% reddish yellow (7.5YR 6/8), trace very fine yellow sand stringers throughout, gradational change at 11.7' to silty sand		Top of Casing Elevation: 23.87ft Depth to Water (btoc): 20.79ft on January 24, 2011, 09:15 Total Depth (btoc): 30.20ft (after development)
15 5.7 ▽	18.5	Not Sampled	**SILTY SAND (SM)** 11.7-18.5' - 5Y 8/2 and 2.5Y 8/6, Pale yellow and yellow, dry, (very loose), fine grained, nonplastic, trace strong brown (7.5YR 5/8) mottling, 10-15% very fine black grains, 'sugary' 16.8' - wet 17.3-18.2' - 2.5Y 6/4, light yellowish brown 18.2-18.5' - 7.5YR 6/8, reddish yellow		Well screened with 2-inch diameter 0.01 slotted SCH40 PVC from 17-27ft bgs.
20 0.6	20.0	Not Sampled	**NO RECOVERY** 18.5-20.0'		Groundwater sample collection from screen midpoint sent for the analysis of VOCs by U.S. Environmental Protection Agency (EPA) SW-846 Method 8260B and SVOCs by EPA SW-846 Method 8270C, Pesticides and PCBs by EPA SW846 Method 8081A/8082, Total and Dissolved Metals by EPA SW846 Method 6410B, Total and Dissolved Mercury by EPA SW846 Method 7470A, Explosives by EPA SW846 Method 8332, Cyanide by EPA SW846 Method 9012B and Dioxins by EPA SW846 Method 8290A.
25 -4.4	27.0	CAS07-MW01-0111 01/28/2011 12:30	**NOT SAMPLED FOR SOIL LITHOLOGY** 22.0-27'		
			Bottom of Boring at 27.0 ft below ground surface		

Legend:

▽ Water Level

PROJECT NUMBER: 379183.SI.SI	BORING NUMBER: CAS07-MW02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Cheatham Annex (CAX) Site 07 Site Inspection, Williamsburg, VA LOCATION : (3636755.0 N, 12032862.4 E)

GROUND ELEVATION : 18.22 ft (WGS 84) DRILLING CONTRACTOR : Parratt-Wolff Inc.\K. White

DRILLING METHOD AND EQUIPMENT : Track mounted CME-55, 4.25-inch I.D. hollow stem augers, 4ft macro core sampler, 4ft acetate liners

WATER LEVELS : 13.0 ft below ground surface START : 1/18/2011 END : 1/18/2011 LOGGER : T. Stewart

DEPTH BELOW GROUND SURFACE (ft) AND ELEVATION	DEPTH OF LITHOLOGIC CHANGE (ft)	SAMPLE ID (TIME)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
18.2	3.5	Not Sampled	**SILTY SAND (SM)** 0.0-3.5' - 10YR 4/2, Dark grayish brown, moist, (loose), very fine to fine grained, low plasticity, organic rich, roots, pine straws		The DTW measurements are from observations in soil sample cores collected during drilling. The DTW measurements were subtracted from a surveyed reference datum (natural ground) to obtain groundwater elevations relative to the World Geodectic System of 1984 (WGS84). All elevation references and potentiometric indications in this figure are based on a survey conducted by Michael Surveying & Mapping, PC of Newport News, VA on April 4, 2011.
5 13.2	5.0	Not Sampled	**CLAYEY SAND (SC)** 3.5-5.0' - 7.5YR 6/8 and 10YR 5/8, Reddish yellow and yellowish brown, moist, (dense), fine to medium grained, high plasticity, trace roots		
10 8.2	10.3	Not Sampled	**CLAY (CH)** 5.0-10.3' - 5Y 7/2, light gray, dry to moist, (very stiff), high plasticity, mottled 30% reddish yellow (7.5YR 6/8), few yellow sand stringers throughout		Top of Casing Elevation: 21.11ft Depth to Water (btoc): 17.73ft on January 24, 2011, 09:15 Total Depth (btoc): 27.44ft (after development)
▽	14.0	Not Sampled	**SILTY SAND (SM)** 10.3-14' - 2.5Y 8/6 to 5Y 8/2, yellow grading to pale yellow, moist, (very loose to loose), fine to medium grained, nonplastic, 20% strong brown laminations 13.0' - wet		
15 3.2	16.0	Not Sampled	**NO RECOVERY** 14.0-16.0'		Well screened with 2-inch diameter 0.01 slotted SCH40 PVC from 14-24ft bgs.
20 -1.8	24.0	CAS07-MW02-0111 1/28/2011 14:10	**NOT SAMPLED FOR SOIL LITHOLOGY** 16.0-24.0'		Sample collection from screen midpoint sent for the analysis of VOCs by U.S. Environmental Protection Agency (EPA) SW-846 Method 8260B and SVOCs by EPA SW-846 Method 8270C, Pesticides and PCBs by EPA SW846 Method 8081A/8082, Total and Dissolved Metals by EPA SW846 Method 6410B, Total and Dissolved Mercury by EPA SW846 Method 7470A, Explosives by EPA SW846 Method 8332, Cyanide by EPA SW846 Method 9012B and Dioxins by EPA SW846 Method 8290A.
			Bottom of Boring at 24.0 ft below ground surface		

Legend:

▽ Water Level

PROJECT NUMBER: 379183.SI.SI	BORING NUMBER: CAS07-MW03	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Cheatham Annex (CAX) Site 07 Site Inspection, Williamsburg, VA LOCATION : (3636958.8 N, 12032937.8 E)

GROUND ELEVATION : 21.05 ft (WGS 84) DRILLING CONTRACTOR : Parratt-Wolff Inc.\K. White

DRILLING METHOD AND EQUIPMENT : Track mounted CME-55, 4.25-inch I.D. hollow stem augers, 4ft macro core sampler, 4ft acetate liners

WATER LEVELS : 16.5 ft below ground surface START : 1/13/2011 END : 1/13/2011 LOGGER : T. Stewart

DEPTH BELOW GROUND SURFACE (ft) AND ELEVATION	DEPTH OF LITHOLOGIC CHANGE (ft)	SAMPLE ID (TIME)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
21.1	0.3	Not Sampled	**ORGANIC SILT (OH)** 0.0-0.3' - 2.5YR 2.5/1, black, wet, (soft), very fine to fine grained, low plasticity, trace pebbles		The DTW measurements are from observations in soil sample cores collected during drilling. The DTW measurements were subtracted from a surveyed reference datum (natural ground) to obtain groundwater elevations relative to the World Geodectic System of 1984 (WGS84). All elevation references and potentiometric indications in this figure are based on a survey conducted by Michael Surveying & Mapping, PC of Newport News, VA on April 4, 2011.
	1.5	Not Sampled			
	1.6	Not Sampled	**CLAY (CL)** 0.3-1.5' - 10YR 7/2, 7.5YR 5/3 and 7.5YR 4/6, Light gray, brown and strong brown, moist, (stiff), high plasticity, wet 2" lenses at 1.5', trace silt, 2" of rounded pebble gravel		
	3.2	Not Sampled			
	4.0	Not Sampled			
5 16.1		Not Sampled	**CLAYEY SAND (SC)** 1.6-3.2' - 10YR 7/2 and 7.5YR 5/6, Light gray and strong brown, moist, (stiff), fine to medium grained, medium to high plasticity, some organics		
	7.5		**NO RECOVERY** 3.2-4.0'		
		Not Sampled	**CLAYEY SAND (SC)** 4.0-7.5' - Same as 1.6-3.2'		
10 11.1	11.0		**CLAY (CH)** 7.5-11.0' - 5Y 7/1, light gray, moist, (very stiff), high plasticity, fine grained sand in <1/2" thick lenses throughout, roots		Top of Casing Elevation: 23.96ft Depth to Water (btoc): 21.47ft on January 24, 2011, 09:15 Total Depth (btoc): 32.76ft (after development)
		Not Sampled	**SILTY SAND (SM)** 11.0-11.3' - 7.5YR 6/8 to 5/8, Reddish yellow to strong brown, moist, (hard), (very loose to loose), nonplastic, laminated yellow, 15% dark reddish brown nodules (< 3/8") 11.3-13.6' - 5Y 8/4 to 5Y 8/6, Pale yellow to yellow, moist, (very loose to loose), fine to medium grained, nonplastic, little fine grained black particles		
	13.6				
	14.0	Not Sampled			
15 6.1		Not Sampled			
	18.0		**CLAY (CH)** 13.6-14.0' - Same as 7.5-11.0'		
		Not Sampled	**SILTY SAND (SM)** 14.0-17.2' - 5Y 8/1, White, moist to wet, (very loose to loose), non plastic fines, little fine black grains 16.5' - wet 17.2-18.0' - 5YR 5/8, Yellowish red		Well screened with 2-inch diameter 0.01 slotted SCH40 PVC from 20-30ft bgs.
20 1.1	20.0		**NO RECOVERY** 18.0-20.0'		
			NOT SAMPLED FOR SOIL LITHOLOGY 20.0-30.0'		
25 -4.0		CAS07-MW03-0111 01/25/2011 15:08			Sample collection from screen midpoint sent for the analysis of VOCs by U.S. Environmental Protection Agency (EPA) SW-846 Method 8260B and SVOCs by EPA SW-846 Method 8270C, Pesticides and PCBs by EPA SW846 Method 8081A/8082, Total and Dissolved Metals by EPA SW846 Method 6410B, Total and Dissolved Mercury by EPA SW846 Method 7470A, Explosives by EPA SW846 Method 8332, Cyanide by EPA SW846 Method 9012B and Dioxins by EPA SW846 Method 8290A.
30 -9.0	30.0		Bottom of Boring at 30.0 ft below ground surface		

Legend:

Water Level

PROJECT NUMBER: 379183.SI.SI	BORING NUMBER: CAS07-MW04	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Cheatham Annex (CAX) Site 07 Site Inspection, Williamsburg, VA LOCATION : (3636847.9 N, 12033009.1 E)

GROUND ELEVATION : 20.45 ft (WGS 84) DRILLING CONTRACTOR : Parratt-Wolff Inc.\K. White

DRILLING METHOD AND EQUIPMENT : Track mounted CME-55, 4.25-inch I.D. hollow stem augers, 4ft macro core sampler, 4ft acetate liners

WATER LEVELS : 16.4 ft below ground surface START : 11/14/2011 END : 11/14/2011 LOGGER : T. Stewart

DEPTH BELOW GROUND SURFACE (ft) AND ELEVATION	DEPTH OF LITHOLOGIC CHANGE (ft)	SAMPLE ID (TIME)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
20.5	0.5	Not Sampled	**ORGANIC SILT (OH)** 0.0-0.5' - 7.5YR 2.5/1, black, moist, (soft), nonplastic to low plasticity, fine grained, some fine rounded pebble gravel, abundant roots		The DTW measurements are from observations in soil sample cores collected during drilling. The DTW measurements were subtracted from a surveyed reference datum (natural ground) to obtain groundwater elevations relative to the World Geodectic System of 1984 (WGS84). All elevation references and potentiometric indications in this figure are based on a survey conducted by Michael Surveying & Mapping, PC of Newport News, VA on April 4, 2011.
	1.0	Not Sampled			
		Not Sampled	**CLAY (CL)** 0.5-1' - 10YR 7/2 and 7.5YR 5/3, Light gray and brown, dry to moist, (medium stiff), medium to high plasticity, 10-15% fine sand stringers, some roots		
	4.0				
5 15.5	5.2	Not Sampled	**NO RECOVERY** 1.0-4.0'		
		Not Sampled	**CLAYEY SAND (SC)** 4.0-5.2' - 5YR 5/6-5/8, Yellowish red with trace gray mottling, moist, (dense), medium to high plastic fines, fine to medium grained		
10 10.5	10.6		**CLAY (CH)** Gley1 7-6/10GY, Light greenish gray to greenish gray, dry to moist, (medium stiff), medium to high plasticity, fine to medium grained, brownish black laminations, trace roots		Top of Casing Elevation: 23.38ft Depth to Water (btoc): 21.04ft on January 24, 2011, 09:15 Total Depth (btoc): 32.86ft (after development)
	10.9	Not Sampled			
	12.0	Not Sampled	**CLAYEY SAND (SC)** 10.6-10.9' - 5YR 5/8, Yellowish red, moist, (medium dense), fine grained, low to medium plasticity, transitions from clay above to sand below		
	13.0	Not Sampled			
15 5.5 ▽		Not Sampled	**SILTY SAND (SM)** 10.9-12.0' - 5Y 7/2 to 8/3, Light gray grading to pale yellow at 11.5', moist, (loose), fine to medium grained, nonplastic, 10-15% yellow (2.5Y 8/6) laminations		
			CLAY (CL) 12.0-13.0' - Same as 0.5-1.0'		
	19.0		**SILTY SAND (SM)** 13.0-17.0' - 5Y 8/2-8/3, Pale yellow, moist to wet, (very loose), nonplastic, little fine black grains, laminated 16.4' - wet		Well screened with 2-inch diameter 0.01 slotted SCH40 PVC from 20-30ft bgs.
20 0.4	20.0	Not Sampled	17.0-19.0' - 5YR 5/6-5/8, Yellowish red, wet, (very loose), fine to medium grained, nonplastic, trace dark reddish gray (5YR 4/2) mottling		
			NO RECOVERY 19.0-20.0'		
			NOT SAMPLED FOR SOIL LITHOLOGY 20.0-30.0'		
25 -4.6		CAS07-MW04-0111 01/28/2011 09:35			Sample collection from screen midpoint sent for the analysis of VOCs by U.S. Environmental Protection Agency (EPA) SW-846 Method 8260B and SVOCs by EPA SW-846 Method 8270C, Pesticides and PCBs by EPA SW846 Method 8081A/8082, Total and Dissolved Metals by EPA SW846 Method 6410B, Total and Dissolved Mercury by EPA SW846 Method 7470A, Explosives by EPA SW846 Method 8332, Cyanide by EPA SW846 Method 9012B and Dioxins by EPA SW846 Method 8290A.
30 -9.6	30.0		Bottom of Boring at 30.0 ft below ground surface		

Legend:

▽ Water Level

PROJECT NUMBER: 379183.SI.SI	BORING NUMBER: CAS07-MW05	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Cheatham Annex (CAX) Site 07 Site Inspection, Williamsburg, VA LOCATION : (3637060.3 N, 12033054.3 E)

GROUND ELEVATION : 22.04 ft (WGS 84) DRILLING CONTRACTOR : Parratt-Wolff Inc.\K. White

DRILLING METHOD AND EQUIPMENT : Track mounted CME-55, 4.25-inch I.D. hollow stem augers, 4ft macro core sampler, 4ft acetate liners

WATER LEVELS : 20.0 ft below ground surface START : 1/12/2011 END : 1/12/2011 LOGGER : T. Stewart

DEPTH BELOW GROUND SURFACE (ft) AND ELEVATION	DEPTH OF LITHOLOGIC CHANGE (ft)	SAMPLE ID (TIME)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
22.0	1.5	Not Sampled	**SILTY SAND (SM)** 0.0-1.5' - 7.5YR 4/2, Brown, moist, (loose), very fine to fine grained, low to medium plasticity, organic rich (20%)		The DTW measurements are from observations in soil sample cores collected during drilling. The DTW measurements were subtracted from a surveyed reference datum (natural ground) to obtain groundwater elevations relative to the World Geodectic System of 1984 (WGS84). All elevation references and potentiometric indications in this figure are based on a survey conducted by Michael Surveying & Mapping, PC of Newport News, VA on April 4, 2011.
5 17.0		Not Sampled	**CLAYEY SAND (SC)** 1.5-9.2' - 7.5YR 5/8 and 6/6, Strong brown and reddish yellow, moist, (stiff), fine to medium grained, medium to high plasticity, 10-15% black medium grain organics, trace roots 7.6' - 2" wet lense		
10 12.0	11.5		9.2-11.5' - 10YR 7/2 to 7.5YR 5/8, Light gray, moist, (stiff), fine to medium grained, high plasticity, mottled 20% strong brown (7.5YR 5/8), trace light bluish gray mottling/laminations, 2" thick medium sand at bottom of interval		Top of Casing Elevation: 24.59ft Depth to Water (btoc): 23.21ft on January 24, 2011, 09:15 Total Depth (btoc): 32.15ft (after development)
	12.8	Not Sampled	**SANDY FAT CLAY (CH)** 11.5-12.8' - 2.5Y 6/1, gray, moist to dry, (very stiff), very fine grained, high plasticity, 30% strong brown mottling with roots (7.5YR 4/6), very fine sand seams throughout		
15 7.0		Not Sampled	**SILTY SAND (SM)** 12.8-19.2' - 2.5Y 5/1 and 2.5Y 8/3, White and pale yellow, moist, (loose), fine to medium grained, nonplastic, mottled 15% brownish yellow 19.2-20.5' - 5YR 5/8, Yellowish red, moist, (loose), medium grained, trace red (2.5YR 4/8) laminations 20.5-22.0' - 5Y 7/3, Pale yellow, wet, (very loose), medium grained, nonplastic, 20% poorly graded shell gravel; shells are white, whole and fragments, medium to coarse gravel sized		Well screened with 2-inch diameter 0.01 slotted SCH40 PVC from 20-30ft bgs. Driller Note: water at 20', wet sample in shoe collar
▽20 2.0	22.0	Not Sampled	**NO RECOVERY** 22.0-24.0'		Sample collection from screen midpoint sent for the analysis of VOCs by U.S. Environmental Protection Agency (EPA) SW-846 Method 8260B and SVOCs by EPA SW-846 Method 8270C, Pesticides and PCBs by EPA SW846 Method 8081A/8082, Total and Dissolved Metals by EPA SW846 Method 6410B, Total and Dissolved Mercury by EPA SW846 Method 7470A, Explosives by EPA SW846 Method 8332, Cyanide by EPA SW846 Method 9012B and Dioxins by EPA SW846 Method 8290A.
25 -3.0	24.0	CAS07-MW05-0111 01/25/2011 09:40	**NOT SAMPLED FOR SOIL LITHOLOGY** 24.0-30.0'		
30 -8.0	30.0		Bottom of Boring at 30.0 ft below ground surface		

Legend:

▽ Water Level

PROJECT NUMBER: 379183.SI.SI	BORING NUMBER: CAS07-MW06	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Cheatham Annex (CAX) Site 07 Site Inspection, Williamsburg, VA LOCATION : (3636933.4 N, 12033082.6 E)

GROUND ELEVATION : 20.94 ft (WGS 84) DRILLING CONTRACTOR : Parratt-Wolff Inc.\K. White

DRILLING METHOD AND EQUIPMENT : Track mounted CME-55, 4.25-inch I.D. hollow stem augers, 4ft macro core sampler, 4ft acetate liners

WATER LEVELS : 17.0 ft below ground surface START : 1/12/2011 END : 1/12/2011 LOGGER : T. Stewart

DEPTH BELOW GROUND SURFACE (ft) AND ELEVATION	DEPTH OF LITHOLOGIC CHANGE (ft)	SAMPLE ID (TIME)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
20.9	0.3	Not Sampled	**SILTY SAND (SM)** 0.0-0.5' - 7.5YR 4/2, Brown, moist, (soft), low plasticity, very fine to fine grained, 20-30% organics, bark		The DTW measurements are from observations in soil sample cores collected during drilling. The DTW measurements were subtracted from a surveyed reference datum (natural ground) to obtain groundwater elevations relative to the World Geodectic System of 1984 (WGS84). All elevation references and potentiometric indications in this figure are based on a survey conducted by Michael Surveying & Mapping, PC of Newport News, VA on April 4, 2011.
	1.3	Not Sampled			
	1.6	Not Sampled	**CLAYEY SAND (SC)** 0.3-1.3' - 7.5YR 5/8 and 10YR 5/3, Mottled reddish yellow and brown, moist, (stiff), very fine to fine grained, medium to high plasticity, trace medium organics		
		Not Sampled			
	4.4		**WELL GRADED PEBBLE GRAVEL (GW)** 1.3-1.6' - angular, possible fill material		
5 15.9			**SILTY SAND (SM)** 1.6-4.4' - 7.5YR 5/4-5/8, Brown to strong brown, moist, (stiff), medium plasticity, fine grained, roots along fissures		
		Not Sampled	**CLAYEY SAND (SC)** 4.4-11.5' - 7.5YR 6/6 and 10YR 7/2, Strong brown and reddish yellow, dry to moist, (very stiff), high plasticity, grades to light gray, 5-10% medium grain blackish brown organics, mottled 20% yellowish red		Top of Casing Elevation: 23.75ft Depth to Water (btoc): 22.15ft on January 24, 2011, 09:15 Total Depth (btoc): 33.61ft (after development)
10 10.9	11.5		**SILTY SAND (SM)** 11.5-11.7' - 5YR 5/8, Yellowish red, dry, (loose), medium to non plasticity, with red (2.5YR 4/8) laminations 11.7-18.0' - 2.5Y 8/1 and 2.5Y 8/3, white and pale yellow, moist to wet, (loose), fine to medium grained, nonplastic, 15% strong brown mottling (5YR 5/8)		
15 5.9		Not Sampled			
▽			17.0' - wet		
	18.0		17.7-18.0' - 5YR 5/8, yellowish red, 10% red (2.5YR 4/8) laminations		Well screened with 2-inch diameter 0.01 slotted SCH40 PVC from 20-30ft bgs.
		Not Sampled	**NO RECOVERY** 18.0-20.0'		
20 0.9	20.0		**NOT SAMPLED FOR SOIL LITHOLOGY** 20.0-30.0'		
25 -4.1		CAS07-MW06-0111 01/24/2011 1425 CAS07-MW06P-0111 01/24/2011 14:30			Sample collection from screen midpoint sent for the analysis of VOCs by U.S. Environmental Protection Agency (EPA) SW-846 Method 8260B and SVOCs by EPA SW-846 Method 8270C, Pesticides and PCBs by EPA SW846 Method 8081A/8082, Total and Dissolved Metals by EPA SW846 Method 6410B, Total and Dissolved Mercury by EPA SW846 Method 7470A, Explosives by EPA SW846 Method 8332, Cyanide by EPA SW846 Method 9012B and Dioxins by EPA SW846 Method 8290A.
30 -9.1	30.0		Bottom of Boring at 30.0 ft below ground surface		

Legend:

▽ Water Level

PROJECT NUMBER: 379183.SI.SI	BORING NUMBER: CAS07-MW07	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Cheatham Annex (CAX) Site 07 Site Inspection, Williamsburg, VA LOCATION : (3636780.6 N, 12033104.1 E)

GROUND ELEVATION : 21.03 ft (WGS 84) DRILLING CONTRACTOR : Parratt-Wolff Inc.\K. White

DRILLING METHOD AND EQUIPMENT : Track mounted CME-55, 4.25-inch I.D. hollow stem augers, 4ft macro core sampler, 4ft acetate liners

WATER LEVELS : 16.5 ft below ground surface START : 1/13/2011 END : 1/13/2011 LOGGER : T. Stewart

DEPTH BELOW GROUND SURFACE (ft) AND ELEVATION	DEPTH OF LITHOLOGIC CHANGE (ft)	SAMPLE ID (TIME)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
21.0	1.0	Not Sampled	**ORGANIC SILT (OH)** 0.0-1.0' - 2.5Y 2.5/1, black, wet, (very soft), very fine grained, low plasticity, trace rounded pebbles, roots/pine straw		The DTW measurements are from observations in soil sample cores collected during drilling. The DTW measurements were subtracted from a surveyed reference datum (natural ground) to obtain groundwater elevations relative to the World Geodectic System of 1984 (WGS84). All elevation references and potentiometric indications in this figure are based on a survey conducted by Michael Surveying & Mapping, PC of Newport News, VA on April 4, 2011.
	3.8	Not Sampled	**CLAY (CL)** 1.0-3.8' - 10YR 7/2 and 7.5YR 5/6, light gray and strong brown, dry to moist, (medium stiff to stiff), high plasticity, trace silt, trace very fine grained sand lenses, 5-15% coarse black organics, trace subangular rocks		
5 16.0		Not Sampled	**CLAY (CH)** 3.8-10.7' - 10YR 7/2, light gray, dry to moist, (very stiff), high plasticity, mottled 20% strong brown (7.5YR 5/8), discrete (<1" thick) fine grained sand lenses with black organics up to 5%; root seams throughout, sharp contact with underlying sand		
10 11.0	10.7				Top of Casing Elevation: 24.11ft Depth to Water (btoc): 22.12ft on January 24, 2011, 09:15 Total Depth (btoc): 33.06ft (after development)
	14.5	Not Sampled	**SILTY SAND (SM)** 10.7-11.1' - 7.5YR 6/8-5/8, Reddish yellow to strong brown, moist, (very loose to loose), fine to medium grained, nonplastic, laminated 15% yellowish red (5YR 5/8), 15% fine black particles 11.1-14.5' - 2.5Y 8/1, White, moist, (very loose), fine to medium grained, nonplastic, laminated 10% strong brown (7.5YR 5/8), 15% black particles		
15 6.0	16.0	Not Sampled	**NO RECOVERY** 14.5-16.0'		
∇		Not Sampled	**SILTY SAND (SM)** 16.0-17.0' - Same as 11.1-14.5' except 2.5Y 8/3, Pale yellow, no lamination 17.0-19' - 5YR 5/8, Yellowish red, moist, (very loose), non plastic fines, fine grained, 10% red (2.5YR 4/8) laminations 18.5' - wet		Well screened with 2-inch diameter 0.01 slotted SCH40 PVC from 20-30ft bgs.
	19.0	Not Sampled	**NO RECOVERY** 19.0-20.0'		
20 1.0	20.0		**NOT SAMPLED FOR SOIL LITHOLOGY** 20.0-30.0'		Sample collection from screen midpoint sent for the analysis of VOCs by U.S. Environmental Protection Agency (EPA) SW-846 Method 8260B and SVOCs by EPA SW-846 Method 8270C, Pesticides and PCBs by EPA SW846 Method 8081A/8082, Total and Dissolved Metals by EPA SW846 Method 6410B, Total and Dissolved Mercury by EPA SW846 Method 7470A, Explosives by EPA SW846 Method 8332, Cyanide by EPA SW846 Method 9012B and Dioxins by EPA SW846 Method 8290A.
25 -4.0		CAS07-MW07-0111 01/24/2011 11:30			
30 -9.0	30.0		Bottom of Boring at 30.0 ft below ground surface		

Legend:

∇ Water Level

Appendix D
Monitoring Well Construction Logs

PROJECT NUMBER	WELL NUMBER	
379183	CAS07-MW01	SHEET 1 OF 1

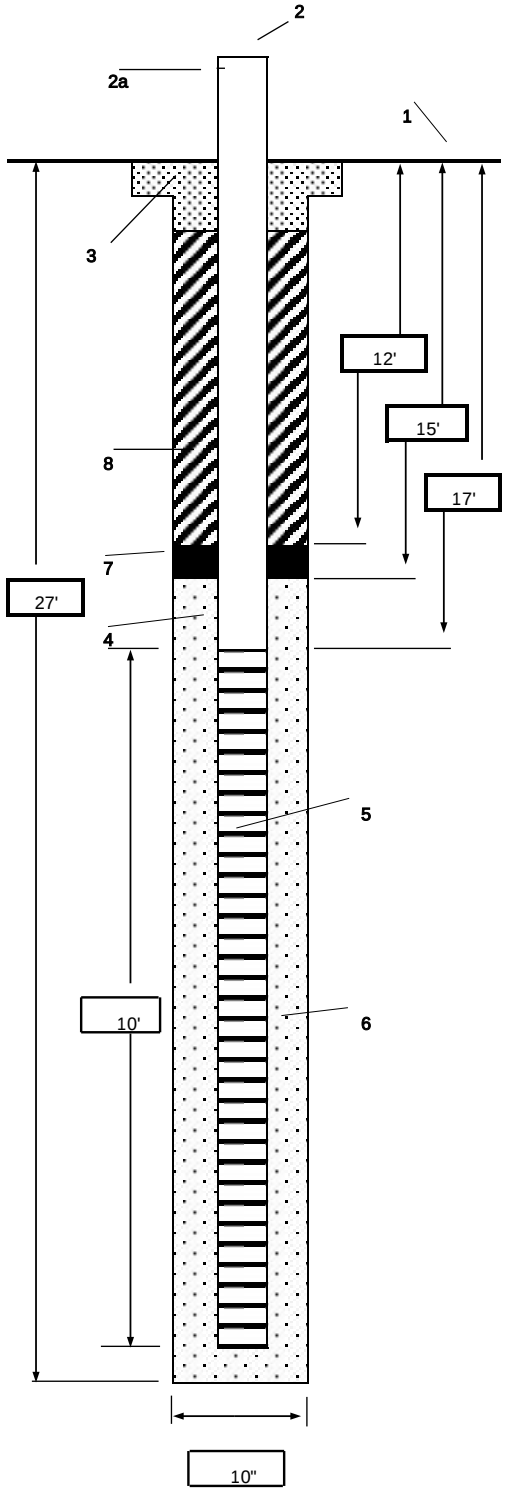
WELL COMPLETION DIAGRAM

PROJECT: CAX Site 07 Site Inspection LOCATION: Cheatham Annex, WIlliamsburg, Virginia

DRILLING CONTRACTOR: Parratt-Wolf Drilling, Inc. Coordinates: (3636757.1 N, 12032862.1 E)

DRILLING METHOD AND EQUIPMENT USED: Rubber Track Mounted CME-55, 4ft macro core sampler, acetate liners; 4.25-inch ID hollow stem augers

WATER LEVELS: 20.75' BTOC (3.12' Elevation) START: 1/18/11 END: 1/18/11 LOGGER: T. Stewart



1- Ground elevation at well	20.65'
2- Top of casing elevation	23.87'
a) vent hole?	No
3- Concrete pad dimensions	3' x 3'
4- Dia./type of well casing	2" Dia./Sch 40 PVC
5- Type/slot size of screen	0.010" Sch 40 PVC
6- Type screen filter	#1 Sand
a) Quantity used	7 - 50lb bags
7- Type of seal	Enviroplug Medium Bentonite Chips
a) Quantity used	1 – 50lb bag
8- Grout	
a) Grout mix used	Portland Cement
b) Method of placement	Tremie
c) Vol. of well casing grout	~50 gallons
Development method	Submersible pump and 2" x 6" surge block
Development time	1.5 hours
Estimated purge volume	55 gallons

Comments: The DTW measurements were subtracted from a surveyed reference datum (top of casing) to obtain groundwater elevations relative to the World Geodectic System of 1984 (WGS84). All elevation references and potentiometric indications in this figure are based on a survey conducted by Michael Surveying & Mapping, PC of Newport News, VA on April 4, 2011. Location coordinates are top of well PVC casing.

PROJECT NUMBER	WELL NUMBER	
379183	CAS07-MW02	SHEET 1 OF 1

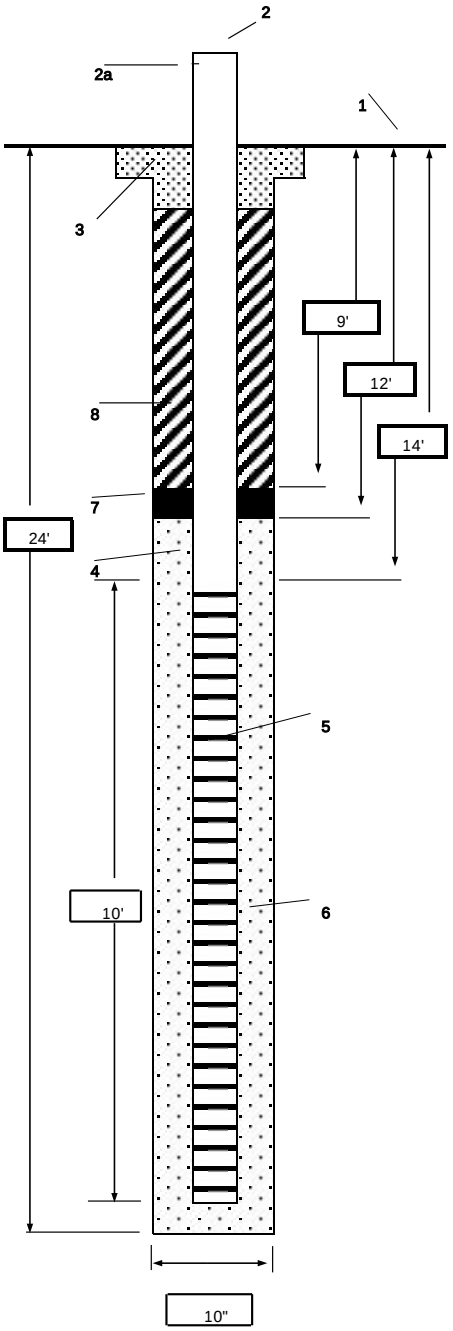
WELL COMPLETION DIAGRAM

PROJECT: CAX Site 07 Site Inspection LOCATION: Cheatham Annex, WIlliamsburg, Virginia

DRILLING CONTRACTOR: Parratt-Wolf Drilling, Inc. Coordinates: (3636757.1 N, 12032862.1 E)

DRILLING METHOD AND EQUIPMENT USED: Rubber Track Mounted CME-55, 4ft macro core sampler, acetate liners; 4.25-inch ID hollow stem augers

WATER LEVELS: 17.89' BTOC (3.22' Elevation) START: 1/18/11 END: 1/18/11 LOGGER: T. Stewart



1- Ground elevation at well	18.22'
2- Top of casing elevation	21.11'
a) vent hole?	No
3- Concrete pad dimensions	3' x 3'
4- Dia./type of well casing	2" Dia./Sch 40 PVC
5- Type/slot size of screen	0.010" Sch 40 PVC
6- Type screen filter	#1 Sand
a) Quantity used	7 - 50lb bags
7- Type of seal	Enviroplug Medium Bentonite Chips
a) Quantity used	1 - 50lb bag
8- Grout	
a) Grout mix used	Portland Cement
b) Method of placement	Tremie
c) Vol. of well casing grout	~40 gallons
Development method	Submersible pump and 2" x 6" surge block
Development time	1.25 hours
Estimated purge volume	50 gallons

Comments: The DTW measurements were subtracted from a surveyed reference datum (top of casing) to obtain groundwater elevations relative to the World Geodectic System of 1984 (WGS84). All elevation references and potentiometric indications in this figure are based on a survey conducted by Michael Surveying & Mapping, PC of Newport News, VA on April 4, 2011. Location coordinates are top of well PVC casing.

PROJECT NUMBER	WELL NUMBER	
379183	CAS07-MW03	SHEET 1 OF 1

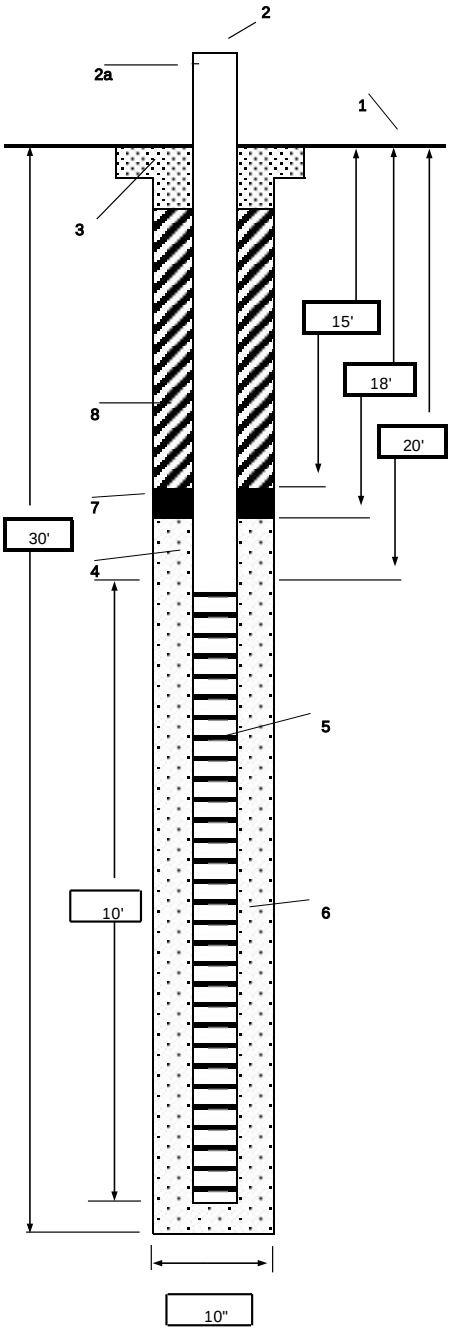
WELL COMPLETION DIAGRAM

PROJECT: CAX Site 07 Site Inspection LOCATION: Cheatham Annex, WIlliamsburg, Virginia

DRILLING CONTRACTOR: Parratt-Wolf Drilling, Inc. Coordinates: (3636757.1 N, 12032862.1 E)

DRILLING METHOD AND EQUIPMENT USED: Rubber Track Mounted CME-55, 4ft macro core sampler, acetate liners; 4.25-inch ID hollow stem augers

WATER LEVELS: 21.55' BTOC (2.41' Elevation) START: 1/14/11 END: 1/14/11 LOGGER: T. Stewart



1- Ground elevation at well	21.05'
2- Top of casing elevation	23.96'
a) vent hole?	No
3- Concrete pad dimensions	3' x 3'
4- Dia./type of well casing	2" Dia./Sch 40 PVC
5- Type/slot size of screen	0.010" Sch 40 PVC
6- Type screen filter	#1 Sand
a) Quantity used	7 - 50lb bags
7- Type of seal	Enviroplug Medium Bentonite Chips
a) Quantity used	1 - 50lb bag
8- Grout	
a) Grout mix used	Portland Cement
b) Method of placement	Tremie
c) Vol. of well casing grout	~60 gallons
Development method	Submersible pump and 2" x 6" surge block
Development time	1 hour
Estimated purge volume	50 gallons

Comments: The DTW measurements were subtracted from a surveyed reference datum (top of casing) to obtain groundwater elevations relative to the World Geodectic System of 1984 (WGS84). All elevation references and potentiometric indications in this figure are based on a survey conducted by Michael Surveying & Mapping, PC of Newport News, VA on April 4, 2011. Location coordinates are top of well PVC casing.

PROJECT NUMBER	WELL NUMBER	
379183	CAS07-MW04	SHEET 1 OF 1

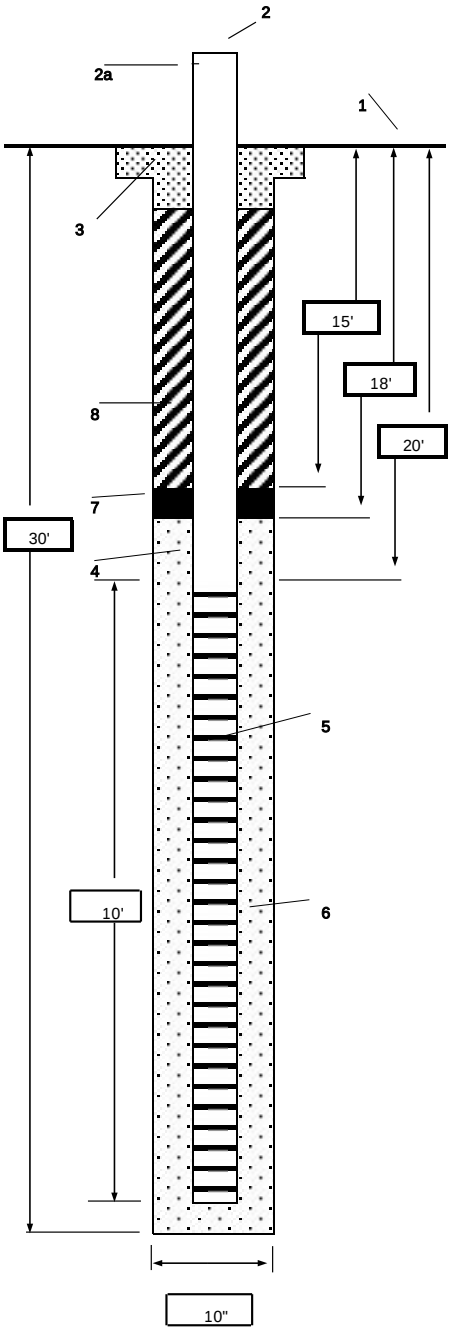
WELL COMPLETION DIAGRAM

PROJECT: CAX Site 07 Site Inspection LOCATION: Cheatham Annex, WIlliamsburg, Virginia

DRILLING CONTRACTOR: Parratt-Wolf Drilling, Inc. Coordinates: (3636757.1 N, 12032862.1 E)

DRILLING METHOD AND EQUIPMENT USED: Rubber Track Mounted CME-55, 4ft macro core sampler, acetate liners; 4.25-inch ID hollow stem augers

WATER LEVELS: 22.49' BTOC (0.89' Elevation) START: 1/14/11 END: 1/14/11 LOGGER: T. Stewart



1- Ground elevation at well	20.45'
2- Top of casing elevation	23.38'
a) vent hole?	No
3- Concrete pad dimensions	3' x 3'
4- Dia./type of well casing	2" Dia./Sch 40 PVC
5- Type/slot size of screen	0.010" Sch 40 PVC
6- Type screen filter	#1 Sand
a) Quantity used	7 - 50lb bags
7- Type of seal	Enviroplug Medium Bentonite Chips
a) Quantity used	1 - 50lb bag
8- Grout	
a) Grout mix used	Portland Cement
b) Method of placement	Tremie
c) Vol. of well casing grout	~60 gallons
Development method	Submersible pump and 2" x 6" surge block
Development time	1 .2 hours
Estimated purge volume	50 gallons

Comments: The DTW measurements were subtracted from a surveyed reference datum (top of casing) to obtain groundwater elevations relative to the World Geodectic System of 1984 (WGS84). All elevation references and potentiometric indications in this figure are based on a survey conducted by Michael Surveying & Mapping, PC of Newport News, VA on April 4, 2011. Location coordinates are top of well PVC casing.

PROJECT NUMBER	WELL NUMBER	
379183	CAS07-MW05	SHEET 1 OF 1

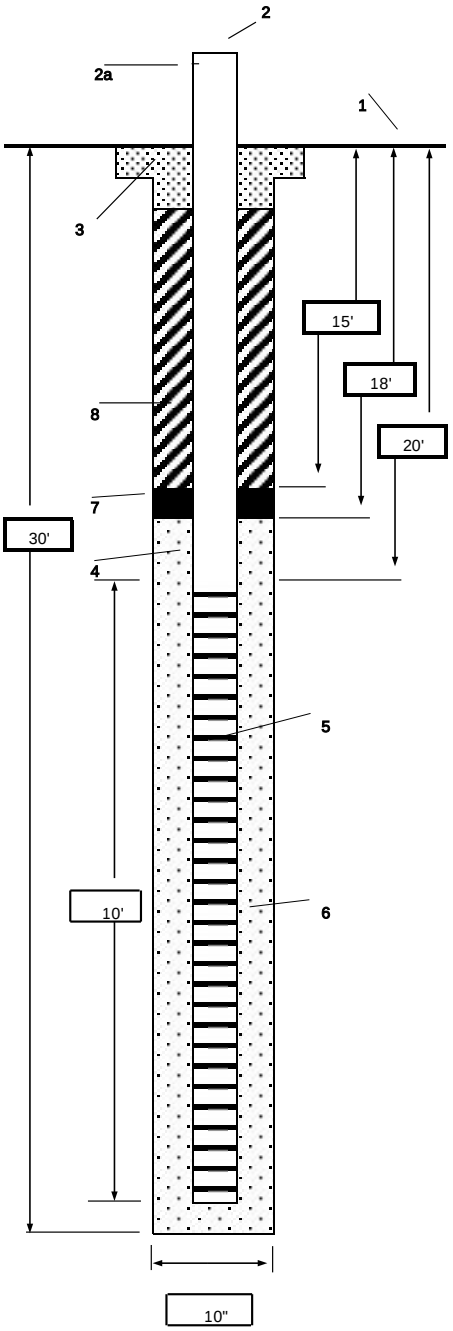
WELL COMPLETION DIAGRAM

PROJECT: CAX Site 07 Site Inspection LOCATION: Cheatham Annex, WIlliamsburg, Virginia

DRILLING CONTRACTOR: Parratt-Wolf Drilling, Inc. Coordinates: (3637060.0 N, 12033052.3 E)

DRILLING METHOD AND EQUIPMENT USED: Rubber Track Mounted CME-55, 4ft macro core sampler, acetate liners; 4.25-inch ID hollow stem augers

WATER LEVELS: 23.17' BTOC (1.42' Elevation) START: 1/12/11 END: 1/12/11 LOGGER: T. Stewart



1- Ground elevation at well	22.04'
2- Top of casing elevation	24.59'
a) vent hole?	No
3- Concrete pad dimensions	3' x 3'
4- Dia./type of well casing	2" Dia./Sch 40 PVC
5- Type/slot size of screen	0.010" Sch 40 PVC
6- Type screen filter	#1 Sand
a) Quantity used	7 - 50lb bags
7- Type of seal	Enviroplug Medium Bentonite Chips
a) Quantity used	1 - 50lb bag
8- Grout	
a) Grout mix used	Portland Cement
b) Method of placement	Tremie
c) Vol. of well casing grout	~60 gallons
Development method	Submersible pump and 2" x 6" surge block
Development time	1 .3 hours
Estimated purge volume	35 gallons

Comments: The DTW measurements were subtracted from a surveyed reference datum (top of casing) to obtain groundwater elevations relative to the World Geodectic System of 1984 (WGS84). All elevation references and potentiometric indications in this figure are based on a survey conducted by Michael Surveying & Mapping, PC of Newport News, VA on April 4, 2011. Location coordinates are top of well PVC casing.

PROJECT NUMBER	WELL NUMBER	
379183	CAS07-MW06	SHEET 1 OF 1

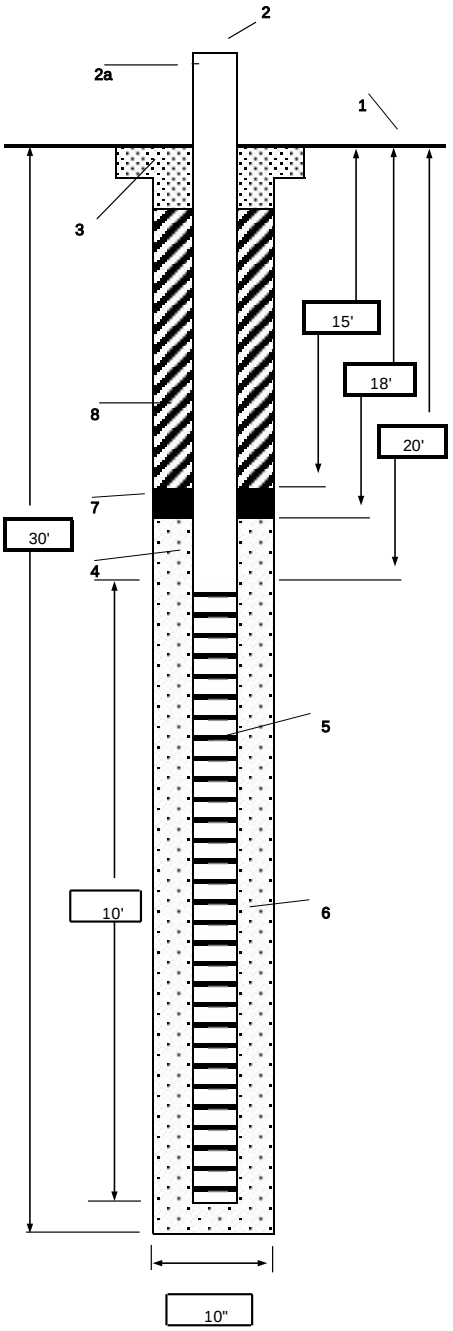
WELL COMPLETION DIAGRAM

PROJECT: CAX Site 07 Site Inspection LOCATION: Cheatham Annex, WIlliamsburg, Virginia

DRILLING CONTRACTOR: Parratt-Wolf Drilling, Inc. Coordinates: (3636932.9 N, 12033080.7 E)

DRILLING METHOD AND EQUIPMENT USED: Rubber Track Mounted CME-55, 4ft macro core sampler, acetate liners; 4.25-inch ID hollow stem augers

WATER LEVELS: 22.22' BTOC (1.53' Elevation) START: 1/13/11 END: 1/13/11 LOGGER: T. Stewart



1- Ground elevation at well	20.94'
2- Top of casing elevation	23.75'
a) vent hole?	No
3- Concrete pad dimensions	3' x 3'
4- Dia./type of well casing	2" Dia./Sch 40 PVC
5- Type/slot size of screen	0.010" Sch 40 PVC
6- Type screen filter	#1 Sand
a) Quantity used	7 - 50lb bags
7- Type of seal	Enviroplug Medium Bentonite Chips
a) Quantity used	1 - 50lb bag
8- Grout	
a) Grout mix used	Portland Cement
b) Method of placement	Tremie
c) Vol. of well casing grout	~60 gallons
Development method	Submersible pump and 2" x 6" surge block
Development time	1.25 hours
Estimated purge volume	55 gallons

Comments: The DTW measurements were subtracted from a surveyed reference datum (top of casing) to obtain groundwater elevations relative to the World Geodectic System of 1984 (WGS84). All elevation references and potentiometric indications in this figure are based on a survey conducted by Michael Surveying & Mapping, PC of Newport News, VA on April 4, 2011. Location coordinates are top of well PVC casing.

PROJECT NUMBER	WELL NUMBER	
379183	CAS07-MW07	SHEET 1 OF 1

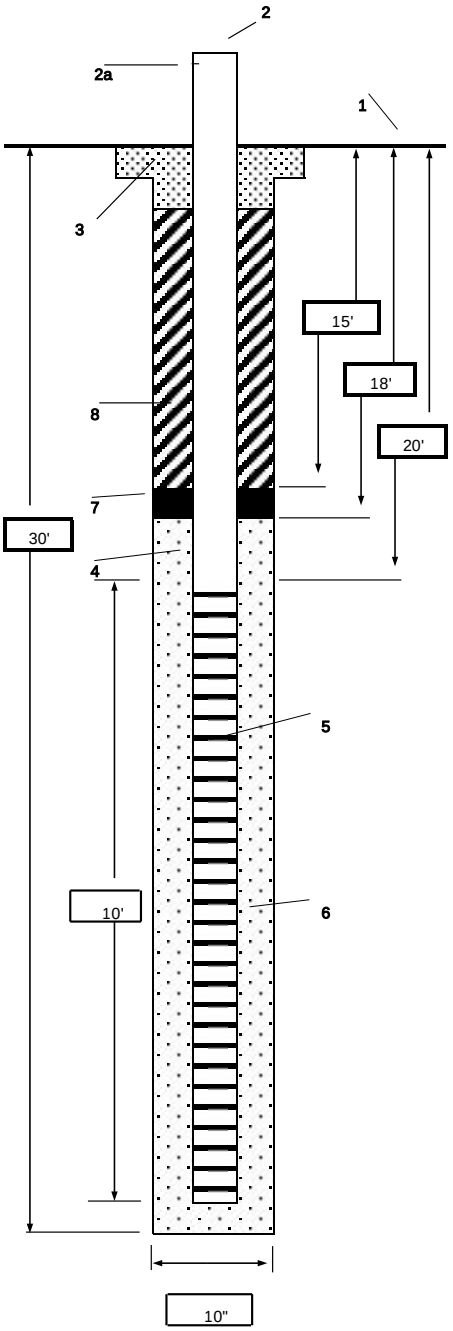
WELL COMPLETION DIAGRAM

PROJECT: CAX Site 07 Site Inspection LOCATION: Cheatham Annex, WIlliamsburg, Virginia

DRILLING CONTRACTOR: Parratt-Wolf Drilling, Inc. Coordinates: (3636780.7 N, 12033102.2 E)

DRILLING METHOD AND EQUIPMENT USED: Rubber Track Mounted CME-55, 4ft macro core sampler, acetate liners; 4.25-inch ID hollow stem augers

WATER LEVELS: 22.15' BTOC (1.96' Elevation) START: 1/13/11 END: 1/13/11 LOGGER: T. Stewart



1- Ground elevation at well	21.03'
2- Top of casing elevation	24.11'
a) vent hole?	No
3- Concrete pad dimensions	3' x 3'
4- Dia./type of well casing	2" Dia./Sch 40 PVC
5- Type/slot size of screen	0.010" Sch 40 PVC
6- Type screen filter	#1 Sand
a) Quantity used	7 - 50lb bags
7- Type of seal	Enviroplug Medium Bentonite Chips
a) Quantity used	1 - 50lb bag
8- Grout	
a) Grout mix used	Portland Cement
b) Method of placement	Tremie
c) Vol. of well casing grout	~60 gallons
Development method	Submersible pump and 2" x 6" surge block
Development time	1.25 hours
Estimated purge volume	50 gallons

Comments: The DTW measurements were subtracted from a surveyed reference datum (top of casing) to obtain groundwater elevations relative to the World Geodectic System of 1984 (WGS84). All elevation references and potentiometric indications in this figure are based on a survey conducted by Michael Surveying & Mapping, PC of Newport News, VA on April 4, 2011. Location coordinates are top of well PVC casing.

Appendix E
Investigation-derived Waste Analytical Data

Appendix E
Investigative Derived Waste Analytical Results - Soil
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Sample ID	CAS07-IDW-SO-021411
Sample Date	2/14/11
Chemical Name	
TCLP Volatile Organic Compounds (MG/L)	
1,1-Dichloroethene	0.005 U
1,2-Dichloroethane	0.005 U
1,4-Dichlorobenzene	0.005 U
2-Butanone	0.05 X, U
Benzene	0.005 U
Carbon tetrachloride	0.005 U
Chlorobenzene	0.005 U
Chloroform	0.005 U
Tetrachloroethene	0.005 U
Trichloroethene	0.005 U
Vinyl chloride	0.005 U
TCLP Semivolatile Organic Compounds (MG/L)	
2,4,5-Trichlorophenol	0.025 U
2,4,6-Trichlorophenol	0.025 U
2,4-Dinitrotoluene	0.025 U
2-Methylphenol	0.025 U
3-Methylphenol	0.025 U
4-Methylphenol	0.025 U
Hexachlorobenzene	0.025 Q, U
Hexachlorobutadiene	0.025 U
Hexachloroethane	0.025 U
Nitrobenzene	0.025 U
Pentachlorophenol	0.1 U
Pyridine	0.025 U
TCLP Pesticides/Polychlorinated Biphenyls (MG/L)	
Chlordane	0.00025 X, U
Endrin	0.0001 U
gamma-BHC (Lindane)	0.0001 U
Heptachlor	0.0001 U
Heptachlor epoxide	0.0001 U
Methoxychlor	0.0001 U
Toxaphene	0.0067 X, U
TCLP Herbicides (MG/L)	
2,4,5-TP (Silvex)	0.005 U
2,4-D	0.05 U
TCLP Metals (MG/L)	
Arsenic	0.06 U
Barium	0.671
Cadmium	0.02 U
Chromium	0.04 U
Lead	0.0295 J
Mercury	0.002 U
Selenium	0.05 U
Silver	0.02 U
Wet Chemistry (MG/KG)	
Cyanide	0.25 U
Reactive Sulfide	150 U
Corrosivity (pH units)	5.71 H3
Ignitability (DEG/F)	> 158

Notes:

H3 - Sample received after EPA recommended holding time.
J - Analyte present below detection limit
Q - The RPD and/or percent recovery exceeded limits in the associated Blank Spike and/or Blank Spike Duplicate.
Q, U - See 'Q' and 'U'
U - The material was analyzed for, but not detected
X, U - See 'X' and 'U'
X - The parameter shows a potential positive bias on a reported concentration due to an ICV or CCV exceeding the upper control limit on the high side.
DEG/F - Degrees Fahrenheit
MG/KG - Milligrams per kilogram
MG/L - Milligrams per liter
PH - pH units

Appendix E
Investigative Derived Waste Detection Summary - Soil
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Sample ID	CAS07-IDW-SO-021411
Sample Date	2/14/11
Chemical Name	
TCLP Volatile Organic Compounds (MG/L)	
No Detections	
TCLP Semivolatile Organic Compounds (MG/L)	
No Detections	
TCLP Pesticides/Polychlorinated Biphenyls (MG/L)	
No Detections	
TCLP Herbicides (MG/L)	
No Detections	
TCLP Metals (MG/L)	
Barium	0.671
Lead	0.0295 J
Wet Chemistry	
Corrosivity (pH units)	5.71 H3

Notes:

Shading indicates detection

H3 - Sample received after EPA recommended holding time.

J - Analyte present below detection limit

MG/L - Milligrams per liter

PH - pH units

Appendix E
Investigative Derived Waste Analytical Results - Aqueous
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Sample ID	CAS07-IDW-AQ-021411
Sample Date	2/14/11
Chemical Name	
TCLP Volatile Organic Compounds (MG/L)	
1,1-Dichloroethene	0.005 U
1,2-Dichloroethane	0.005 U
1,4-Dichlorobenzene	0.005 U
2-Butanone	0.05 X, U
Benzene	0.005 U
Carbon tetrachloride	0.005 U
Chlorobenzene	0.005 U
Chloroform	0.005 U
Tetrachloroethene	0.005 U
Trichloroethene	0.00501 J
Vinyl chloride	0.005 U
TCLP Semivolatile Organic Compounds (MG/L)	
2,4,5-Trichlorophenol	0.025 U
2,4,6-Trichlorophenol	0.025 U
2,4-Dinitrotoluene	0.025 U
2-Methylphenol	0.025 U
3-Methylphenol	0.025 U
4-Methylphenol	0.025 U
Hexachlorobenzene	0.025 Q, U
Hexachlorobutadiene	0.025 U
Hexachloroethane	0.025 U
Nitrobenzene	0.025 U
Pentachlorophenol	0.1 U
Pyridine	0.025 U
TCLP Pesticides/Polychlorinated Biphenyls (MG/L)	
Chlordane	0.00025 X, U
Endrin	0.0001 U
gamma-BHC (Lindane)	0.0001 U
Heptachlor	0.0001 U
Heptachlor epoxide	0.0001 U
Methoxychlor	0.0001 U
Toxaphene	0.0067 X, U
TCLP Herbicides (MG/L)	
2,4,5-TP (Silvex)	0.005 U
2,4-D	0.05 U
TCLP Metals (MG/L)	
Arsenic	0.06 U
Barium	0.0809 J
Cadmium	0.02 U
Chromium	0.04 U
Lead	0.03 U
Mercury	0.002 U
Selenium	0.05 U
Silver	0.02 U
Wet Chemistry (MG/L)	
Cyanide	0.0132 J
Reactive Sulfide	150 U
Corrosivity (pH units)	7.39 H3
Ignitability (DEG/F)	> 158

Notes:

H3 - Sample received after EPA recommended holding time.

J - Analyte present below detection limit

Q - The RPD and/or percent recovery exceeded limits in the associated Blank Spike and/or Blank Spike Duplicate.

Q, U - See 'Q' and 'U'

U - The material was analyzed for, but not detected

X, U - See 'X' and 'U'

X - The parameter shows a potential positive bias on a reported concentration due to an ICV or CCV exceeding the upper control limit on the high side.

DEG/F - Degrees Fahrenheit

MG/L - Milligrams per liter

PH - pH units

Appendix E
Investigative Derived Waste Detection Summary - Aqueous
Site 7 Site Inspection
Cheatham Annex
Williamsburg, Virginia

Sample ID	CAS07-IDW-AQ-021411
Sample Date	2/14/11
Chemical Name	
TCLP Volatile Organic Compounds (MG/L)	
Trichloroethene	0.00501 J
TCLP Semivolatile Organic Compounds (MG/L)	
No Detections	
TCLP Pesticides/Polychlorinated Biphenyls (MG/L)	
No Detections	
TCLP Herbicides (MG/L)	
No Detections	
TCLP Metals (MG/L)	
Barium	0.0809 J
Wet Chemistry	
Cyanide (MG/L)	0.0132 J
Corrosivity (pH units)	7.39 H3

Notes:

Shading indicates detection
H3 - Sample received after EPA recommended holding time.
J - Analyte present below detection limit
DEG/F - Degrees Fahrenheit
MG/L - Milligrams per liter
PH - pH units

Appendix F
Investigation-derived Waste Disposal Manifests

Soilex Corporation
Post Office Box 1444
Chesapeake, VA 23327
(757) 549-8448
FAX: (757) 549-6668

NON-HAZARDOUS SHIPPING MANIFEST

MANIFEST NO._____

GENERATOR

NAME	**NAVFAC Mid-Atlantic**	TELEPHONE	
ADDRESS	**9742 Maryland Ave. Bldg. N-26**	CITY **Norfolk**	STATE **VA**
SHIPMENT ORIGIN	**N.W.S. Yorktown, CAX, Site 7**	CITY **Williamsburg**	STATE **VA**
AUTHORIZED AGENT	**c/o CH2M HILL**	FIRM	
ADDRESS		OTHER **N62470-08-D-1000, CTO-55**	

MATERIAL CHARACTERIZATION

ACTIVITY GENERATING THIS MATERIAL: UST/AST REMOVAL _____ OTHER **Groundwater IDW**

PETROLEUM TYPE (S): **none** VIRGIN PRODUCT_____ NON-VIRGIN PRODUCT_____

PHYSICAL STATE: STOCKPILED _____ EXCAVATING_____ DRUMS **12** OTHER _____

HANDLING INSTRUCTIONS: **Transport To Facility Designated Below**

FIRE OR SPILL INSTRCUTIONS: **Non-Flammable / Non-Hazardous**

DESTINATION: **Chesapeake Facility**

I hereby certify, to the best of my knowledge, the material characterized above is non-hazardous as defined by the Virginia Hazardous Waste Management Regulations, Federal Regulations under Subtitle C - RCRA, U.S. Department of Transportation, or local / state of origin regulations.

Krista Parra
Signature of Generator / Agent

Krista Parra / 4
Printed Name / Date

TRANSPORTER

TRANSPORTER NAME **Soilex Corporation** TELEPHONE **549-8448** TRUCK NO. BOX

I certify that the materials described above were received by me for shipment and delivered to the designated facility.

4-8-11
Transporter Signature / Date

FACILTIY

I certify that the materials described above were delivered to the facility and received by me.

ACCEPTED BY Tony DATE 4-8-11

REASONS FOR REJECTION _____

Gross Weight	
Tare Weight	
Net Weight	
Tons	

FACILITY

Soilex Corporation
Post Office Box 1444
Chesapeake, VA 23327
(757) 549-8448
FAX: (757) 549-6668

NON-HAZARDOUS SHIPPING MANIFEST

MANIFEST NO._____

GENERATOR

NAME	**NAVFAC Mid-Atlantic**	TELEPHONE	
ADDRESS	**9742 Maryland Ave. Bldg. N-26**	CITY **Norfolk**	STATE **VA**
SHIPMENT ORIGIN	**N.W.S. Yorktown, CAX, Site 7**	CITY **Williamsburg**	STATE **VA**
AUTHORIZED AGENT	**c/o CH2M HILL**	FIRM	
ADDRESS		OTHER **N62470-08-D-1000, CTO-55**	

MATERIAL CHARACTERIZATION

ACTIVITY GENERATING THIS MATERIAL: UST/AST REMOVAL _____ OTHER **Soil IDW**

PETROLEUM TYPE (S): **none** VIRGIN PRODUCT_____ NON-VIRGIN PRODUCT_____

PHYSICAL STATE: STOCKPILED _____ EXCAVATING_____ DRUMS **15** OTHER _____

HANDLING INSTRUCTIONS: **Transport To Facility Designated Below**

FIRE OR SPILL INSTRCUTIONS: **Non-Flammable / Non-Hazardous**

DESTINATION: **Chesapeake Facility**

I hereby certify, to the best of my knowledge, the material characterized above is non-hazardous as defined by the Virginia Hazardous Waste Management Regulations, Federal Regulations under Subtitle C - RCRA, U.S. Department of Transportation, or local / state of origin regulations.

Krista Parra
Signature of Generator / Agent

Krista Parra /
Printed Name / Date

TRANSPORTER

TRANSPORTER NAME **Soilex Corporation** TELEPHONE **549-8448** TRUCK NO. 80X

I certify that the materials described above were received by me for shipment and delivered to the designated facility.

4-8-11
Transporter Signature / Date

FACILTIY

I certify that the materials described above were delivered to the facility and received by me.

ACCEPTED BY Tony DATE 4-8-11

REASONS FOR REJECTION _____

Gross Weight	
Tare Weight	
Net Weight	
Tons	

FACILITY

Appendix G
Pre-TCRA Human Health Risk Screening

APPENDIX G

Human Health Risk Screening (Site 7 Sediment)

A human health risk screening and risk ration evaluation for the surface soil to sediment exposure pathway was conducted assuming that the concentrations in the pre-time critical removal action (TCRA) surface soil data from samples at the edge of the site adjacent to the river are a conservative representation of the potential concentrations in the river sediment. In reality, contaminated soil and ash that was eroded during a major storm would be transported, diluted, and dispersed over a wide area, causing actual river sediment concentrations resulting from the exposed debris to be significantly lower than assumed in this evaluation. Therefore, the results of the human health risk screening provide a conservative preliminary indication of potential risks from exposure to chemicals of potential concern (COPCs) in the river sediment and may be used to help determine whether the site requires further evaluation (e.g., a baseline risk assessment or additional data collection).

G.1 Human Health Conceptual Site Model

The human health conceptual site model (CSM) presents an overview of site conditions, potential contaminant migration pathways, and exposure pathways to potential receptors. The human health CSM for sediment for Site 7 is presented in **Figure G-1**.

CAX currently comprises 1,578 acres, of which approximately 50% is undeveloped with outdoor recreational facilities. The mission of CAX includes supplying Atlantic Fleet ships and providing recreational opportunities to military and civilian personnel. In addition to receiving, storing, issuing, packing, and shipping Navy stock material and shipboard equipment, CAX provides warehouse and distribution services for 39 Storage Authorization Programs and tenant organizations. Site 7, the Old DuPont Disposal Area, is approximately 1 acre in size located along the York River, northeast of Chase Road in the north central portion of CAX. The site gradient is fairly level with a nearly vertical drop (approximately 15 feet) along the eastern boundary to the York River shoreline which is highly vulnerable to erosion caused by surface water runoff and wave action. Site 7 received wastes from the City of Penniman and from the DuPont facility. Wastes were reported to be non-hazardous and/or inert; however, specific information documenting the types and quantities of wastes is not available. The presence of ash, melted bottles, and charred metal indicate some of the waste may have been incinerated prior to disposal (Baker/CH2M HILL, 2004b). In September 2003, Hurricane Isabel eroded approximately 15 to 20 feet of shoreline, resulting in a large amount of debris covering the beach and an unstable slope along the eastern boundary of Site 7. A time critical removal action (TCRA) was completed in July/August 2006 to stabilize the shoreline and prevent further erosion of disposal area contents into the York River (Baker/CH2M HILL, 2004a). A removal action was completed between December 2007 and April 2008 to remove waste and waste-impacted soils remaining on site

Currently, Site 7 is vacant and surrounded by a fence to prevent trespassers from entering the site. However, recreational users and trespassers can access the river and contact thw

sediment. Therefore, the potential current receptors may come in contact with sediment; exposure routes may include incidental ingestion of and dermal contact with the sediment. The potential future receptors for sediment would be the same as the potential current receptors.

G.2 Human Health Risk Screening Methodology

The human health risk screening was conducted in three steps using a risk ratio technique (U.S. Navy, 2000). If COPCs were identified after Step 1, the COPCs were evaluated in Step 2. If COPCs were identified after Step 2, the COPCs were evaluated in Step 3. The three-step screening process is described below:

G.2.1 Step 1

The maximum detected constituent concentrations for soil (representing sediment) were compared to the ten times USEPA human health regional screening levels for residential soil (RSL, USEPA 2011). RSLs based on noncarcinogenic effects were divided by 10 to account for exposure to multiple constituents (i.e., were adjusted to a hazard quotient of 0.1, from the hazard quotient of 1.0 used on the USEPA RSL table). RSLs based on carcinogenic endpoints were used as presented in the RSL table, and are based on a carcinogenic risk of 1×10^{-6}. Therefore, the sediment screening values for constituents with RSLs based on non carcinogenic effects are the residential soil RSLs (RSL multiplied by ten for sediment, and then divided by ten for exposure to multiple constituents) and the sediment screening values for constituents with RSLs based on cancer are the ten times the residential soil RSLs. Appropriate constituents were chosen as surrogates for constituents not included in the RSL table, and their RSLs were used as the screening value. These constituents are identified on **Table G-2.1**.

The COPC selection process for dioxin/furan congeners was performed using the 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxicity equivalent (TEQ) concentration. TEQ concentrations for the dioxin/furan congeners were calculated for the one sample analyzed for dioxion/furan congeners in accordance with the World Health Organization (WHO) toxicity equivalency factor (TEF) approach (Van den Berg et al., 2006; USEPA, 2010) to adjust the relative carcinogenic potency of specific dioxin/furan congeners, relative to 2,3,7,8-TCDD, the most potent dioxin congener. Using the measured concentration values for each congener and the TEF for that congener, the dioxin TEQ concentration for a mixture of dioxin/furan congeners in the sample was calculated using the equation below. The TEFs used to calculate the dioxin TEQ concentrations are shown in **Table G-2.1 Supplement A**.

$$\text{2,3,7,8-TCDD TEQ Concentration} = \Sigma\,(TEFi \times Ci)$$

where:

2,3,7,8-TCDD TEQ = 2,3,7,8-TCDD toxicity equivalent concentration (mg/kg)

TEFi = Toxicity equivalency factor for congener "i" (unitless)

Ci = Concentration of congener "i" (mg/kg)

If the maximum detected concentration in sediment exceeded the appropriate screening level, the screening level risk evaluation proceeded to Step 2.

G.2.2 Step 2

For chemicals identified as COPCs in Step 1, a corresponding risk level was calculated using the following equation:

$$\text{corresponding risk level} = \frac{\text{concentration x acceptable risk level}}{\text{RSL}}$$

The concentration is the maximum detected concentration (the same concentration that was used in Step 1). The acceptable risk level is 1 for noncarcinogens and 10^{-6} for carcinogens. RSLs for noncarcinogenic effects are not adjusted by 10 as was done in Step 1; they are used as presented in the RSL table. All of the corresponding risk levels for each constituent within a media are summed to calculate the cumulative corresponding hazard index (for noncarcinogens) and cumulative corresponding carcinogenic risk (for carcinogens). A cumulative corresponding hazard index is also calculated for each target organ/effect. If the cumulative corresponding hazard index for a target organ/effect is greater than the risk-ratio screening benchmark of 0.5, or the cumulative corresponding carcinogenic risk is greater than the 5×10^{-5} risk-ratio screening benchmark, the chemicals contributing to these values are retained as COPCs and carried forward to Step 3.

G.2.3 Step 3

Step 3 was not performed for the sediment. As discussed below, there were no COPCs following Step 2.

G.3 Human Health Risk Screening Results

Tables G-2.1 through **G-2.1a** present the risk-based screening and risk ratio evaluation for soil (representing sediment) at Site 7. Two metals (arsenic and chromium) were identified as COPCs for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations, **Table G-2.1a**), neither of these metals were identified as a COPC.

The potential unacceptable carcinogenic risk identified in Step 1 from exposure to Site 7 soil was primarily associated with chromium, and based on the assumption that all of the chromium present in the soil is in the hexavalent form of chromium. However, while only 1 of the 45 detected concentrations of chromium exceeded the background 95 percent UTL for chromium, none of these concentrations exceeded the maximum base background concentrations. This indicates that chromium concentrations were consistent with base background concentrations and are not site-related. Also, it is important to note that in performing the risk evaluation, it was assumed that all of the chromium detected in the soil was in the hexavalent form, which is very unlikely. Chromium is generally found in natural soil predominantly in the trivalent form, unless activities at the site have resulted in the release or formation of hexavalent chromium. At Site 7, it is likely that trivalent chromium is

the predominant form of chromium that is present at the site. Chromium was identified as a COPC in soil only when screened against the RSL for hexavalent chromium. However, the maximum detected concentration for chromium in soil was less than the RSL for trivalent chromium. If chromium is not retained as a COPC since site concentrations are consistent with base background concentrations and the chromium present is likely to be the trivalent form, arsenic would not be considered a COPC, as it alone does not contribute a cancer risk above the 5×10^{-5} risk-ratio screening benchmark level. Therefore, exposure to sediment (based on the conservative use of Pre-TCRA site soil data) would not result in unacceptable risks to potential human receptors.

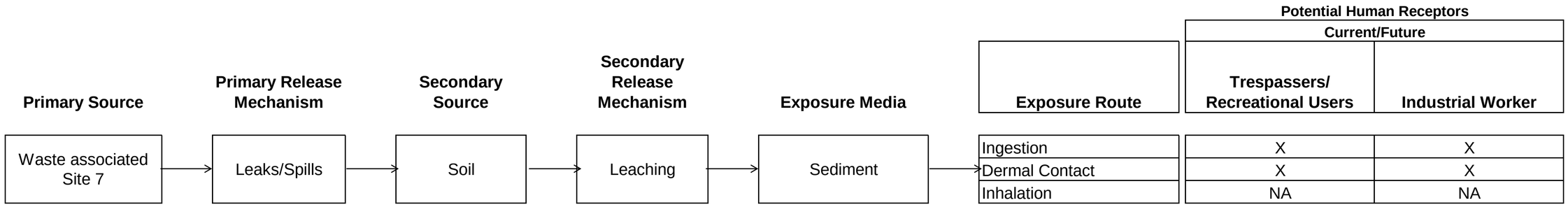
G.4 References

U.S. Navy. 2000. *Overview of Screening, Risk Ratio, and Toxicological Evaluation*. Procedures for Northern Division Human Health Risk Assessments. May.

USEPA. 2010. Recommended Toxicity Equivalence Factors (TEFs) for Human Health Risk Assessments of 2,3,7,8-Tetrachlorodibenzo-p-dioxin and Dioxin-Like Compounds. Risk Assessment Forum, Washington, DC. *EPA/100/R-10/005*.

USEPA. 2011. *Regional Screening Levels for Chemicals at Superfund Sites*. June.

Van den Berg et al., 2006. The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds. ToxSci Advance Access. July 7.



Exposure Route	Potential Human Receptors: Current/Future — Trespassers/ Recreational Users	Potential Human Receptors: Current/Future — Industrial Worker
Ingestion	X	X
Dermal Contact	X	X
Inhalation	NA	NA

NA - Not Applicable or pathway is incomplete
X - Potentially complete exposure pathways

FIGURE G-1
Pre-TCRA Conceptual Site Model for HHRA for Sediment
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Table G-2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 7

Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Sediment

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Sediment	56-55-3	Benzo(a)anthracene	5.2E-03 J	9.3E-03 J	MG/KG	CAX-07N-SS5-00	2/8	0.0052 - 0.011	9.3E-03	NA	1.5E+00 C	N/A	N/A	NO	BSL
	50-32-8	Benzo(a)pyrene	5.2E-03 J	8.9E-03 J	MG/KG	CAX-07N-SS5-00	2/8	0.0052 - 0.011	8.9E-03	NA	1.5E-01 C	N/A	N/A	NO	BSL
	205-99-2	Benzo(b)fluoranthene	1.1E-02 J	1.3E-02	MG/KG	CAX-07N-SS5-00	2/8	0.0095 - 0.013	1.3E-02	NA	1.5E+00 C	N/A	N/A	NO	BSL
	191-24-2	Benzo(g,h,i)perylene	5.6E-03 J	8.0E-03 J	MG/KG	CAX-07N-SS5-00	2/8	0.0056 - 0.011	8.0E-03	NA	1.7E+03 N	N/A	N/A	NO	BSL
	207-08-9	Benzo(k)fluoranthene	4.7E-03 J	9.3E-03 J	MG/KG	CAX-07N-SS5-00	3/8	0.0047 - 0.011	9.3E-03	NA	1.5E+01 C	N/A	N/A	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	1.9E-01 J	9.9E-01	MG/KG	07N-SS14-00	2/8	0.19 - 0.99	9.9E-01	NA	3.5E+02 C*	N/A	N/A	NO	BSL
	218-01-9	Chrysene	5.0E-03 J	1.2E-02	MG/KG	CAX-07N-SS5-00	3/8	0.005 - 0.012	1.2E-02	NA	1.5E+02 C	N/A	N/A	NO	BSL
	53-70-3	Dibenz(a,h)anthracene	5.4E-03 J	5.4E-03 J	MG/KG	CAX-07N-SS9-00	1/8	0.0054 - 0.011	5.4E-03	NA	1.5E-01 C	N/A	N/A	NO	BSL
	117-84-0	Di-n-octylphthalate	9.7E-02 J	9.7E-02 J	MG/KG	07N-SS15-00	1/8	0.097 - 0.45	9.7E-02	NA	N/A	N/A	N/A	NO	NTX
	206-44-0	Fluoranthene	4.4E-03 J	1.9E-02	MG/KG	CAX-07N-SS5-00	5/8	0.0044 - 0.019	1.9E-02	NA	2.3E+03 N	N/A	N/A	NO	BSL
	85-01-8	Phenanthrene	4.8E-03 J	1.5E-02	MG/KG	CAX-07N-SS5-00	5/8	0.0048 - 0.015	1.5E-02	NA	1.7E+04 N	N/A	N/A	NO	BSL
	129-00-0	Pyrene	6.8E-03 J	1.6E-02	MG/KG	CAX-07N-SS5-00	3/8	0.0068 - 0.016	1.6E-02	NA	1.7E+03 N	N/A	N/A	NO	BSL
	72-55-9	4,4'-DDE	2.0E-03 J	2.0E-03 J	MG/KG	07N-SS12-00	1/8	0.002 - 0.0045	2.0E-03	NA	1.4E+01 C	N/A	N/A	NO	BSL
	50-29-3	4,4'-DDT	1.3E-03 JP	1.3E-03 JP	MG/KG	07N-SS12-00	1/8	0.0013 - 0.0045	1.3E-03	NA	1.7E+01 C*	N/A	N/A	NO	BSL
	319-84-6	alpha-BHC	9.4E-04 J	9.4E-04 J	MG/KG	CAX-07N-SS5-00	1/8	0.00094 - 0.0023	9.4E-04	NA	7.7E-01 C	N/A	N/A	NO	BSL
	5103-71-9	alpha-Chlordane	4.6E-04 JP	3.6E-03	MG/KG	CAX-07N-SS9-00	2/8	0.00046 - 0.0036	3.6E-03	NA	1.6E+01 C*	N/A	N/A	NO	BSL
	319-85-7	beta-BHC	8.2E-04 J	2.6E-03 J	MG/KG	CAX-07N-SB4-01	4/8	0.00082 - 0.0026	2.6E-03	NA	2.7E+00 C	N/A	N/A	NO	BSL
	1024-57-3	Heptachlor epoxide	6.1E-04 J	6.1E-04 J	MG/KG	CAX-07N-SS5-00	1/8	0.00061 - 0.0023	6.1E-04	NA	5.3E-01 C*	N/A	N/A	NO	BSL
	1746-01-6	2,3,7,8-TCDD TEQ (dioxin)[6]	3.2E-05	3.2E-05	MG/KG	CAX-07N-SB4-01	1/1		3.2E-05	NA	4.5E-05 C*	N/A	N/A	NO	BSL
	7429-90-5	Aluminum	5.1E+03	1.0E+04	MG/KG	07N-SS13-00	8/8	5130 - 10200	1.0E+04	NA	7.7E+04 N	N/A	N/A	NO	BSL
	7440-38-2	**Arsenic**	**2.8E+00**	**4.8E+00**	**MG/KG**	**CAX-07N-SB4-01**	**7/8**	**4.0E+02**	**4.8E+00**	**NA**	**3.9E+00 C***	**N/A**	**N/A**	**YES**	**ASL**
	7440-39-3	Barium	3.4E+01 J	2.6E+02	MG/KG	CAX-07N-SB4-01	8/8	33.5 - 264	2.6E+02	NA	1.5E+04 N	N/A	N/A	NO	BSL
	7440-70-2	Calcium	8.7E+02 J	8.9E+03	MG/KG	CAX-07N-SB4-01	6/8	738 - 8880	8.9E+03	NA	N/A	N/A	N/A	NO	NUT
	7440-47-3	**Chromium**	**6.6E+00 E**	**1.9E+01**	**MG/KG**	**CAX-07N-SS5-00**	**8/8**	**6.6 - 18.5**	**1.9E+01**	**NA**	**2.9E+00 C**	**N/A**	**N/A**	**YES**	**ASL**
	7440-48-4	Cobalt	4.4E+00 J	6.7E+00 J	MG/KG	CAX-07N-SS5-00	3/8	1.3 - 6.7	6.7E+00	NA	2.3E+01 N	N/A	N/A	NO	BSL
	7440-50-8	Copper	5.4E+00 J	6.9E+01	MG/KG	CAX-07N-SB4-01	6/8	4.1 - 69.2	6.9E+01	NA	3.1E+03 N	N/A	N/A	NO	BSL
	7439-89-6	Iron	4.7E+03	1.1E+04	MG/KG	CAX-07N-SS8-00	8/8	4670 - 11000	1.1E+04	NA	5.5E+04 N	N/A	N/A	NO	BSL
	7439-92-1	Lead	1.7E+01	2.8E+02	MG/KG	CAX-07N-SB4-01	8/8	17.3 - 283	2.8E+02	NA	4.0E+02 L	N/A	N/A	NO	BSL
	7439-95-4	Magnesium	5.7E+02 J	1.1E+03 J	MG/KG	CAX-07N-SB4-01	4/8	516 - 1140	1.1E+03	NA	N/A	N/A	N/A	NO	NUT
	7439-96-5	Manganese	6.4E+01	3.9E+02	MG/KG	CAX-07N-SS5-00	8/8	64.3 - 393	3.9E+02	NA	1.8E+03 N	N/A	N/A	NO	BSL
	7439-97-6	Mercury	6.3E-02 J	2.4E-01	MG/KG	CAX-07N-SB4-01	3/8	0.053 - 0.24	2.4E-01	NA	2.3E+01 N	N/A	N/A	NO	BSL
	7440-02-0	Nickel	4.2E+00 J	1.4E+01	MG/KG	CAX-07N-SS5-00	4/8	4.2 - 14.2	1.4E+01	NA	1.5E+03 N	N/A	N/A	NO	BSL
	7440-09-7	Potassium	2.9E+02 J	9.9E+02 J	MG/KG	CAX-07N-SB4-01	4/8	289 - 993	9.9E+02	NA	N/A	N/A	N/A	NO	NUT
	7440-23-5	Sodium	5.5E+01 J	3.7E+02 J	MG/KG	CAX-07N-SB4-01	3/8	51.4 - 369	3.7E+02	NA	N/A	N/A	N/A	NO	NUT
	7440-62-2	Vanadium	1.2E+01	2.7E+01	MG/KG	CAX-07N-SS8-00	8/8	11.8 - 26.8	2.7E+01	NA	3.9E+02 N	N/A	N/A	NO	BSL
	7440-66-6	Zinc	1.8E+01	3.4E+02	MG/KG	CAX-07N-SS8-00	8/8	18.1 - 344	3.4E+02	NA	2.3E+04 N	N/A	N/A	NO	BSL

Table G-2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 7
Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Sediment

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentrations.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Oak Ridge National Laboratory (ORNL). June, 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites. [Online].
Available: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm. Ten times adjusted (noncarcinogenic RSLs adjusted by dividing by 10) residential soil RSLs.
RSL value for pyrene used as surrogate for benzo(g,h,i)perylene.
RSL value for anthracene used as surrogate for phenanthrene.
RSL value for chlordane used as surrogate for alpha-chlordane.
RSL value for 2,3,7,8-TCDD TEQ is RSL for 2,3,7,8-TCDD (dioxin)
RSL value for Chromium(VI) used for chromium.
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
RSL value for Manganese (water) used as surrogate for manganese.
RSL value for Mercury (inorganic salts) used as surrogate for mercury.
[5] Rationale Codes

Selection Reason:	Above Screening Levels (ASL)
Deletion Reason:	No Toxicity Information (NTX)
	Essential Nutrient (NUT)
	Below Screening Level (BSL)

[6] 2,3,7,8-TCDD TEQ concentration calculated on Table 2.1 Supplement A.

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
C = Carcinogenic
C* = where N RSL < 10x C RSL
N = Noncarcinogenic
E = Concentration exceeds calibration range of GC/MS instrument (Organic), or Value is estimated due to matrix interferences (Inorganic)
L = Noncarcinogenic lead residential soil RSL not adjusted by dividing by 10.

Table G-2.1 Supplement A

Calculation of 2,3,7,8-TCDD Equivalent Concentrations - Soil/Sediment

Site 7

Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia

StationID		**CAS07N-SO04**		
SampleID		**CAX-07N-SB4-01**		
SampleDate		**3/24/2004**		
Analyte (pg/g)	**TEF[1]**	**Conc. (pg/g)**	**Data Qualifier**	**2,3,7,8-TCDD TEQ**
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.01	6.1E+00		6.1E-02
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.01	1.1E+02		1.1E+00
1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.01	7.7E-01	J	7.7E-03
1,2,3,4,7,8-Hexachlorodibenzofuran	0.1	1.4E+00	J	1.4E-01
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	0.1	1.5E+01		1.5E+00
1,2,3,6,7,8-Hexachlorodibenzofuran	0.1	1.6E+00	J	1.6E-01
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	0.1	1.9E+01		1.9E+00
1,2,3,7,8,9-Hexachlorodibenzofuran	0.1	7.7E-01	J	7.7E-02
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	0.1	2.2E+01		2.2E+00
1,2,3,7,8-Pentachlorodibenzofuran	0.03	8.3E-01	J	2.5E-02
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1	1.9E+01		1.9E+01
2,3,4,6,7,8-Hexachlorodibenzofuran	0.1	2.3E+00	J	2.3E-01
2,3,4,7,8-Pentachlorodibenzofuran	0.3	1.8E+00	J	5.5E-01
2,3,7,8-TCDD (dioxin)	1	4.9E+00		4.9E+00
2,3,7,8-Tetrachlorodibenzofuran	0.1	4.8E-01	J	4.8E-02
Octachlorodibenzofuran	0.0003	5.3E-06	J	1.6E-09
Octachlorodibenzo-p-dioxin	0.0003	2.0E-04		5.9E-08
Total 2,3,7,8-TCDD TEQ (pg/g)				3.2E+01
Sample 2,3,7,8-TCDD TEQ Concentration (mg/kg)				3.2E-05

Notes:

pg/g = picograms per gram

mg/kg = milligrams per kilogram

J = Estimated Value

TEF = Toxicity Equivalent Factor

TEQ = Toxicity Equivalent

[1] TEF from *The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds,* ToxSci Advance Access, 7 July 2006 (http://www.who.int/ipcs/assessment/tef_update/en/) and USEPA 2010, *Recommended Toxicity Equivalence Factors (TEFs) for Human Health Risk Assessments of 2,3,7,8-Tetrachlorodibenzo-p-dioxin and Dioxin-Like Compounds.* Risk Assessment Forum, Washington, DC. EPA/100/R-10/005.

Table G-2.1a
Step 2 Screening, Risk Ratio Screening for Soil to Sediment, Maximum Detected Concentration
Site 7
Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (mg/kg)								
Arsenic	7 / 8	4.8E+00	CAX-07N-SB4-01	3.9E+00	1.E-06	NA	1E-06	NA
Chromium	8 / 8	1.9E+01	CAX-07N-SS5-00	2.9E+00	1.E-06	NA	6E-06	NA
Cumulative Corresponding Hazard Index[c]						**NA**		
Cumulative Corresponding Cancer Risk[d]							**8E-06**	

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

mg/kg = milligrams per kilogram

NA = Not available/not applicable.

Appendix H
Pre-TCRA Ecological Risk Screening

APPENDIX H

Ecological Risk Screening – Soil to Sediment Transport Pathway

An ecological risk screening was conducted using pre-TCRA (2004) surface soil data collected from the Site 7 boundary along the York River to conservatively estimate potential pre-TCRA soil to sediment transport from the site to the York River as a result of Hurricane Isabel. The ecological risk screening for this potential soil to sediment pathway assumed that the concentrations in the pre-TCRA surface soil (0 to 6 inches) data from samples at the site perimeter adjacent to the river were an appropriate representation of the potential concentrations in the sediment.

H.1 Ecological Conceptual Site Model

The ecological conceptual site model (CSM) provides a brief summary of site conditions, potential contaminant migration pathways, and exposure pathways to potential receptors. Section 3.4.1 of the SI report provide details on the physical setting and history of Site 7.

Site 7 is approximately 1 acre in size and is located immediately adjacent to the York River. Site 7 was forested prior to the 2007-2008 removal action. However, as part of the removal action, the excavation area was cleared of trees and brush. Currently, the portions of the site surrounding the removal area are forested, with the removal area consisting of successional old field habitat. The site gradient is fairly level with a nearly vertical drop (approximately 15 feet) along the eastern boundary to the York River shoreline. Other than the York River, there are no wetlands or water bodies on, or immediately adjacent to, Site 7.

There is the potential for groundwater transport and subsequent discharge from the site to the York River (brackish to marine water body). This potential pathway is evaluated in **Appendix B**. There was also documented transport of debris and soil from the site to the York River during Hurricane Isabel, which occurred prior to the completion of remedial actions at the site. This historical pathway, which is no longer complete following the completion of remedial action on the site, is the subject of the evaluation in this appendix.

H.2 Ecological Risk Screening Methodology

The ecological risk screening was conducted using a two step process within the overall decision analysis process described in Section 1.1.1 of the SI report, which is comprised of three steps. The ERA process falls within Steps 2a and 2b of this overall process.

Since a CERCLA-related release to the river was known to have occurred during Hurricane Isabel (Step 1 of the overall decision process), detected constituents from historical surface soil samples collected from the site prior to Hurricane Isabel were compared to ecological screening values (Step 2a). Surface soil (0 to 6 inches) data from the eight 2004 soil sampling locations (SO04, SO05, SO08, SO09, SO12, SO13, SO14, and SO15; **Figure 3-2**) that were on the site perimeter adjacent to the York River were used in the evaluation, except at SO04. A

surface soil sample was not collected at SO04 so the subsurface soil sample was used. While there is some uncertainty associated with the use of these surface soil data, the surface layer is likely to be the best representation of the soil that washed out since it was at the top of the soil column when the 2003 storm event occurred. Also, since the concentrations in the surface strata were generally similar to, or higher than, the corresponding subsurface strata (where multiple depths were sampled) for the sample locations considered, the process used is likely to be a conservative representation of the available 2004 soil data set.

The marine sediment screening values used in the evaluation are contained in **Table H-1**. Because of the high level of conservatism associated with estimating sediment concentrations from soil concentrations, the ecological screening utilized both conservative screening values (e.g., ER-L values) and less conservative screening values (e.g., ER-M values). Comparisons based upon mean concentrations were used when selecting potential COPCs because any soil transported from the site to the river would likely be thoroughly mixed prior to any deposition to the river bottom.

The currently accepted method for evaluating dioxins and furans in ERAs uses the concept of toxicity equivalence (TEQ). The TEQ method relates the toxicity of dioxin-like chemicals to the toxicity of 2,3,7,8-TCDD, which is considered to be the most toxic of this group of chemicals. The TEQ method is appropriate and applicable to ERAs for both terrestrial and aquatic systems. As part of this methodology, a toxicity equivalence factor (TEF), which denotes a congener's toxicity (potency) relative to 2,3,7,8-TCDD (which has a TEF of 1.0), is developed for each dioxin and furan congener. Consensus-based, internationally-accepted TEFs for 7 dioxin (PCDD) and 10 furan (PCDF) congeners (including 2,3,7,8-TCDD) have been developed for fish, birds, and mammals. Each TEF is multiplied by the concentration of its respective congener measured in an environmental sample (such as a fish tissue sample) and the products are summed. As shown in the following formula, the sum represents the TEQ and is a measure of exposure:

$$TEQ = \sum_{n=1}^{7}\left[PCDD_n \times TEF_n\right] + \sum_{p=1}^{10}\left[PCDF_p \times TEF_p\right]$$

The currently accepted fish TEFs for dioxin and furan congeners (Van den Berg et al., 1998) are listed in **Table H-2**. These fish TEFs were used to calculate the TEQ value, which was then used in the screening.

If the mean detected soil concentration (used as a surrogate for sediment) exceeded the conservative ecological screening value, or if a screening value was not available, the constituent was retained as an initial COPC. This constituted Step 2a of the decision process and also corresponds to a screening level ERA (which is Step 2 of the ERA process outlined in USEPA [1997] and NAVFAC [2003]).

For the conservative screening value exceedances that are likely attributable to a historic CERCLA-related release, an evaluation of the data using more realistic assumptions was conducted. This more realistic evaluation (Step 2b of the decision process) was performed to help ensure appropriate perspective is considered regarding the release such that informed decisions on the need for further investigation or action can be made (which is Step 3 of the decision process). Step 2b of the decision process corresponds to the first step of a baseline ERA (which is Step 3A of the ERA process outlined in NAVFAC [2003]).

Where there were exceedances of the conservative ecological screening values, more realistic evaluations considered the following types of information:

- The frequency and magnitude of screening value exceedances
- The spatial pattern of exceedances
- Additional screening values from the literature
- Other site-specific factors that might be relevant to assessing potential exposures (e.g., bioavailability, fate, transport properties)

H.3 Ecological Risk Screening Results and Conclusions

The mean (or maximum, if the mean exceeded the maximum) concentrations of six constituents(bis[2-ethylhexyl]phthalate, di-n-octylphthalate, heptachlor epoxide, dioxin/ furans, barium, and lead) exceeded the most conservative screening values. Additionally, a screening value was not available for beryllium. Therefore, these seven constituents were identified as initial COPCs (**Tables H-3 and H-4**).

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- For beryllium, half of the samples were B-flagged, while the rest were at or below the surface soil UTL (0.59 mg/kg), indicating that they were consistent with background levels. Thus, this constituent was not identified as a refined COPC.
- The mean concentrations of all initial COPCs, except dioxin/furans, did not exceed screening values in the secondary evaluation (**Tables H-3 and H-4**); the HQ for dioxin/furans was 1.56. However, the dioxin/furan data were associated with sample SO04 (the maximum concentrations for barium and lead also occurred in this sample), which was a subsurface sample that consisted almost entirely of ash. Thus, this sample is not likely to be representative of the dioxin/furan concentrations in the material potentially washed into the York River during Hurricane Isabel. Therefore, utilizing the dioxin/furans results from this single sample adds additional conservatism to the evaluation beyond the assumption of no dilution or dispersion. In addition, the fine nature of this material (ash) would likely result in its deposition over a relatively large area of river bottom at concentrations that are likely to be orders of magnitude lower than those represented by sample SO04.

The ecological risk screening evaluation assumes no dilution or attenuation of the soil (including the ash) occurred prior to deposition and that the deposited soil would constitute the entire sediment surface (exposure medium) to which potential ecological exposures would occur, both highly conservative and unrealistic assumptions. Dilution by a factor of just 1.56 would reduce the dioxin/furan HQ to one. Consequently, the ecological risk evaluation determined that unacceptable ecological risks in the York River from potential historical soil transport from the site are very unlikely.

Buried debris has been removed from the site, and the potential for future contaminant migration via surface runoff to sediment is no longer a complete pathway. It has been documented that Hurricane Isabel eroded between 15 and 20 feet of shoreline from Site 7.

However, due to the hurricane's extensive surge, it is unlikely that the portion of the Site 7 shoreline that was removed during this storm was deposited immediately adjacent to the site within the York River. Studies of the York River, including the *Estuarine Suspended Sediment Loads and Sediment Budgets in Tributaries of Chesapeake Bay*, conducted by the Center for Coastal Resource Management (CCRM) and the Virginia Institute of Marine Science (VIMS), indicate that sediment within the vicinity of Site 7 is eroding at a rate of 0.58 meters per year. As part of this study, historical hydrographic surveys (1857 and 1945) conducted by NOAA were used to create a sediment accumulation map. Over the course of the 88-year time frame, CCRM calculated a net loss of sediment within the vicinity of Site 7. Due to this continual erosion, sediment data collected at present from along the Site 7 shoreline would be useful in determining whether or not a CERCLA release occurred from Site 7.

H.4 References

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Ecological Risk Screening Tables

Table H-1
Ecological Screening Values (ESVs) for Marine Sediment
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	ESV	Units	Type[1]	Reference	Comments
Inorganics					
Aluminum	18,000	mg/kg	AET	Buchman 2008	
Antimony	2.00	mg/kg	ER-L	Long and Morgan 1990	
Arsenic	8.20	mg/kg	ER-L	Long et al. 1995	
Barium	48.0	mg/kg	AET	Buchman 2008	
	130	mg/kg	TEL	Buchman 2008	
Beryllium	NSV	--	--	--	
Chromium	81.0	mg/kg	ER-L	Long et al. 1995	
Cobalt	10.0	mg/kg	AET	Buchman 2008	
Copper	34.0	mg/kg	ER-L	Long et al. 1995	
Iron	220,000	mg/kg	AET	Buchman 2008	
Lead	46.7	mg/kg	ER-L	Long et al. 1995	
	218	mg/kg	ER-M	Long et al. 1995	
Manganese	260	mg/kg	AET	Buchman 2008	
Mercury	0.15	mg/kg	ER-L	Long et al. 1995	
Nickel	20.9	mg/kg	ER-L	Long et al. 1995	
Vanadium	57.0	mg/kg	AET	Buchman 2008	
Zinc	150	mg/kg	ER-L	Long et al. 1995	
Pesticides					
4,4'-DDE	2.20	ug/kg	ER-L	Long et al. 1995	
4,4'-DDT	1.58	ug/kg	ER-L	Long et al. 1995	
alpha-BHC	1,360	ug/kg	EqP	USEPA 2006	1% TOC
alpha-Chlordane	2.26	ug/kg	TEL	Buchman 2008	
beta-BHC	5.00	ug/kg	LEL	Persuad et al. 1993	Freshwater
Heptachlor epoxide	0.60	ug/kg	ISQC	CCME 2002	Freshwater
	2.74	ug/kg	PEL	CCME 2002	Freshwater
Semivolatile Organic Compounds					
Benzo(a)anthracene	261	ug/kg	ER-L	Long et al. 1995	
Benzo(a)pyrene	430	ug/kg	ER-L	Long et al. 1995	
Benzo(b)fluoranthene	1,800	ug/kg	AET	Buchman 2008	
Benzo(g,h,i)perylene	670	ug/kg	AET	Buchman 2008	
Benzo(k)fluoranthene	1,800	ug/kg	AET	Buchman 2008	

Table H-1
Ecological Screening Values (ESVs) for Marine Sediment
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	ESV	Units	Type[1]	Reference	Comments
bis(2-Ethylhexyl)phthalate	182	ug/kg	TEL	Buchman 2008	
	2,647	ug/kg	PEL	Buchman 2008	
Chrysene	384	ug/kg	ER-L	Long et al. 1995	
Dibenz(a,h)anthracene	63.4	ug/kg	ER-L	Long et al. 1995	
Di-n-octylphthalate	61.0	ug/kg	AET	Buchman 2008	
	580	ug/kg	EqP	Washington State 1995	1% TOC
Fluoranthene	600	ug/kg	ER-L	Long et al. 1995	
PAH (total)	4,022	ug/kg	ER-L	Long et al. 1995	
PAH (HMW)	1,700	ug/kg	ER-L	Long et al. 1995	
PAH (LMW)	552	ug/kg	ER-L	Long et al. 1995	
Phenanthrene	240	ug/kg	ER-L	Long et al. 1995	
Pyrene	665	ug/kg	ER-L	Long et al. 1995	
Dioxin/Furans					
2,3,7,8-TCDD (dioxin)	0.85	pg/g	ISQC	CCME 2002	
	21.5	pg/g	ISQC	CCME 2002	

1 - AET = Apparent Effects Threshold; EqP = Equilibrium Partitioning (1% TOC); ER-L = Effects Range-Low; ER-M = Effects Range-Median; ISQC = Interim Sediment Quality Criteria; LEL = Lowest Effect Level; TEL = Threshold Effect Level; PEL = Probable Effect Level

Table H-2
Toxicity Equivalency Factors for Dioxins and Furans
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Congener	Fish TEF
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.001
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.01
1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.01
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	0.5
1,2,3,4,7,8-Hexachlorodibenzofuran	0.1
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	0.01
1,2,3,6,7,8-Hexachlorodibenzofuran	0.1
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	0.01
1,2,3,7,8,9-Hexachlorodibenzofuran	0.1
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1
1,2,3,7,8-Pentachlorodibenzofuran	0.05
2,3,4,6,7,8-Hexachlorodibenzofuran	0.1
2,3,4,7,8-Pentachlorodibenzofuran	0.5
2,3,7,8-TCDD (dioxin)	1
2,3,7,8-Tetrachlorodibenzofuran	0.05
Octachlorodibenzo-p-dioxin	0.0001
Octachlorodibenzofuran	0.0001

Table H-3
Ecological Screening Statistics - Site 7 Soil (2004) Detected Constituents Compared With Marine Sediment Screening Values
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	More Conservative Screening Values: Marine Sediment Screening Value	Basis[3]	Frequency of Exceedance[1]	Maximum Hazard Quotient	Mean Hazard Quotient	Initial COPC?	Less Conservative Screening Values: Marine Sediment Screening Value	Basis[3]	Frequency of Exceedance[1]	Maximum Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Semivolatile Organic Compounds (UG/KG)																		
Benzo(a)anthracene	9.50 - 11.0	2 / 8	9.30	CAX-07N-SS5-00	5.53	1.54	261	ER-L	0 / 8	0.04	0.02	NO	--	--	-- / --	--	--	NO
Benzo(a)pyrene	9.50 - 11.0	2 / 8	8.90	CAX-07N-SS5-00	5.48	1.40	430	ER-L	0 / 8	0.02	0.01	NO	--	--	-- / --	--	--	NO
Benzo(b)fluoranthene	9.50 - 11.0	2 / 8	13.0	CAX-07N-SS5-00	6.72	3.31	1,800	AET	0 / 8	0.01	0.004	NO	--	--	-- / --	--	--	NO
Benzo(g,h,i)perylene	9.50 - 11.0	2 / 8	8.00	CAX-07N-SS5-00	5.42	1.09	670	AET	0 / 8	0.01	0.008	NO	--	--	-- / --	--	--	NO
Benzo(k)fluoranthene	9.50 - 11.0	3 / 8	9.30	CAX-07N-SS5-00	5.83	1.70	1,800	AET	0 / 8	0.01	0.003	NO	--	--	-- / --	--	--	NO
bis(2-Ethylhexyl)phthalate	380 - 450	2 / 8	990	07N-SS14-00	301	279	182	TEL	2 / 8	5.44	1.65	YES	2,647	PEL	0 / 8	0.37	0.11	NO
Chrysene	9.50 - 11.0	3 / 8	12.0	CAX-07N-SS5-00	6.01	2.46	384	ER-L	0 / 8	0.03	0.02	NO	--	--	-- / --	--	--	NO
Dibenz(a,h)anthracene	9.50 - 11.0	1 / 8	5.40	CAX-07N-SS9-00	5.08	0.33	63.4	ER-L	0 / 8	0.09	0.08	NO	--	--	-- / --	--	--	NO
Di-n-octylphthalate	380 - 450	1 / 8	97.0	07N-SS15-00	189	39.3	61.0	AET	1 / 8	1.59	--	YES	580	EqP	0 / 8	0.17	--	NO
Fluoranthene	9.50 - 11.0	5 / 8	19.0	CAX-07N-SS5-00	7.62	5.08	600	ER-L	0 / 8	0.03	0.01	NO	--	--	-- / --	--	--	NO
Phenanthrene	9.50 - 10.0	5 / 8	15.0	CAX-07N-SS5-00	7.13	3.61	240	ER-L	0 / 8	0.06	0.03	NO	--	--	-- / --	--	--	NO
Pyrene	9.50 - 11.0	3 / 8	16.0	CAX-07N-SS5-00	7.08	3.87	665	ER-L	0 / 8	0.02	0.01	NO	--	--	-- / --	--	--	NO
PAH (HMW)	42.8 - 47.7	3 / 8	85.9	CAX-07N-SS5-00	37.8	24.3	1,700	ER-L	0 / 8	0.05	0.02	NO	--	--	-- / --	--	--	NO
PAH (LMW)	228 - 245	6 / 8	282	CAX-07N-SS5-00	217	63.7	552	ER-L	0 / 8	0.51	0.39	NO	--	--	-- / --	--	--	NO
PAH (total)	271 - 289	6 / 8	368	CAX-07N-SS5-00	263	82.2	4,022	ER-L	0 / 8	0.09	0.07	NO	--	--	-- / --	--	--	NO
Pesticide/Polychlorinated Biphenyls (UG/KG)																		
4,4'-DDE	3.80 - 4.50	1 / 8	2.00	07N-SS12-00	2.03	0.12	2.20	ER-L	0 / 8	0.91	--	NO	--	--	-- / --	--	--	NO
4,4'-DDT	3.80 - 4.50	1 / 8	1.30	07N-SS12-00	1.94	0.29	1.58	ER-L	0 / 8	0.82	--	NO	--	--	-- / --	--	--	NO
alpha-BHC	2.00 - 2.30	1 / 8	0.94	CAX-07N-SS5-00	1.02	0.062	1,360	EqP	0 / 8	0.001	--	NO	--	--	-- / --	--	--	NO
alpha-Chlordane	2.00 - 2.30	2 / 8	3.60	CAX-07N-SS9-00	1.30	0.96	2.26	TEL	1 / 8	1.59	0.57	NO	--	--	-- / --	--	--	NO
beta-BHC	2.00 - 2.10	4 / 8	2.60	CAX-07N-SB4-01	1.26	0.58	5.00	LEL	0 / 8	0.52	0.25	NO	--	--	-- / --	--	--	NO
Heptachlor epoxide	2.00 - 2.30	1 / 8	0.61	CAX-07N-SS5-00	0.98	0.16	0.60	ISQC	1 / 8	1.02	--	YES	2.74	PEL	0 / 8	0.22	--	NO
Dioxin/Furans (PG/G)																		
1,2,3,4,6,7,8-Heptachlorodibenzofuran	-- - --	1 / 1	6.14	CAX-07N-SB4-01	6.14	--	TEQ	--	-- / --	--	--	--	--	--	-- / --	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	-- - --	1 / 1	105	CAX-07N-SB4-01	105	--	TEQ	--	-- / --	--	--	--	--	--	-- / --	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran	-- - --	1 / 1	0.77	CAX-07N-SB4-01	0.77	--	TEQ	--	-- / --	--	--	--	--	--	-- / --	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran	-- - --	1 / 1	1.40	CAX-07N-SB4-01	1.40	--	TEQ	--	-- / --	--	--	--	--	--	-- / --	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	-- - --	1 / 1	14.6	CAX-07N-SB4-01	14.6	--	TEQ	--	-- / --	--	--	--	--	--	-- / --	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran	-- - --	1 / 1	1.55	CAX-07N-SB4-01	1.55	--	TEQ	--	-- / --	--	--	--	--	--	-- / --	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	-- - --	1 / 1	18.7	CAX-07N-SB4-01	18.7	--	TEQ	--	-- / --	--	--	--	--	--	-- / --	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran	-- - --	1 / 1	0.77	CAX-07N-SB4-01	0.77	--	TEQ	--	-- / --	--	--	--	--	--	-- / --	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	-- - --	1 / 1	21.5	CAX-07N-SB4-01	21.5	--	TEQ	--	-- / --	--	--	--	--	--	-- / --	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran	-- - --	1 / 1	0.83	CAX-07N-SB4-01	0.83	--	TEQ	--	-- / --	--	--	--	--	--	-- / --	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	-- - --	1 / 1	19.1	CAX-07N-SB4-01	19.1	--	TEQ	--	-- / --	--	--	--	--	--	-- / --	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran	-- - --	1 / 1	2.27	CAX-07N-SB4-01	2.27	--	TEQ	--	-- / --	--	--	--	--	--	-- / --	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran	-- - --	1 / 1	1.84	CAX-07N-SB4-01	1.84	--	TEQ	--	-- / --	--	--	--	--	--	-- / --	--	--	--
2,3,7,8-TCDD (dioxin)	-- - --	1 / 1	4.88	CAX-07N-SB4-01	4.88	--	TEQ	--	-- / --	--	--	--	--	--	-- / --	--	--	--
2,3,7,8-Tetrachlorodibenzofuran	-- - --	1 / 1	0.48	CAX-07N-SB4-01	0.48	--	TEQ	--	-- / --	--	--	--	--	--	-- / --	--	--	--
Octachlorodibenzofuran	-- - --	1 / 1	5.32	CAX-07N-SB4-01	5.32	--	TEQ	--	-- / --	--	--	--	--	--	-- / --	--	--	--
Octachlorodibenzo-p-dioxin	-- - --	1 / 1	195	CAX-07N-SB4-01	195	--	TEQ	--	-- / --	--	--	--	--	--	-- / --	--	--	--
Total heptachlorodibenzofuran	-- - --	1 / 1	18.3	CAX-07N-SB4-01	18.3	--	NA	--	-- / --	--	--	--	--	--	-- / --	--	--	--
Total heptachlorodibenzo-p-dioxin	-- - --	1 / 1	257	CAX-07N-SB4-01	257	--	NA	--	-- / --	--	--	--	--	--	-- / --	--	--	--
Total hexachlorodibenzofuran	-- - --	1 / 1	35.4	CAX-07N-SB4-01	35.4	--	NA	--	-- / --	--	--	--	--	--	-- / --	--	--	--
Total hexachlorodibenzo-p-dioxin	-- - --	1 / 1	455	CAX-07N-SB4-01	455	--	NA	--	-- / --	--	--	--	--	--	-- / --	--	--	--
Total pentachlorodibenzofuran	-- - --	1 / 1	31.4	CAX-07N-SB4-01	31.4	--	NA	--	-- / --	--	--	--	--	--	-- / --	--	--	--
Total pentachlorodibenzo-p-dioxin	-- - --	1 / 1	473	CAX-07N-SB4-01	473	--	NA	--	-- / --	--	--	--	--	--	-- / --	--	--	--
Total tetrachlorodibenzofuran	-- - --	1 / 1	30.0	CAX-07N-SB4-01	30.0	--	NA	--	-- / --	--	--	--	--	--	-- / --	--	--	--
Total tetrachlorodibenzo-p-dioxin	-- - --	1 / 1	325	CAX-07N-SB4-01	325	--	NA	--	-- / --	--	--	--	--	--	-- / --	--	--	--
Dioxin TEQ[4]	-- - --	1 / 1	33.5	CAX-07N-SB4-01	33.5	--	0.85	ISQC	1 / 1	39.4	39.4	YES	21.5	PEL	1 / 1	1.56	1.56	YES

Table H-3
Ecological Screening Statistics - Site 7 Soil (2004) Detected Constituents Compared With Marine Sediment Screening Values
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	More Conservative Screening Values: Marine Sediment Screening Value	Basis[3]	Frequency of Exceedance[1]	Maximum Hazard Quotient	Mean Hazard Quotient	Initial COPC?	Less Conservative Screening Values: Marine Sediment Screening Value	Basis[3]	Frequency of Exceedance[1]	Maximum Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Inorganics (MG/KG)																		
Aluminum	-- - --	8 / 8	10,200	07N-SS13-00	8,946	1,747	18,000	AET	0 / 8	0.57	0.50	NO	--	--	-- / --	--	--	NO
Antimony	0.40 - 1.10	2 / 8	0.91	07N-SS12-00	0.39	0.25	2.00	ER-L	0 / 8	0.46	0.19	NO	--	--	-- / --	--	--	NO
Arsenic	-- - --	8 / 8	4.80	CAX-07N-SB4-01	3.49	0.87	8.20	ER-L	0 / 8	0.59	0.43	NO	--	--	-- / --	--	--	NO
Barium	-- - --	8 / 8	264	CAX-07N-SB4-01	101	77.7	48.0	AET	7 / 8	5.50	2.09	YES	130	TEL	2 / 8	2.03	0.77	NO
Beryllium	0.23 - 0.87	4 / 8	0.61	07N-SS15-00	0.43	0.19	NSV	--	-- / --	NSV	NSV	YES	NSV	--	-- / --	NSV	NSV	NO
Calcium [2]	-- - --	8 / 8	8,880	CAX-07N-SB4-01	2,378	2,773	NSV	--	-- / --	--	--	NO	--	--	-- / --	--	--	NO
Chromium	-- - --	8 / 8	18.5	CAX-07N-SS5-00	10.8	4.17	81.0	ER-L	0 / 8	0.23	0.13	NO	--	--	-- / --	--	--	NO
Cobalt	1.30 - 1.30	7 / 8	6.70	CAX-07N-SS5-00	3.56	2.08	10.0	AET	0 / 8	0.67	0.36	NO	--	--	-- / --	--	--	NO
Copper	-- - --	8 / 8	69.2	CAX-07N-SB4-01	21.9	28.3	34.0	ER-L	2 / 8	2.04	0.64	NO	--	--	-- / --	--	--	NO
Iron	-- - --	8 / 8	11,000	CAX-07N-SS8-00	7,405	2,010	220,000	AET	0 / 8	0.05	0.03	NO	--	--	-- / --	--	--	NO
Lead	-- - --	8 / 8	283	CAX-07N-SB4-01	91.2	110	46.7	ER-L	3 / 8	6.06	1.95	YES	218	ER-M	2 / 8	1.30	0.42	NO
Magnesium [2]	-- - --	8 / 8	1,140	CAX-07N-SB4-01	676	213	NSV	--	-- / --	--	--	NO	--	--	-- / --	--	--	NO
Manganese	-- - --	8 / 8	393	CAX-07N-SS5-00	212	102	260	AET	2 / 8	1.51	0.81	NO	--	--	-- / --	--	--	NO
Mercury	0.053 - 0.058	6 / 8	0.24	CAX-07N-SB4-01	0.077	0.068	0.15	ER-L	1 / 8	1.60	0.51	NO	--	--	-- / --	--	--	NO
Nickel	-- - --	8 / 8	14.2	CAX-07N-SS5-00	7.34	4.11	20.9	ER-L	0 / 8	0.68	0.35	NO	--	--	-- / --	--	--	NO
Potassium [2]	-- - --	8 / 8	993	CAX-07N-SB4-01	447	249	NSV	--	-- / --	--	--	NO	--	--	-- / --	--	--	NO
Sodium [2]	51.4 - 51.4	7 / 8	369	CAX-07N-SB4-01	106	108	NSV	--	-- / --	--	--	NO	--	--	-- / --	--	--	NO
Vanadium	-- - --	8 / 8	26.8	CAX-07N-SS8-00	16.6	4.79	57.0	AET	0 / 8	0.47	0.29	NO	--	--	-- / --	--	--	NO
Zinc	-- - --	8 / 8	344	CAX-07N-SS8-00	110	120	150	ER-L	3 / 8	2.29	0.73	NO	--	--	-- / --	--	--	NO

NSV - No Screening Value
Shaded cells indicate HQ > 1
1 - Count of detected samples exceeding or equaling Screening Value
2 - Macronutrient - Not considered to be a COPC
3 - AET = Apparent Effects Threshold; EqP = Equilibrium Partitioning (1% TOC); ER-L = Effects Range-Low; ER-M = Effects Range-Median; ISQC = Interim Sediment Quality Criteria; LEL = Lowest Effect Level; TEL = Threshold Effect Level; PEL = Probable Effect Level
4 - Calculated using fish TEFs

Table H-4
Exceedances - Site 7 Soil as Sediment
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	More Conservative Screening Values	Less Conservative Screening Values	CAS07N-SO04	CAS07N-SO05	CAS07N-SO08	CAS07N-SO09	CAS07N-SO12	CAS07N-SO13	CAS07N-SO14	CAS07N-SO15
			CAX-07N-SB4-01	CAX-07N-SS5-00	CAX-07N-SS8-00	CAX-07N-SS9-00	07N-SS12-00	07N-SS13-00	07N-SS14-00	07N-SS15-00
			03/03/04	03/03/04	03/03/04	03/03/04	04/22/04	04/22/04	04/22/04	04/22/04
Volatile Organic Compounds (UG/KG)										
No Detections	--	--	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds (UG/KG)										
Benzo(a)anthracene	261	--	11 U	9.3 J	10 U	5.2 J	9.5 U	9.7 U	9.5 U	9.8 U
Benzo(a)pyrene	430	--	11 U	8.9 J	10 U	5.2 J	9.5 U	9.7 U	9.5 U	9.8 U
Benzo(b)fluoranthene	1,800	--	11 U	13	10 U	11 J	9.5 U	9.7 U	9.5 U	9.8 U
Benzo(g,h,i)perylene	670	--	11 U	8 J	10 U	5.6 J	9.5 U	9.7 U	9.5 U	9.8 U
Benzo(k)fluoranthene	1,800	--	11 U	9.3 J	10 U	7.6 J	4.7 J	9.7 U	9.5 U	9.8 U
bis(2-Ethylhexyl)phthalate	182	2,647	450 U	430 U	410 U	400 U	380 U	380 U	990	190 J
Chrysene	384	--	11 U	12	10 U	6.1 J	5 J	9.7 U	9.5 U	9.8 U
Dibenz(a,h)anthracene	63.4	--	11 U	11 U	10 U	5.4 J	9.5 U	9.7 U	9.5 U	9.8 U
Di-n-octylphthalate	61.0	580	450 U	430 U	410 U	400 U	380 U	380 U	380 U	97 J
Fluoranthene	600	--	11 U	19	10 U	11	6.7 J	4.6 J	9.5 U	4.4 J
PAH (HMW)	1,700	--	47.7 U	85.9	43.7 U	60.9	45	43.7 U	42.8 U	44.1 U
PAH (LMW)	552	--	271	282	245 U	251	231	229	228 U	234
PAH (total)	4,022	--	319	368	289 U	311	276	272	271 U	278
Phenanthrene	240	--	7.7 J	15	10 U	9.5 J	5.4 J	4.8 J	9.5 U	9.8 U
Pyrene	665	--	11 U	16	10 U	8.8 J	6.8 J	9.7 U	9.5 U	9.8 U
Pesticide/Polychlorinated Biphenyls (UG/KG)										
4,4'-DDE	2.20	--	4.5 U	4.3 U	4.1 U	4 U	2 J	3.8 U	3.8 U	3.9 U
4,4'-DDT	1.58	--	4.5 U	4.3 U	4.1 U	4 U	1.3 JP	3.8 U	3.8 U	3.9 U
alpha-BHC	1,360	--	2.3 U	0.94 J	2.1 U	2.1 U	2 U	2 U	2 U	2 U
alpha-Chlordane	2.26	--	2.3 U	2.2 U	2.1 U	3.6	0.46 JP	2 U	2 U	2 U
beta-BHC	5.00	--	2.6 J	1.5 J	0.82 J	2.1 U	1.1 JP	2 U	2 U	2 U
Heptachlor epoxide	0.60	2.74	2.3 U	0.61 J	2.1 U	2.1 U	2 U	2 U	2 U	2 U
Dioxin/Furans (PG/G)										
1,2,3,4,6,7,8-Heptachlorodibenzofuran	TEQ	--	6.14	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	TEQ	--	105	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	TEQ	--	0.765 J	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	TEQ	--	1.4 J	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	TEQ	--	14.6	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	TEQ	--	1.55 J	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	TEQ	--	18.7	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzofuran	TEQ	--	0.773 J	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	TEQ	--	21.5	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzofuran	TEQ	--	0.833 J	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	TEQ	--	19.1	NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	TEQ	--	2.27 J	NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-Pentachlorodibenzofuran	TEQ	--	1.84 J	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD (dioxin)	TEQ	--	4.88	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzofuran	TEQ	--	0.478 J	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzofuran	TEQ	--	5.32 J	NA	NA	NA	NA	NA	NA	NA

Table H-4
Exceedances - Site 7 Soil as Sediment
Site 7 Site Inspection Report
Cheatham Annex, Williamsburg, Virginia

Chemical	More Conservative Screening Values	Less Conservative Screening Values	CAS07N-SO04	CAS07N-SO05	CAS07N-SO08	CAS07N-SO09	CAS07N-SO12	CAS07N-SO13	CAS07N-SO14	CAS07N-SO15
			CAX-07N-SB4-01	CAX-07N-SS5-00	CAX-07N-SS8-00	CAX-07N-SS9-00	07N-SS12-00	07N-SS13-00	07N-SS14-00	07N-SS15-00
			03/03/04	03/03/04	03/03/04	03/03/04	04/22/04	04/22/04	04/22/04	04/22/04
Octachlorodibenzo-p-dioxin	TEQ	--	195	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzofuran	TEQ	--	18.3	NA	NA	NA	NA	NA	NA	NA
Total heptachlorodibenzo-p-dioxin	TEQ	--	257	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzofuran	TEQ	--	35.4	NA	NA	NA	NA	NA	NA	NA
Total hexachlorodibenzo-p-dioxin	TEQ	--	455	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzofuran	TEQ	--	31.4	NA	NA	NA	NA	NA	NA	NA
Total pentachlorodibenzo-p-dioxin	TEQ	--	473	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzofuran	TEQ	--	30	NA	NA	NA	NA	NA	NA	NA
Total tetrachlorodibenzo-p-dioxin	TEQ	--	325	NA	NA	NA	NA	NA	NA	NA
Dioxin TEQ	0.85	21.5	33.5	NA	NA	NA	NA	NA	NA	NA
Inorganics (MG/KG)										
Aluminum	18,000	--	5,130	9,440	7,580	9,520	9,840	10,200	10,100	9,760
Antimony	2.00	--	1.1 B	0.51 UJ	0.49 UJ	0.48 UJ	0.91 JN	0.4 UN	0.41 UN	0.48 JN
Arsenic	8.20	--	4.8	4.1	4.4	3	3.5	2.8	3.0	2.3 J
Barium	48.0	130	264	173	33.5 J	76.6	65	63.9	63.2	65
Beryllium	NSV	NSV	0.41 B	0.81 B	0.23 B	0.87 B	0.54 J	0.57 J	0.59 J	0.61 J
Chromium	81.0	--	14.4	18.5	13.2	7.4	9.8 E	8.4 E	8 E	6.6 E
Cobalt	10.0	--	6.3 J	6.7 J	1.3 B	4.4 J	2.7 J	2.4 J	2.7 J	2.6 J
Copper	34.0	--	69.2	66.1	10.2	5.4 J	9.6	6.0	4.5 J	4.1 J
Iron	220,000	--	4,670	9,050	11,000	6,270	8,400	7,130	6,920	5,800
Lead	46.7	218	283	250	38.3	19.2	68.7	33.0	20.1	17.3
Manganese	260	--	289	393	64.3	256	163	127	186	216
Mercury	0.15	--	0.24	0.075 J	0.063 J	0.058 U	0.067 J	0.058 J	0.054 J	0.053 U
Nickel	20.9	--	13.6	14.2	4.2 J	5.6 J	6.5 J	4.9 J	5.0 J	4.7 J
Vanadium	57.0	--	17.9	14.2	26.8	12.8	19.3	14.9	15.3	11.8
Zinc	150	--	182	201	344	35.4	49	28.6	21.1	18.1

Notes:

Grey highlighting indicates value greater than more conservative screening value

Red highlighting indicates value greater than less conservative screening value

Bold indicates detections

NSV - No Screening Value

Appendix I
Laboratory Analytical Results

Station ID	CAS07-MW01	CAS07-MW02
Sample ID	CAS07-MW01-0111	CAS07-MW02-0111
Sample Date	01/28/11	01/28/11
Chemical Name		
Volatile Organic Compounds (UG/L)		
1,1,1-Trichloroethane	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	1 U	1 U
1,1,2-Trichloroethane	0.5 U	0.5 U
1,1-Dichloroethane	0.5 U	0.5 U
1,1-Dichloroethene	0.5 U	0.5 U
1,2,4-Trichlorobenzene	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	1 U	1 U
1,2-Dibromoethane	0.5 U	0.5 U
1,2-Dichlorobenzene	0.5 U	0.5 U
1,2-Dichloroethane	0.5 U	0.5 U
1,2-Dichloropropane	0.5 U	0.5 U
1,3-Dichlorobenzene	0.5 U	0.5 U
1,4-Dichlorobenzene	0.5 U	0.5 U
2-Butanone	5 U	5 U
2-Hexanone	2.5 U	2.5 U
4-Methyl-2-pentanone	2.5 U	2.5 U
Acetone	5 U	5 U
Benzene	0.5 U	0.5 U
Bromodichloromethane	0.5 U	0.5 U
Bromoform	0.5 U	0.5 U
Bromomethane	1 U	1 U
Carbon disulfide	0.5 U	0.5 U
Carbon tetrachloride	0.5 U	0.5 U
Chlorobenzene	0.5 U	0.5 U
Chloroethane	1 U	1 U
Chloroform	0.5 U	0.5 U
Chloromethane	0.5 U	0.5 U
cis-1,2-Dichloroethene	0.5 U	0.5 U
cis-1,3-Dichloropropene	0.5 U	0.5 U
Cyclohexane	0.5 U	0.5 U
Dibromochloromethane	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	1 U	1 U
Ethylbenzene	0.5 U	0.5 U
Isopropylbenzene	0.5 U	0.5 U
m- and p-Xylene	1 U	1 U
Methyl acetate	1 U	1 U
Methylcyclohexane	0.5 U	0.5 U
Methylene chloride	1 U	1 U
Methyl-tert-butyl ether (MTBE)	0.5 U	0.5 U
o-Xylene	0.5 U	0.5 U
Styrene	0.5 U	0.5 U
Tetrachloroethene	0.5 U	0.5 U
Toluene	0.5 U	0.5 U
trans-1,2-Dichloroethene	0.5 U	0.5 U
trans-1,3-Dichloropropene	0.5 U	0.5 U
Trichloroethene	0.5 U	0.5 U
Trichlorofluoromethane (Freon-11)	1 U	1 U
Vinyl chloride	0.5 U	0.5 U
Xylene, total	1.5 U	1.5 U
Semivolatile Organic Compounds (UG/L)		
1,1-Biphenyl	2.6 U	2.36 U
2,2'-Oxybis(1-chloropropane)	2.6 U	2.36 U
2,4,5-Trichlorophenol	2.6 U	2.36 U
2,4,6-Trichlorophenol	2.6 U	2.36 U
2,4-Dichlorophenol	2.6 U	2.36 U
2,4-Dimethylphenol	10.4 U	9.43 U
2,4-Dinitrophenol	26 U	23.6 U
2,4-Dinitrotoluene	0.163 U	0.0961 B
2,6-Dinitrotoluene	0.163 U	0.154 U
2-Chloronaphthalene	2.6 U	2.36 U
2-Chlorophenol	2.6 U	2.36 U
2-Methylnaphthalene	2.6 U	2.36 U
2-Methylphenol	2.6 U	2.36 U
2-Nitroaniline	10.4 U	9.43 U
2-Nitrophenol	2.6 U	2.36 U
3,3'-Dichlorobenzidine	2.6 U	2.36 U
3-Nitroaniline	10.4 U	9.43 U
4,6-Dinitro-2-methylphenol	10.4 U	9.43 U
4-Bromophenyl-phenylether	2.6 U	2.36 U
4-Chloro-3-methylphenol	2.6 U	2.36 U
4-Chloroaniline	2.6 U	2.36 U
4-Chlorophenyl-phenylether	2.6 U	2.36 U
4-Methylphenol	2.6 U	2.36 U

Station ID	CAS07-MW01	CAS07-MW02
Sample ID	CAS07-MW01-0111	CAS07-MW02-0111
Sample Date	01/28/11	01/28/11
Chemical Name		
4-Nitroaniline	10.4 U	9.43 U
4-Nitrophenol	10.4 U	9.43 U
Acenaphthene	2.6 U	2.36 U
Acenaphthylene	2.6 U	2.36 U
Acetophenone	2.6 U	2.36 U
Anthracene	2.6 U	2.36 U
Atrazine	2.6 U	2.36 U
Benzaldehyde	2.6 UJ	2.36 UJ
Benzo(a)anthracene	2.6 U	2.36 U
Benzo(a)pyrene	2.6 U	2.36 U
Benzo(b)fluoranthene	2.6 U	2.36 U
Benzo(g,h,i)perylene	2.6 U	2.36 U
Benzo(k)fluoranthene	2.6 U	2.36 U
bis(2-Chloroethoxy)methane	2.6 U	2.36 U
bis(2-Chloroethyl)ether	2.6 U	2.36 U
bis(2-Ethylhexyl)phthalate	2.6 U	2.36 U
Butylbenzylphthalate	2.6 U	2.36 U
Caprolactam	2.6 UL	2.36 UL
Carbazole	2.6 U	2.36 U
Chrysene	2.6 U	2.36 U
Dibenz(a,h)anthracene	2.6 U	2.36 U
Dibenzofuran	2.6 U	2.36 U
Diethylphthalate	2.6 U	2.36 U
Dimethyl phthalate	2.6 U	2.36 U
Di-n-butylphthalate	2.6 U	2.36 U
Di-n-octylphthalate	2.6 U	2.36 U
Fluoranthene	2.6 U	2.36 U
Fluorene	2.6 U	2.36 U
Hexachlorobenzene	2.6 U	2.36 U
Hexachlorobutadiene	2.6 UL	2.36 UL
Hexachlorocyclopentadiene	2.6 U	2.36 U
Hexachloroethane	2.6 UL	2.36 UL
Indeno(1,2,3-cd)pyrene	2.6 U	2.36 U
Isophorone	2.6 U	2.36 U
Naphthalene	2.6 U	2.36 U
n-Nitroso-di-n-propylamine	2.6 U	2.36 U
n-Nitrosodiphenylamine	2.6 U	2.36 U
Nitrobenzene	0.163 U	0.156 B
Pentachlorophenol	10.4 U	9.43 U
Phenanthrene	2.6 U	2.36 U
Phenol	2.6 U	2.36 U
Pyrene	2.6 U	2.36 U
Pesticide/Polychlorinated Biphenyls (UG/L)		
4,4'-DDD	0.0102 U	0.00962 U
4,4'-DDE	0.0102 U	0.00962 U
4,4'-DDT	0.0102 U	0.00962 U
Aldrin	0.0102 U	0.00962 U
alpha-BHC	0.0102 U	0.00962 U
alpha-Chlordane	0.0102 U	0.00962 U
Aroclor-1016	0.255 U	0.24 U
Aroclor-1221	0.255 U	0.24 U
Aroclor-1232	0.255 U	0.24 U
Aroclor-1242	0.255 U	0.24 U
Aroclor-1248	0.255 U	0.24 U
Aroclor-1254	0.255 U	0.24 U
Aroclor-1260	0.255 U	0.24 U
beta-BHC	0.0102 U	0.00962 U
delta-BHC	0.0102 U	0.00962 U
Dieldrin	0.0102 U	0.00962 U
Endosulfan I	0.0102 U	0.00962 U
Endosulfan II	0.0102 U	0.00962 U
Endosulfan sulfate	0.0102 U	0.00962 U
Endrin	0.0102 U	0.00962 U
Endrin aldehyde	0.0102 U	0.00962 U
Endrin ketone	0.0102 U	0.00962 U
gamma-BHC (Lindane)	0.0102 U	0.00962 U
gamma-Chlordane	0.0102 U	0.00921 J
Heptachlor	0.0102 U	0.00962 U
Heptachlor epoxide	0.0102 U	0.00962 U
Methoxychlor	0.0102 U	0.00962 U
Toxaphene	0.681 U	0.641 U
Dioxin/Furans (NG/L)		
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.000303 U	0.000339 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.000995 U	0.000810 J
1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.000416 U	0.000466 U

Station ID	CAS07-MW01	CAS07-MW02
Sample ID	CAS07-MW01-0111	CAS07-MW02-0111
Sample Date	01/28/11	01/28/11
Chemical Name		
1,2,3,4,7,8-Hexachlorodibenzofuran	0.000384 U	0.000394 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	0.000505 U	0.000479 U
1,2,3,6,7,8-Hexachlorodibenzofuran	0.000329 U	0.000339 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	0.000469 U	0.000444 U
1,2,3,7,8,9-Hexachlorodibenzofuran	0.000439 U	0.000454 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	0.000524 U	0.000497 U
1,2,3,7,8-Pentachlorodibenzofuran	0.000357 U	0.000299 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	0.000492 U	0.000672 U
2,3,4,6,7,8-Hexachlorodibenzofuran	0.000365 U	0.000376 U
2,3,4,7,8-Pentachlorodibenzofuran	0.000365 U	0.000307 U
2,3,7,8-TCDD (dioxin)	0.000641 U	0.000577 U
2,3,7,8-Tetrachlorodibenzofuran	0.000458 U	0.000444 U
Octachlorodibenzofuran	0.000874 U	0.000729 U
Octachlorodibenzo-p-dioxin	0.001110 J	0.012900 J
Total heptachlorodibenzofuran	0.000303 U	0.000339 U
Total heptachlorodibenzo-p-dioxin	0.000995 U	0.000810 U
Total hexachlorodibenzofuran	0.000329 U	0.000339 U
Total hexachlorodibenzo-p-dioxin	0.000469 U	0.000444 U
Total pentachlorodibenzofuran	0.000357 U	0.000299 U
Total pentachlorodibenzo-p-dioxin	0.000492 U	0.000672 U
Total tetrachlorodibenzofuran	0.000458 U	0.000444 U
Total tetrachlorodibenzo-p-dioxin	0.000641 U	0.000577 U
Toxic Equivalents (Total TEQ)	0.000000	0.000004
Explosives (UG/L)		
1,3,5-Trinitrobenzene	0.163 U	0.129 B
1,3-Dinitrobenzene	0.163 U	1.46
2,4,6-Trinitrotoluene	0.163 U	0.154 U
2-Amino-4,6-dinitrotoluene	0.163 U	0.154 U
2-Nitrotoluene	0.163 U	0.154 U
3-Nitrotoluene	0.163 U	0.22 B
4-Amino-2,6-dinitrotoluene	0.163 U	0.154 U
4-Nitrotoluene	0.163 U	0.154 U
HMX	0.163 U	0.64
Nitroglycerin	0.408 U	0.385 U
PETN	0.408 U	0.385 U
RDX	0.163 U	0.721
Tetryl	0.163 U	0.791 B
Total Metals (UG/L)		
Aluminum	203	149
Antimony	2 U	2 U
Arsenic	1.5 U	1.5 U
Barium	17.2	16.6
Beryllium	0.5 U	0.5 U
Cadmium	0.932 J	0.597 J
Calcium	50,600	39,600
Chromium	1.57 J	1.49 J
Cobalt	1.29 J	2.35 J
Copper	2 U	2 U
Cyanide	10 U	10 U
Iron	389	113
Lead	0.75 U	0.75 U
Magnesium	1,990	2,020
Manganese	42.9	135
Mercury	0.2 U	0.2 U
Nickel	2.44 J	2.06 J
Potassium	854 J	1,010 J
Selenium	1.25 U	1.25 U
Silver	0.5 U	0.5 U
Sodium	16,400	13,000
Thallium	1 U	1 U
Vanadium	2.5 U	2.5 U
Zinc	2.37 J	1.84 J
Dissolved Metals (UG/L)		
Aluminum, Dissolved	43.5 J	40.3 J
Antimony, Dissolved	2 U	2 U
Arsenic, Dissolved	1.5 U	1.5 U
Barium, Dissolved	17.1	15.9
Beryllium, Dissolved	0.5 U	0.5 U
Cadmium, Dissolved	0.893 J	0.591 J
Calcium, Dissolved	52,100	39,800
Chromium, Dissolved	1 U	1 U
Cobalt, Dissolved	2.5 U	2.22 J
Copper, Dissolved	2 U	2 U
Iron, Dissolved	23.7 J	7.6 J

Station ID	CAS07-MW01	CAS07-MW02
Sample ID	CAS07-MW01-0111	CAS07-MW02-0111
Sample Date	01/28/11	01/28/11
Chemical Name		
Lead, Dissolved	0.75 U	0.75 U
Magnesium, Dissolved	1,950	1,990
Manganese, Dissolved	46.3	137
Mercury, Dissolved	0.2 U	0.2 U
Nickel, Dissolved	2.11 J	1.71 J
Potassium, Dissolved	807 J	979 J
Selenium, Dissolved	1.25 U	1.25 U
Silver, Dissolved	0.5 U	0.5 U
Sodium, Dissolved	16,800	12,900
Thallium, Dissolved	1 U	1 U
Vanadium, Dissolved	2.5 U	2.5 U
Zinc, Dissolved	1.53 J	1.59 J

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

NG/L - Nanograms per liter

UG/L - Micrograms per liter

Station ID	CAS07-MW01	CAS07-MW02
Sample ID	CAS07-MW01-0111	CAS07-MW02-0111
Sample Date	01/28/11	01/28/11
Chemical Name		
Volatile Organic Compounds (UG/L)		
Acetone	5 U	5 U
Bromodichloromethane	0.5 U	0.5 U
Chloroform	0.5 U	0.5 U
cis-1,2-Dichloroethene	0.5 U	0.5 U
Dibromochloromethane	0.5 U	0.5 U
Tetrachloroethene	0.5 U	0.5 U
Toluene	0.5 U	0.5 U
trans-1,2-Dichloroethene	0.5 U	0.5 U
Trichloroethene	0.5 U	0.5 U
Vinyl chloride	0.5 U	0.5 U
Semivolatile Organic Compounds (UG/L)		
2,4-Dinitrotoluene	0.163 U	0.0961 B
2,6-Dinitrotoluene	0.163 U	0.154 U
Pesticide/Polychlorinated Biphenyls (UG/L)		
4,4'-DDD	0.0102 U	0.00962 U
alpha-BHC	0.0102 U	0.00962 U
delta-BHC	0.0102 U	0.00962 U
Endosulfan II	0.0102 U	0.00962 U
gamma-Chlordane	0.0102 U	0.00921 J
Dioxin/Furans (NG/L)		
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.000995 U	0.000810 J
1,2,3,4,7,8-Hexachlorodibenzofuran	0.000384 U	0.000394 U
2,3,4,7,8-Pentachlorodibenzofuran	0.000365 U	0.000307 U
Octachlorodibenzo-p-dioxin	0.001110 J	0.012900 J
Total heptachlorodibenzo-p-dioxin	0.000995 U	0.000810 U
Total hexachlorodibenzofuran	0.000329 U	0.000339 U
Toxic Equivalents (Total TEQ)	0.000000	0.000004
Explosives (UG/L)		
1,3,5-Trinitrobenzene	0.163 U	0.129 B
1,3-Dinitrobenzene	0.163 U	1.46
2,4,6-Trinitrotoluene	0.163 U	0.154 U
2-Amino-4,6-dinitrotoluene	0.163 U	0.154 U
3-Nitrotoluene	0.163 U	0.22 B
4-Amino-2,6-dinitrotoluene	0.163 U	0.154 U
HMX	0.163 U	0.64
Nitroglycerin	0.408 U	0.385 U
PETN	0.408 U	0.385 U
RDX	0.163 U	0.721
Total Metals (UG/L)		
Aluminum	203	149
Arsenic	1.5 U	1.5 U
Barium	17.2	16.6
Cadmium	0.932 J	0.597 J
Calcium	50,600	39,600
Chromium	1.57 J	1.49 J
Cobalt	1.29 J	2.35 J
Copper	2 U	2 U
Iron	389	113
Magnesium	1,990	2,020
Manganese	42.9	135
Nickel	2.44 J	2.06 J
Potassium	854 J	1,010 J
Selenium	1.25 U	1.25 U
Sodium	16,400	13,000
Vanadium	2.5 U	2.5 U
Zinc	2.37 J	1.84 J
Dissolved Metals (UG/L)		
Aluminum, Dissolved	43.5 J	40.3 J
Arsenic, Dissolved	1.5 U	1.5 U
Barium, Dissolved	17.1	15.9
Cadmium, Dissolved	0.893 J	0.591 J
Calcium, Dissolved	52,100	39,800
Chromium, Dissolved	1 U	1 U
Cobalt, Dissolved	2.5 U	2.22 J
Iron, Dissolved	23.7 J	7.6 J

Station ID	CAS07-MW01	CAS07-MW02
Sample ID	CAS07-MW01-0111	CAS07-MW02-0111
Sample Date	01/28/11	01/28/11
Chemical Name		
Magnesium, Dissolved	1,950	1,990
Manganese, Dissolved	46.3	137
Nickel, Dissolved	2.11 J	1.71 J
Potassium, Dissolved	807 J	979 J
Selenium, Dissolved	1.25 U	1.25 U
Sodium, Dissolved	16,800	12,900
Zinc, Dissolved	1.53 J	1.59 J

Notes:

Shading indicates detections

NA - Not analyzed

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NG/L - Nanograms per liter

UG/L - Micrograms per liter

Station ID	CAS07-MW03	CAS07-MW04	CAS07-MW05	CAS07-MW06		CAS07-MW07
Sample ID	CAS07-MW03-0111	CAS07-MW04-0111	CAS07-MW05-0111	CAS07-MW06-0111	CAS07-MW06P-0111	CAS07-MW07-0111
Sample Date	01/25/11	01/28/11	01/25/11	01/24/11	01/24/11	01/24/11
Chemical Name						
Volatile Organic Compounds (UG/L)						
1,1,1-Trichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2,4-Trichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromoethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloropropane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-Butanone	5 U	5 U	5 U	5 U	5 U	5 U
2-Hexanone	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
4-Methyl-2-pentanone	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Acetone	5 U	4.73 J	5 U	5 U	5 U	5 U
Benzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromodichloromethane	0.5 U	0.5 U	0.5 U	0.46 J	0.528 J	0.5 U
Bromoform	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromomethane	1 U	1 U	1 U	1 U	1 U	1 U
Carbon disulfide	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon tetrachloride	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloroethane	1 U	1 U	1 U	1 U	1 U	1 U
Chloroform	0.5 U	0.614 J	0.5 U	0.757 J	0.628 J	0.5 U
Chloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	2.27 J	0.5 U	0.5 U	0.5 U	0.5 U	7.26
cis-1,3-Dichloropropene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Cyclohexane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	0.5 U	0.5 U	0.5 U	0.609 J	0.555 J	0.345 J
Dichlorodifluoromethane (Freon-12)	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Isopropylbenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
m- and p-Xylene	1 U	1 U	1 U	1 U	1 U	1 U
Methyl acetate	1 U	1 U	1 U	1 U	1 U	1 U
Methylcyclohexane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylene chloride	1 U	1 U	1 U	1 U	1 U	1 U
Methyl-tert-butyl ether (MTBE)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
o-Xylene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Styrene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.474 J
Toluene	0.5 U	0.28 J	0.5 U	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	0.444 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
trans-1,3-Dichloropropene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	1.27 J	0.5 U	0.5 U	0.274 J	0.518 J	86.4
Trichlorofluoromethane (Freon-11)	1 U	1 U	1 U	1 U	1 U	1 U
Vinyl chloride	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.33 J
Xylene, total	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
Semivolatile Organic Compounds (UG/L)						
1,1-Biphenyl	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
2,2'-Oxybis(1-chloropropane)	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
2,4,5-Trichlorophenol	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
2,4,6-Trichlorophenol	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
2,4-Dichlorophenol	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
2,4-Dimethylphenol	9.43 U	9.62 U	9.26 U	9.26 U	9.43 U	10.2 U
2,4-Dinitrophenol	23.6 U	24 U	23.1 U	23.1 U	23.6 U	25.5 U
2,4-Dinitrotoluene	0.582 J	1.09	0.154 U	0.412 J	0.481 J	0.0987 J
2,6-Dinitrotoluene	0.154 U	0.39	0.154 U	0.151 U	0.154 U	0.162 U
2-Chloronaphthalene	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
2-Chlorophenol	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
2-Methylnaphthalene	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
2-Methylphenol	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
2-Nitroaniline	9.43 U	9.62 U	9.26 U	9.26 U	9.43 U	10.2 U
2-Nitrophenol	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
3,3'-Dichlorobenzidine	2.36 U	2.4 U	2.31 U	2.31 UJ	2.36 UJ	2.55 UJ
3-Nitroaniline	9.43 U	9.62 U	9.26 U	9.26 U	9.43 U	10.2 U
4,6-Dinitro-2-methylphenol	9.43 U	9.62 U	9.26 U	9.26 U	9.43 U	10.2 U
4-Bromophenyl-phenylether	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
4-Chloro-3-methylphenol	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
4-Chloroaniline	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
4-Chlorophenyl-phenylether	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
4-Methylphenol	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
4-Nitroaniline	9.43 U	9.62 U	9.26 U	9.26 U	9.43 U	10.2 U
4-Nitrophenol	9.43 U	9.62 U	9.26 U	9.26 U	9.43 U	10.2 U
Acenaphthene	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U

Station ID	CAS07-MW03	CAS07-MW04	CAS07-MW05	CAS07-MW06		CAS07-MW07
Sample ID	CAS07-MW03-0111	CAS07-MW04-0111	CAS07-MW05-0111	CAS07-MW06-0111	CAS07-MW06P-0111	CAS07-MW07-0111
Sample Date	01/25/11	01/28/11	01/25/11	01/24/11	01/24/11	01/24/11
Chemical Name						
Acenaphthylene	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Acetophenone	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Anthracene	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Atrazine	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Benzaldehyde	2.36 UJ	2.4 UJ	2.31 UJ	2.31 UJ	2.36 UJ	2.55 UJ
Benzo(a)anthracene	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Benzo(a)pyrene	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Benzo(b)fluoranthene	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Benzo(g,h,i)perylene	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Benzo(k)fluoranthene	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
bis(2-Chloroethoxy)methane	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
bis(2-Chloroethyl)ether	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
bis(2-Ethylhexyl)phthalate	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Butylbenzylphthalate	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Caprolactam	2.36 UL	2.4 UL	2.31 UL	2.31 UL	2.36 UL	2.55 UL
Carbazole	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Chrysene	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Dibenz(a,h)anthracene	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Dibenzofuran	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Diethylphthalate	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Dimethyl phthalate	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Di-n-butylphthalate	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Di-n-octylphthalate	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Fluoranthene	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Fluorene	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Hexachlorobenzene	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Hexachlorobutadiene	2.36 U	2.4 UL	2.31 U	2.31 U	2.36 U	2.55 U
Hexachlorocyclopentadiene	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Hexachloroethane	2.36 U	2.4 UL	2.31 U	2.31 U	2.36 U	2.55 U
Indeno(1,2,3-cd)pyrene	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Isophorone	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Naphthalene	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
n-Nitroso-di-n-propylamine	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
n-Nitrosodiphenylamine	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Nitrobenzene	0.154 U	0.292 B	0.154 U	0.0934 B	0.154 U	0.259 B
Pentachlorophenol	9.43 U	9.62 U	9.26 U	9.26 U	9.43 U	10.2 U
Phenanthrene	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Phenol	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Pyrene	2.36 U	2.4 U	2.31 U	2.31 U	2.36 U	2.55 U
Pesticide/Polychlorinated Biphenyls (UG/L)						
4,4'-DDD	0.00943 U	0.0398 J	0.0102 U	0.0098 UJ	0.00926 UJ	0.00992 J
4,4'-DDE	0.00943 U	0.00943 UJ	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
4,4'-DDT	0.00943 U	0.00943 UJ	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
Aldrin	0.00943 U	0.00943 UJ	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
alpha-BHC	0.00943 U	0.00531 J	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
alpha-Chlordane	0.00943 U	0.00943 UJ	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
Aroclor-1016	0.236 UJ	0.236 UJ	0.255 U	0.231 UJ	0.24 UJ	0.255 UJ
Aroclor-1221	0.236 UJ	0.236 UJ	0.255 U	0.231 UJ	0.24 UJ	0.255 UJ
Aroclor-1232	0.236 UJ	0.236 UJ	0.255 U	0.231 UJ	0.24 UJ	0.255 UJ
Aroclor-1242	0.236 UJ	0.236 UJ	0.255 U	0.231 UJ	0.24 UJ	0.255 UJ
Aroclor-1248	0.236 UJ	0.236 UJ	0.255 U	0.231 UJ	0.24 UJ	0.255 UJ
Aroclor-1254	0.236 UJ	0.236 UJ	0.255 U	0.231 UJ	0.24 UJ	0.255 UJ
Aroclor-1260	0.236 UJ	0.236 UJ	0.255 U	0.231 UJ	0.24 UJ	0.255 UJ
beta-BHC	0.00943 U	0.00943 UJ	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
delta-BHC	0.00558 J	0.00943 UJ	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
Dieldrin	0.00943 U	0.00943 UJ	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
Endosulfan I	0.00943 U	0.00943 UJ	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
Endosulfan II	0.00943 U	0.00943 UJ	0.0102 U	0.0098 UJ	0.00575 J	0.00714 J
Endosulfan sulfate	0.00943 U	0.00943 UJ	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
Endrin	0.00943 U	0.00943 UJ	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
Endrin aldehyde	0.00943 U	0.00943 UJ	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
Endrin ketone	0.00943 U	0.00943 UJ	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
gamma-BHC (Lindane)	0.00943 U	0.00943 UJ	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
gamma-Chlordane	0.00943 U	0.0251 J	0.0102 U	0.0098 UJ	0.00926 UJ	0.00646 J
Heptachlor	0.00943 U	0.00943 UJ	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
Heptachlor epoxide	0.00943 U	0.00943 UJ	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
Methoxychlor	0.00943 U	0.00943 UJ	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
Toxaphene	0.629 U	0.629 UJ	0.681 U	0.654 UJ	0.618 UJ	0.618 U
Dioxin/Furans (NG/L)						
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.000474 U	0.000409 U	0.000398 U	0.000451 U	0.000498 U	0.000456 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.000836 U	0.001360 J	0.000689 U	0.000790 U	0.000881 U	0.000833 U
1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.000653 U	0.000563 U	0.000546 U	0.000621 U	0.000682 U	0.000627 U
1,2,3,4,7,8-Hexachlorodibenzofuran	0.000596 J	0.000331 U	0.000390 U	0.000461 U	0.000455 U	0.000460 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	0.000564 U	0.000726 U	0.000604 U	0.000715 U	0.000745 U	0.000747 U
1,2,3,6,7,8-Hexachlorodibenzofuran	0.000506 U	0.000283 U	0.000334 U	0.000398 U	0.000392 U	0.000394 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	0.000521 U	0.000674 U	0.000558 U	0.000664 U	0.000690 U	0.000691 U
1,2,3,7,8,9-Hexachlorodibenzofuran	0.000676 U	0.000378 U	0.000447 U	0.000531 U	0.000522 U	0.000528 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	0.000583 U	0.000753 U	0.000625 U	0.000741 U	0.000772 U	0.000773 U

Station ID	CAS07-MW03	CAS07-MW04	CAS07-MW05	CAS07-MW06		CAS07-MW07
Sample ID	CAS07-MW03-0111	CAS07-MW04-0111	CAS07-MW05-0111	CAS07-MW06-0111	CAS07-MW06P-0111	CAS07-MW07-0111
Sample Date	01/25/11	01/28/11	01/25/11	01/24/11	01/24/11	01/24/11
Chemical Name						
1,2,3,7,8-Pentachlorodibenzofuran	0.000387 U	0.000308 U	0.000392 U	0.000486 U	0.000625 U	0.000489 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	0.000693 U	0.000577 U	0.000604 U	0.000588 U	0.000727 U	0.000767 U
2,3,4,6,7,8-Hexachlorodibenzofuran	0.000562 U	0.000314 U	0.000370 U	0.000439 U	0.000433 U	0.000437 U
2,3,4,7,8-Pentachlorodibenzofuran	0.000425 J	0.000314 U	0.000400 U	0.000496 U	0.000640 U	0.000499 U
2,3,7,8-TCDD (dioxin)	0.000723 U	0.000720 U	0.000705 U	0.000892 U	0.000800 U	0.000773 U
2,3,7,8-Tetrachlorodibenzofuran	0.000551 U	0.000546 U	0.000429 U	0.000592 U	0.000605 U	0.000555 U
Octachlorodibenzofuran	0.000881 U	0.000877 U	0.000823 U	0.001120 U	0.001150 U	0.001150 U
Octachlorodibenzo-p-dioxin	0.008170 J	0.060600 J	0.000790 U	0.002040 J	0.003110 J	0.010100 J
Total heptachlorodibenzofuran	0.000474 U	0.000409 U	0.000398 U	0.000451 U	0.000498 U	0.000456 U
Total heptachlorodibenzo-p-dioxin	0.000836 U	0.004400 J	0.000689 U	0.000790 U	0.000881 U	0.000833 U
Total hexachlorodibenzofuran	0.000596 J	0.000283 U	0.000334 U	0.000398 U	0.000392 U	0.000394 U
Total hexachlorodibenzo-p-dioxin	0.000521 U	0.000674 U	0.000558 U	0.000664 U	0.000690 U	0.000691 U
Total pentachlorodibenzofuran	0.000387 U	0.000308 U	0.000392 U	0.000486 U	0.000625 U	0.000489 U
Total pentachlorodibenzo-p-dioxin	0.000693 U	0.000577 U	0.000604 U	0.000588 U	0.000727 U	0.000767 U
Total tetrachlorodibenzofuran	0.000551 U	0.000546 U	0.000429 U	0.000592 U	0.000605 U	0.000555 U
Total tetrachlorodibenzo-p-dioxin	0.000723 U	0.000720 U	0.000705 U	0.000892 U	0.000800 U	0.000773 U
Toxic Equivalents (Total TEQ)	0.000062	0.000032	0.000000	0.000001	0.000001	0.000003
Explosives (UG/L)						
1,3,5-Trinitrobenzene	0.154 U	0.132 J	0.154 U	0.151 U	0.154 U	0.162 U
1,3-Dinitrobenzene	0.328 B	0.522 B	0.154 U	0.151 U	0.154 U	0.162 U
2,4,6-Trinitrotoluene	0.154 U	0.157 U	0.154 U	0.151 U	0.214 J	0.162 U
2-Amino-4,6-dinitrotoluene	0.154 U	0.157 U	0.154 U	0.0796 J	0.118 J	0.162 U
2-Nitrotoluene	0.22 B	0.636 B	0.176 B	0.151 U	0.154 U	0.0953 B
3-Nitrotoluene	0.138 B	0.125 B	0.154 U	0.138 J	0.154 U	0.143 J
4-Amino-2,6-dinitrotoluene	0.154 U	0.157 U	0.154 U	0.188 J	0.204 J	0.162 U
4-Nitrotoluene	0.154 U	0.157 U	0.154 U	0.151 U	0.154 U	0.162 U
HMX	0.122 J	0.532 J	0.154 U	0.114 J	0.109 J	0.162 U
Nitroglycerin	0.385 U	0.231 J	0.385 U	0.377 U	0.385 U	0.404 U
PETN	0.251 J	0.463 J	0.385 U	0.288 J	0.269 J	0.404 U
RDX	0.133 J	0.651 J	0.263 J	0.151 U	0.154 U	0.282 J
Tetryl	0.154 U	0.364 B	0.154 U	0.151 U	0.154 U	0.162 U
Total Metals (UG/L)						
Aluminum	24.7 B	262	158 B	59.9	60.3	298
Antimony	2 U	2 U	2 U	2 U	2 U	2 U
Arsenic	1.5 U	3.15	1.5 U	1.5 U	1.5 U	4.26
Barium	28.6	22.3	41.5	28.3	29.4	31.1
Beryllium	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Cadmium	1.1 J	1.05 J	0.861 J	1.14 J	1.17 J	0.716 J
Calcium	84,700	105,000	140,000	91,600	92,200	104,000
Chromium	1 U	2.45 J	2.49 J	1 U	1 U	1.67 J
Cobalt	4.28	3.84	2.5 U	1.84 J	2 J	1.43 J
Copper	2 U	1.12 J	2 U	2.04 J	2 U	2 U
Cyanide	10 U	10 U	10 U	10 U	10 U	10 U
Iron	15 U	333	28.5 B	89.2	104	603
Lead	0.75 U	0.75 U	3.75 U	0.75 U	0.75 U	0.75 U
Magnesium	3,290	2,080	6,490	2,080	2,160	2,310
Manganese	57.1	216	18.5	56.9	55.9	67.7
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	3.94	2.7	2.63	2.48 J	2.61	2.76
Potassium	1,130 J	1,760	2,260	1,360	1,390	1,440
Selenium	1.25 U	1.25 U	2.4 J	0.878 J	1.25 U	1.25 U
Silver	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Sodium	15,700	9,090	21,100	7,360	7,580	7,270
Thallium	1 U	1 U	1 U	1 U	1 U	1 U
Vanadium	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	1.46 J
Zinc	9.91	2.13 J	12.5 U	1.98 J	2.17 J	3.11 J
Dissolved Metals (UG/L)						
Aluminum, Dissolved	161 B	16.9 J	160 B	14.9 J	15.4 J	25 U
Antimony, Dissolved	2 U	2 U	2 U	2 U	2 U	2 U
Arsenic, Dissolved	1.5 U	2.56	1.5 U	1.5 U	1.5 U	3.55
Barium, Dissolved	29.1	20.7	41.3	28.2	27.7	30.4
Beryllium, Dissolved	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Cadmium, Dissolved	1.12 J	0.949 J	0.896 J	1.12 J	1.12 J	0.652 J
Calcium, Dissolved	85,900	101,000	141,000	90,500	87,900	104,000
Chromium, Dissolved	0.818 J	1 U	2.52	1 U	1 U	1 U
Cobalt, Dissolved	4.59	3.53	2.5 U	1.84 J	1.84 J	2.5 U
Copper, Dissolved	2 U	2 U	2 U	2 U	2 U	2 U
Iron, Dissolved	338	8.22 J	30.2 B	15 U	15 U	15 U
Lead, Dissolved	0.75 U	0.75 U	3.75 U	0.75 U	0.75 U	0.75 U
Magnesium, Dissolved	3,340	1,970	6,520	2,030	2,000	2,270
Manganese, Dissolved	58.5	208	18.3	55	53.9	70.4
Mercury, Dissolved	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel, Dissolved	4.58	1.8 J	2.65	2.25 J	2.27 J	1.89 J
Potassium, Dissolved	1,170 J	1,620	2,240	1,340	1,320	1,310
Selenium, Dissolved	1.25 U	1.25 U	2.29 J	1.25 U	1.25 U	1.25 U
Silver, Dissolved	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Sodium, Dissolved	15,700	8,670	21,000	7,390	7,240	7,370

Station ID	CAS07-MW03	CAS07-MW04	CAS07-MW05	CAS07-MW06		CAS07-MW07
Sample ID	CAS07-MW03-0111	CAS07-MW04-0111	CAS07-MW05-0111	CAS07-MW06-0111	CAS07-MW06P-0111	CAS07-MW07-0111
Sample Date	01/25/11	01/28/11	01/25/11	01/24/11	01/24/11	01/24/11
Chemical Name						
Thallium, Dissolved	1 U	1 U	1 U	1 U	1 U	1 U
Vanadium, Dissolved	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Zinc, Dissolved	12	2.5 U	12.5 U	1.83 J	1.54 J	2.5 U

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

NG/L - Nanograms per liter

UG/L - Micrograms per liter

Station ID	CAS07-MW03	CAS07-MW04	CAS07-MW05	CAS07-MW06		CAS07-MW07
Sample ID	CAS07-MW03-0111	CAS07-MW04-0111	CAS07-MW05-0111	CAS07-MW06-0111	CAS07-MW06P-0111	CAS07-MW07-0111
Sample Date	01/25/11	01/28/11	01/25/11	01/24/11	01/24/11	01/24/11
Chemical Name						
Volatile Organic Compounds (UG/L)						
Acetone	5 U	4.73 J	5 U	5 U	5 U	5 U
Bromodichloromethane	0.5 U	0.5 U	0.5 U	0.46 J	0.528 J	0.5 U
Chloroform	0.5 U	0.614 J	0.5 U	0.757 J	0.628 J	0.5 U
cis-1,2-Dichloroethene	2.27 J	0.5 U	0.5 U	0.5 U	0.5 U	7.26
Dibromochloromethane	0.5 U	0.5 U	0.5 U	0.609 J	0.555 J	0.345 J
Tetrachloroethene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.474 J
Toluene	0.5 U	0.28 J	0.5 U	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	0.444 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	1.27 J	0.5 U	0.5 U	0.274 J	0.518 J	86.4
Vinyl chloride	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.33 J
Semivolatile Organic Compounds (UG/L)						
2,4-Dinitrotoluene	0.582 J	1.09	0.154 U	0.412 J	0.481 J	0.0987 J
2,6-Dinitrotoluene	0.154 U	0.39	0.154 U	0.151 U	0.154 U	0.162 U
Pesticide/Polychlorinated Biphenyls (UG/L)						
4,4'-DDD	0.00943 U	0.0398 J	0.0102 U	0.0098 UJ	0.00926 UJ	0.00992 J
alpha-BHC	0.00943 U	0.00531 J	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
delta-BHC	0.00558 J	0.00943 UJ	0.0102 U	0.0098 UJ	0.00926 UJ	0.00926 U
Endosulfan II	0.00943 U	0.00943 UJ	0.0102 U	0.0098 UJ	0.00575 J	0.00714 J
gamma-Chlordane	0.00943 U	0.0251 J	0.0102 U	0.0098 UJ	0.00926 UJ	0.00646 J
Dioxin/Furans (NG/L)						
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.000836 U	0.001360 J	0.000689 U	0.000790 U	0.000881 U	0.000833 U
1,2,3,4,7,8-Hexachlorodibenzofuran	0.000596 J	0.000331 U	0.000390 U	0.000461 U	0.000455 U	0.000460 U
2,3,4,7,8-Pentachlorodibenzofuran	0.000425 J	0.000314 U	0.000400 U	0.000496 U	0.000640 U	0.000499 U
Octachlorodibenzo-p-dioxin	0.008170 J	0.060600 J	0.000790 U	0.002040 J	0.003110 J	0.010100 J
Total heptachlorodibenzo-p-dioxin	0.000836 U	0.004400 J	0.000689 U	0.000790 U	0.000881 U	0.000833 U
Total hexachlorodibenzofuran	0.000596 J	0.000283 U	0.000334 U	0.000398 U	0.000392 U	0.000394 U
Toxic Equivalents (Total TEQ)	0.000062	0.000032	0.000000	0.000001	0.000001	0.000003
Explosives (UG/L)						
1,3,5-Trinitrobenzene	0.154 U	0.132 J	0.154 U	0.151 U	0.154 U	0.162 U
1,3-Dinitrobenzene	0.328 B	0.522 B	0.154 U	0.151 U	0.154 U	0.162 U
2,4,6-Trinitrotoluene	0.154 U	0.157 U	0.154 U	0.151 U	0.214 J	0.162 U
2-Amino-4,6-dinitrotoluene	0.154 U	0.157 U	0.154 U	0.0796 J	0.118 J	0.162 U
3-Nitrotoluene	0.138 B	0.125 B	0.154 U	0.138 J	0.154 U	0.143 J
4-Amino-2,6-dinitrotoluene	0.154 U	0.157 U	0.154 U	0.188 J	0.204 J	0.162 U
HMX	0.122 J	0.532 J	0.154 U	0.114 J	0.109 J	0.162 U
Nitroglycerin	0.385 U	0.231 J	0.385 U	0.377 U	0.385 U	0.404 U
PETN	0.251 J	0.463 J	0.385 U	0.288 J	0.269 J	0.404 U
RDX	0.133 J	0.651 J	0.263 J	0.151 U	0.154 U	0.282 J
Total Metals (UG/L)						
Aluminum	24.7 B	262	158 B	59.9	60.3	298
Arsenic	1.5 U	3.15	1.5 U	1.5 U	1.5 U	4.26
Barium	28.6	22.3	41.5	28.3	29.4	31.1
Cadmium	1.1 J	1.05 J	0.861 J	1.14 J	1.17 J	0.716 J
Calcium	84,700	105,000	140,000	91,600	92,200	104,000
Chromium	1 U	2.45 J	2.49 J	1 U	1 U	1.67 J
Cobalt	4.28	3.84	2.5 U	1.84 J	2 J	1.43 J
Copper	2 U	1.12 J	2 U	2.04 J	2 U	2 U
Iron	15 U	333	28.5 B	89.2	104	603
Magnesium	3,290	2,080	6,490	2,080	2,160	2,310
Manganese	57.1	216	18.5	56.9	55.9	67.7
Nickel	3.94	2.7	2.63	2.48 J	2.61	2.76
Potassium	1,130 J	1,760	2,260	1,360	1,390	1,440
Selenium	1.25 U	1.25 U	2.4 J	0.878 J	1.25 U	1.25 U
Sodium	15,700	9,090	21,100	7,360	7,580	7,270
Vanadium	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	1.46 J
Zinc	9.91	2.13 J	12.5 U	1.98 J	2.17 J	3.11 J
Dissolved Metals (UG/L)						
Aluminum, Dissolved	161 B	16.9 J	160 B	14.9 J	15.4 J	25 U
Arsenic, Dissolved	1.5 U	2.56	1.5 U	1.5 U	1.5 U	3.55
Barium, Dissolved	29.1	20.7	41.3	28.2	27.7	30.4
Cadmium, Dissolved	1.12 J	0.949 J	0.896 J	1.12 J	1.12 J	0.652 J
Calcium, Dissolved	85,900	101,000	141,000	90,500	87,900	104,000
Chromium, Dissolved	0.818 J	1 U	2.52	1 U	1 U	1 U
Cobalt, Dissolved	4.59	3.53	2.5 U	1.84 J	1.84 J	2.5 U
Iron, Dissolved	338	8.22 J	30.2 B	15 U	15 U	15 U
Magnesium, Dissolved	3,340	1,970	6,520	2,030	2,000	2,270
Manganese, Dissolved	58.5	208	18.3	55	53.9	70.4
Nickel, Dissolved	4.58	1.8 J	2.65	2.25 J	2.27 J	1.89 J
Potassium, Dissolved	1,170 J	1,620	2,240	1,340	1,320	1,310
Selenium, Dissolved	1.25 U	1.25 U	2.29 J	1.25 U	1.25 U	1.25 U
Sodium, Dissolved	15,700	8,670	21,000	7,390	7,240	7,370
Zinc, Dissolved	12	2.5 U	12.5 U	1.83 J	1.54 J	2.5 U

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in

J - Analyte present, value may or may not be accurate

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be

NG/L - Nanograms per liter

UG/L - Micrograms per liter

Station ID	CAS07-SO001		CAS07-SO002		CAS07-SO003	CAS07-SO004	CAS07-SO005	CAS07-SO006	CAS07-SO007	CAS07-SO008			CAS07-SO009
Sample ID	NWSY-90-7-SC-PER-132	NWSY-90-7-SC-PER-133	NWSY-90-7-SC-PER-135	NWSY-90-7-SC-PER-183	NWSY-90-7-SC-FLR-136	NWSY-90-7-SC-FLR-137	NWSY-90-7-SC-FLR-138	NWSY-90-7-SC-FLR-139	NWSY-90-7-SC-FLR-140	NWSY-90-7-SC-PER-143	NWSY-90-7-SC-PER-184	NWSY-90-7-SC-PER-185	NWSY-90-7-SC-FLR-144
Sample Date	02/28/08	02/28/08	02/28/08	04/09/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	04/09/08	04/09/08	02/28/08
Chemical Name													
Volatile Organic Compounds (UG/KG)													
1,1,1-Trichloroethane	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
1,1,2,2-Tetrachloroethane	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
1,1,2-Trichloroethane	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
1,1-Dichloroethane	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
1,1-Dichloroethene	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
1,2,3-Trichlorobenzene	4.7 U	7.7 U	7.4 U	7.7 UL	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
1,2,4-Trichlorobenzene	4.7 U	7.7 U	7.4 U	7.7 UL	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
1,2-Dibromo-3-chloropropane	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
1,2-Dibromoethane	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
1,2-Dichlorobenzene	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
1,2-Dichloroethane	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
1,2-Dichloropropane	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
1,3-Dichlorobenzene	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
1,4-Dichlorobenzene	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
2-Butanone	23 UL	38 U	37 U	38 U	32 U	42 U	40 U	35 U	32 U	43 U	39 U	42 U	41 U
2-Hexanone	23 U	38 U	37 U	38 U	32 U	42 U	40 U	35 U	32 U	43 U	39 U	42 U	41 U
4-Methyl-2-pentanone	23 U	38 U	37 U	38 U	32 U	42 U	40 U	35 U	32 U	43 U	39 U	42 U	41 U
Acetone	47 U	77 U	74 U	77 U	65 U	84 U	81 U	69 U	63 U	86 U	78 U	84 U	81 U
Benzene	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Bromochloromethane	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Bromodichloromethane	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Bromoform	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Bromomethane	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Carbon disulfide	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Carbon tetrachloride	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Chlorobenzene	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Chloroethane	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Chloroform	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Chloromethane	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
cis-1,2-Dichloroethene	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
cis-1,3-Dichloropropene	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Cyclohexane	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Dibromochloromethane	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Dichlorodifluoromethane (Freon-12)	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Ethylbenzene	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Isopropylbenzene	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
m- and p-Xylene	9.4 U	15 U	15 U	15 U	13 U	17 U	16 U	14 U	13 U	17 U	16 U	17 U	16 U
Methyl acetate	23 U	38 U	37 U	38 U	32 U	42 U	40 U	35 U	32 U	43 U	39 U	42 U	41 U
Methylcyclohexane	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Methylene chloride	X25.6 BS	X40.3 BS	X69.2 BS	X69.4 BS	X72.1 BS	X89.8 BS	X70.7 BS	X51.1 BS	X36 BS	X43.3 BS	X60.2 BS	X50 BS	X56.3 BS
Methyl-tert-butyl ether (MTBE)	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
o-Xylene	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Styrene	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Tetrachloroethene	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Toluene	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
trans-1,2-Dichloroethene	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
trans-1,3-Dichloropropene	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Trichloroethene	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Trichlorofluoromethane (Freon-11)	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Vinyl chloride	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Xylene, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds (UG/KG)													
1,1-Biphenyl	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
1,2,4,5-Tetrachlorobenzene	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
1,4-Dioxane	230 UJ	380 UJ	370 UJ	380 U	320 UJ	420 UJ	400 UJ	350 UJ	320 UJ	430 UJ	390 U	420 U	410 UJ
1-Methylnaphthalene	340 U	290 U	310 U	310 U	300 U	350 U	310 U	310 U	310 U	310 U	310 U	310 U	310 U
2,2'-Oxybis(1-chloropropane)	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
2,3,4,6-Tetrachlorophenol	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
2,4,5-Trichlorophenol	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
2,4,6-Trichlorophenol	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
2,4-Dichlorophenol	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
2,4-Dimethylphenol	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
2,4-Dinitrophenol	1,000 U	910 U	950 U	980 U	930 U	1,100 U	980 U	960 U	960 U	980 U	960 U	970 U	960 U
2,4-Dinitrotoluene	220 U	210 U	200 U	200 U	190 U	190 U	180 U	220 U	200 U	190 U	200 U	200 U	200 U
2,6-Dinitrotoluene	210 U	180 U	190 U	200 U	190 U	190 U	180 U	190 U	190 U	190 U	200 U	200 UL	190 U
2-Chloronaphthalene	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
2-Chlorophenol	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
2-Methylnaphthalene	340 U	290 U	310 U	310 U	300 U	350 U	310 U	310 U	310 U	310 U	310 U	310 U	310 U
2-Methylphenol	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
2-Nitroaniline	420 U	370 U	380 U	390 U	370 U	440 U	390 U	380 U	380 U	390 U	380 U	390 U	380 U
2-Nitrophenol	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
3- and 4-Methylphenol	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
3,3'-Dichlorobenzidine	420 U	370 U	380 U	390 U	370 U	440 U	390 U	380 U	380 U	390 U	380 U	390 U	380 U
3-Nitroaniline	420 U	370 U	380 U	390 U	370 U	440 U	390 U	380 U	380 U	390 U	380 U	390 U	380 U
4,6-Dinitro-2-methylphenol	420 U	370 U	380 U	390 U	370 U	440 U	390 U	380 U	380 U	390 U	380 U	390 U	380 U
4-Bromophenyl-phenylether	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
4-Chloro-3-methylphenol	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
4-Chloroaniline	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
4-Chlorophenyl-phenylether	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
4-Nitroaniline	420 U	370 U	380 U	390 U	370 U	440 U	390 U	380 U	380 U	390 U	380 U	390 U	380 U

Station ID	CAS07-SO001		CAS07-SO002		CAS07-SO003	CAS07-SO004	CAS07-SO005	CAS07-SO006	CAS07-SO007	CAS07-SO008			CAS07-SO009
Sample ID	NWSY-90-7-SC-PER-132	NWSY-90-7-SC-PER-133	NWSY-90-7-SC-PER-135	NWSY-90-7-SC-PER-183	NWSY-90-7-SC-FLR-136	NWSY-90-7-SC-FLR-137	NWSY-90-7-SC-FLR-138	NWSY-90-7-SC-FLR-139	NWSY-90-7-SC-FLR-140	NWSY-90-7-SC-PER-143	NWSY-90-7-SC-PER-184	NWSY-90-7-SC-PER-185	NWSY-90-7-SC-FLR-144
Sample Date	02/28/08	02/28/08	02/28/08	04/09/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	04/09/08	04/09/08	02/28/08
Chemical Name													
4-Nitrophenol	1,000 U	910 U	950 U	980 U	930 U	1,100 U	980 U	960 U	960 U	980 U	960 U	970 U	960 U
Acenaphthene	340 U	290 U	310 U	310 U	300 U	350 U	310 U	310 U	310 U	310 U	310 U	310 U	310 U
Acenaphthylene	340 U	290 U	310 U	310 U	300 U	350 U	310 U	310 U	310 U	310 U	310 U	310 U	310 U
Acetophenone	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
Anthracene	340 U	290 U	310 U	310 U	300 U	350 U	310 U	310 U	310 U	310 U	310 U	310 U	310 U
Atrazine	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
Benzaldehyde	1,000 U	910 U	950 U	980 U	930 U	1,100 U	980 U	960 U	960 U	980 U	960 U	970 U	960 U
Benzo(a)anthracene	67 U	58 U	61 U	63 U	59 U	71 U	63 U	62 U	62 U	63 U	62 U	62 U	X18.4 JS
Benzo(a)pyrene	67 U	58 U	61 U	63 U	59 U	71 U	63 U	62 U	62 U	63 U	62 U	62 U	61 U
Benzo(b)fluoranthene	67 U	58 U	61 U	63 U	59 U	71 U	63 U	62 U	62 U	63 U	62 U	62 U	16.6 JS
Benzo(g,h,i)perylene	67 U	58 U	61 U	63 U	59 U	71 U	63 U	62 U	62 U	63 U	62 U	62 U	61 U
Benzo(k)fluoranthene	67 U	58 U	61 U	63 U	59 U	71 U	63 U	62 U	62 U	63 U	62 U	62 U	61 U
bis(2-Chloroethoxy)methane	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
bis(2-Chloroethyl)ether	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
bis(2-Ethylhexyl)phthalate	420 U	370 U	380 U	390 U	370 U	440 U	390 U	380 U	380 U	390 U	380 U	390 U	380 U
Butylbenzylphthalate	420 U	370 U	380 U	390 U	370 U	440 U	390 U	380 U	380 U	390 U	380 U	390 U	380 U
Caprolactam	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
Carbazole	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
Chrysene	67 U	58 U	61 U	63 U	59 U	71 U	63 U	62 U	62 U	63 U	62 U	62 U	22.5 JS
Dibenz(a,h)anthracene	67 U	58 U	61 U	63 U	59 U	71 U	63 U	62 U	62 U	63 U	62 U	62 U	61 U
Dibenzofuran	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
Diethylphthalate	420 U	370 U	380 U	390 U	370 U	440 U	390 U	380 U	380 U	390 U	380 U	390 U	380 U
Dimethyl phthalate	420 U	370 U	380 U	390 U	370 U	440 U	390 U	380 U	380 U	390 U	380 U	390 U	380 U
Di-n-butylphthalate	420 U	370 U	380 U	390 U	370 U	440 U	390 U	380 U	380 U	390 U	380 U	390 U	380 U
Di-n-octylphthalate	420 U	370 U	380 U	390 U	370 U	440 U	390 U	380 U	380 U	390 U	380 U	390 U	380 U
Fluoranthene	340 U	290 U	310 U	310 U	300 U	350 U	310 U	310 U	310 U	310 U	310 U	310 U	310 U
Fluorene	340 U	290 U	310 U	310 U	300 U	350 U	310 U	310 U	310 U	310 U	310 U	310 U	310 U
Hexachlorobenzene	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
Hexachlorobutadiene	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
Hexachlorocyclopentadiene	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
Hexachloroethane	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
Indeno(1,2,3-cd)pyrene	67 U	58 U	61 U	63 U	59 U	71 U	63 U	62 U	62 U	63 U	62 U	62 U	61 U
Isophorone	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
Naphthalene	340 U	290 U	310 U	310 U	300 U	350 U	310 U	310 U	310 U	310 U	310 U	310 U	310 U
n-Nitroso-di-n-propylamine	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
n-Nitrosodiphenylamine	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
Nitrobenzene	210 U	180 U	190 U	200 U	190 U	190 U	180 U	190 U	190 U	190 U	200 U	200 U	190 U
Pentachlorophenol	1,000 U	910 U	950 U	980 U	930 U	1,100 U	980 U	960 U	960 U	980 U	960 U	970 U	960 U
Phenanthrene	340 U	290 U	310 U	310 U	300 U	350 U	310 U	310 U	310 U	310 U	310 U	310 U	310 U
Phenol	210 U	180 U	190 U	200 U	190 U	220 U	200 U	190 U	190 U	200 U	190 U	190 U	190 U
Pyrene	340 UJ	290 UJ	310 UJ	310 U	300 UJ	350 UJ	310 UJ	310 UJ	310 UJ	310 U	310 U	310 U	310 U
Pesticide/Polychlorinated Biphenyls (UG/KG)													
4,4'-DDD	4.2 U	3.7 U	3.8 U	3.9 U	3.8 U	4.5 U	3.9 U	3.8 U	3.9 U	3.8 U	3.9 U	3.8 U	3.9 U
4,4'-DDE	4.2 U	3.7 U	3.8 U	3.9 U	3.8 U	4.5 U	3.9 U	3.8 U	3.9 U	3.8 U	3.9 U	3.8 U	3.9 U
4,4'-DDT	4.2 U	3.7 U	3.8 U	3.9 U	3.8 U	4.5 U	3.9 U	3.8 U	3.9 U	38 U	3.9 U	3.8 U	3.9 U
Aldrin	2.1 U	1.9 U	1.9 U	2 U	1.9 U	2.2 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	1.9 U
alpha-BHC	2.1 U	1.9 U	1.9 U	2 U	1.9 U	2.2 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	1.9 U
alpha-Chlordane	2.1 U	1.9 U	1.9 U	2 U	1.9 U	2.2 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	1.9 U
Aroclor-1016	21 U	19 U	19 U	20 U	19 U	22 U	19 U	19 U	20 U	19 U	19 U	19 U	19 U
Aroclor-1221	21 U	19 U	19 U	20 U	19 U	22 U	19 U	19 U	20 U	19 U	19 U	19 U	19 U
Aroclor-1232	21 U	19 U	19 U	20 U	19 U	22 U	19 U	19 U	20 U	19 U	19 U	19 U	19 U
Aroclor-1242	21 U	19 U	19 U	20 U	19 U	22 U	19 U	19 U	20 U	19 U	19 U	19 U	19 U
Aroclor-1248	21 U	19 U	19 U	20 U	19 U	22 U	19 U	19 U	20 U	19 U	19 U	19 U	19 U
Aroclor-1254	21 U	19 U	19 U	20 U	19 U	22 U	19 U	19 U	20 U	19 U	19 U	19 U	19 U
Aroclor-1260	21 U	19 U	19 U	20 U	19 U	22 U	19 U	19 U	20 U	19 U	19 U	19 U	19 U
Aroclor-1262	21 U	19 U	19 U	20 U	19 U	22 U	19 U	19 U	20 U	19 U	19 U	19 U	19 U
Aroclor-1268	21 U	19 U	19 U	20 U	19 U	22 U	19 U	19 U	20 U	19 U	19 U	19 U	19 U
beta-BHC	2.1 U	1.9 U	1.9 U	2 U	1.9 U	2.2 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	1.9 U
delta-BHC	2.1 U	1.9 U	1.9 U	2 U	1.9 U	2.2 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	1.9 U
Dieldrin	2.1 U	1.9 U	1.9 U	2 U	1.9 U	2.2 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	1.9 U
Endosulfan I	2.1 U	1.9 U	1.9 U	2 U	1.9 U	2.2 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	1.9 U
Endosulfan II	4.2 U	3.7 U	3.8 U	3.9 U	3.8 U	4.5 U	3.9 U	3.8 U	3.9 U	3.8 U	3.9 U	3.8 U	3.9 U
Endosulfan sulfate	4.2 U	3.7 U	3.8 U	3.9 U	3.8 U	4.5 U	3.9 U	3.8 U	3.9 U	3.8 U	3.9 U	3.8 U	3.9 U
Endrin	2.4 JS	3.7 U	3.8 U	3.9 U	3.8 U	4.5 U	3.9 U	3.8 U	3.9 U	3.8 U	3.9 U	3.8 U	3.9 U
Endrin aldehyde	4.2 U	3.7 U	3.8 U	3.9 UJ	3.8 U	4.5 U	3.9 U	3.8 U	3.9 U	3.8 U	3.9 UJ	3.8 UJ	3.9 U
Endrin ketone	4.2 U	3.7 U	3.8 U	3.9 U	3.8 U	4.5 U	3.9 U	3.8 U	3.9 U	3.8 U	3.9 U	3.8 U	3.9 U
gamma-BHC (Lindane)	2.1 U	1.9 U	1.9 U	2 U	1.9 U	2.2 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	1.9 U
gamma-Chlordane	2.1 U	1.9 U	1.9 U	2 U	1.9 U	2.2 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	1.9 U
Heptachlor	2.1 U	1.9 U	1.9 U	2 U	1.9 U	2.2 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	1.9 U
Heptachlor epoxide	2.1 U	1.9 U	1.9 U	2 U	1.9 U	2.2 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	1.9 U
Methoxychlor	4.2 U	3.7 U	3.8 U	3.9 U	3.8 U	4.5 U	3.9 U	3.8 U	3.9 U	38 U	3.9 U	3.8 U	3.9 U
Polychlorinated biphenyls (PCBs)	42 U	37 U	38 U	39 U	38 U	45 U	39 U	38 U	39 U	38 U	39 U	38 U	39 U
Toxaphene	100 U	93 U	96 U	98 U	94 U	110 U	97 U	96 U	98 U	96 U	97 U	96 U	97 U
Dioxin/Furans (PG/G)													
2,3,7,8-TCDD (dioxin)	0.248 U	0.19 U	0.138 U	0.119 JS	0.177 U	0.199 U	0.19 U	X0.267 JS	0.182 U	0.201 U	0.109 U	0.135 JS	0.189 U
Explosives (UG/KG)													
1,3,5-Trinitrobenzene	220 U	210 U	200 U	200 U	190 U	190 U	180 U	220 U	200 U	190 U	200 U	200 U	200 U
1,3-Dinitrobenzene	220 U	210 U	200 U	200 U	190 U	190 U	180 U	220 U	200 U	190 U	200 U	200 U	200 U
2,4,6-Trinitrotoluene	220 U	210 U	200 U	200 U	190 U	190 U	180 U	220 U	200 U	190 U	200 U	200 U	200 U
2-Amino-4,6-dinitrotoluene	220 U	210 U	200 U	200 U	190 U	190 U	180 U	220 U	200 U	190 U	200 U	200 U	200 U
2-Nitrotoluene	220 U	210 U	200 U	200 U	190 U	190 U	180 U	220 U	200 U	190 U	200 U	200 U	200 U

Station ID	CAS07-SO001		CAS07-SO002		CAS07-SO003	CAS07-SO004	CAS07-SO005	CAS07-SO006	CAS07-SO007	CAS07-SO008			CAS07-SO009
Sample ID	NWSY-90-7-SC-PER-132	NWSY-90-7-SC-PER-133	NWSY-90-7-SC-PER-135	NWSY-90-7-SC-PER-183	NWSY-90-7-SC-FLR-136	NWSY-90-7-SC-FLR-137	NWSY-90-7-SC-FLR-138	NWSY-90-7-SC-FLR-139	NWSY-90-7-SC-FLR-140	NWSY-90-7-SC-PER-143	NWSY-90-7-SC-PER-184	NWSY-90-7-SC-PER-185	NWSY-90-7-SC-FLR-144
Sample Date	02/28/08	02/28/08	02/28/08	04/09/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	04/09/08	04/09/08	02/28/08
Chemical Name													
3-Nitrotoluene	220 U	210 U	200 U	200 U	190 U	190 U	180 U	220 U	200 U	190 U	200 U	200 U	200 U
4-Amino-2,6-dinitrotoluene	220 U	210 U	200 U	200 U	190 U	190 U	180 U	220 U	200 U	190 U	200 U	200 U	200 U
4-Nitrotoluene	220 U	210 U	200 U	200 U	190 U	190 U	180 U	220 U	200 U	190 U	200 U	200 U	200 U
HMX	220 U	210 U	200 U	200 U	190 U	190 U	180 U	220 U	200 U	190 U	200 U	200 U	200 U
RDX	220 U	210 U	200 U	200 U	190 U	190 U	180 U	220 U	200 U	190 U	200 U	200 U	200 U
Tetryl	440 U	420 U	390 U	400 U	370 U	380 U	370 U	430 U	410 U	370 U	400 U	400 U	390 U
Total Metals (MG/KG)													
Aluminum	11,200 S	3,530 S	6,710 S	9,730 S	12,600 S	X20300 S	X14100 S	6,880 S	11,000 S	7,400 S	7,350 S	8,900 S	7,220 S
Antimony	3.7 UL	3.3 UL	3.4 UL	13 UL	0.3 BS	0.6 BS	0.54 BS	3.4 UL	3.3 UL	3.5 UL	3.4 UL	0.23 LS	3.3 UL
Arsenic	X4.3 LS	X1.4 S	X1.5 S	X2.6 S	X1.9 S	X1.3 S	X2 S	X1.5 S	X1.2 S	X1.4 S	X1.8 S	X1.9 S	X1.8 S
Barium	24.2 JS	19.6 JS	57.7 JS	X90.4 S	48.8 JS	35.7 JS	51.7 JS	X101 JS	42.2 JS	69.1 JS	X57.6 S	X53.7 S	X90.1 JS
Beryllium	0.47 S	0.33 S	X0.97 S	X1.3 S	0.4 S	X0.6 S	X0.6 S	X1.1 S	0.39 S	X0.91 S	0.39 S	0.41 S	X0.85 S
Cadmium	0.25 UL	0.22 U	0.23 U	0.9 U	0.84 U	2.6 U	1.2 U	0.23 U	1.1 U	0.23 U	0.22 U	0.22 U	0.22 U
Calcium	1,480 LS	407 S	458 S	770 JS	1,150 S	2,070 S	1,090 S	883 S	1,200 S	781 S	556 S	1,000 S	873 S
Chromium	X23.3 JS	X10.9 JS	X5.1 JS	X7.4 S	X16.8 JS	X41.1 JS	X16.3 JS	X7.6 JS	X15.3 JS	X7.6 JS	X7.4 S	X10 S	X11.6 JS
Cobalt	X1.1 JS	X3.4 S	X3.3 S	X5.1 JS	X1.5 JS	X2.3 JS	X1.9 JS	X2.8 JS	X2 JS	X2.9 S	X2.1 JS	X2.3 JS	X2.4 JS
Copper	X7.5 JS	X4.6 JS	X3.3 JS	2.9 JS	2 JS	2.7 JS	X3.5 JS	X12.9 JS	X3.7 JS	X5.2 JS	2.9 S	X7 S	X39.6 JS
Cyanide	0.14 U	0.13 U	0.13 U	0.14 U	0.13 U	0.16 U	0.14 U	0.14 U	0.13 U	0.14 U	0.13 U	0.13 U	0.14 U
Iron	X11100 S	X4530 S	X4050 S	X5750 S	X20300 S	X64000 S	X15400 S	X3640 S	X17000 S	X3680 S	X6200 S	X7850 S	X7120 S
Lead	X20.2 JS	X16.4 JS	6.9 JS	10 JS	1.1 JS	26 U	6.6 JS	X84.3 JS	2.2 JS	X81.9 JS	13.6 S	X37.3 S	X204 JS
Magnesium	957 S	661 S	429 S	610 JS	779 S	X1390 S	916 S	454 S	715 S	429 S	481 S	563 S	427 S
Manganese	16.1 JS	49.4 JS	X126 JS	X258 S	9.1 JS	15.6 JS	20.1 JS	X169 JS	15 JS	X114 JS	30.4 S	X69.2 S	X184 JS
Mercury	X0.044 KS	0.032 KS	0.021 KS	0.025 JS	X0.05 KS	X0.18 KS	X0.036 KS	X0.043 KS	X0.047 KS	0.031 KS	0.025 JS	X0.08 JS	X0.043 KS
Nickel	2.5 S	4.2 S	3.7 S	6 JS	2.7 S	4.1 S	3.7 S	4.9 S	2.5 S	3.9 S	3.5 S	3.9 S	4.6 S
Potassium	X982 BS	636 BS	342 BS	X752 BS	702 BS	X1320 BS	685 BS	359 BS	589 BS	339 BS	394 BS	486 BS	369 BS
Selenium	X1 LS	0.41 JS	0.47 JS	22 U	X1.6 JS	X3.5 JS	X1.2 JS	0.37 JS	X1.2 JS	0.26 JS	5.6 U	5.5 U	0.58 JS
Silver	0.62 U	0.54 U	0.57 U	2.2 U	0.53 U	0.64 U	0.59 U	0.57 U	0.56 U	0.58 U	0.56 U	0.55 U	0.56 U
Sodium	276 BS	307 BS	184 BS	266 BS	268 BS	459 BS	227 BS	174 BS	257 BS	173 BS	72.6 BS	81 BS	200 BS
Thallium	X0.38 JS	0.54 U	0.57 U	2.2 U	X1.3 S	X2.4 S	X0.87 S	0.57 U	X1 S	0.58 U	2.2 U	2.2 U	0.56 U
Vanadium	34.3 JS	12.7 JS	8.1 JS	10.5 JS	30.7 JS	X53.8 JS	28.5 JS	7.2 JS	26.1 JS	7.5 JS	12.7 S	15.7 S	10.2 JS
Zinc	22.9 JS	X41.7 JS	14.2 JS	15.3 S	9.2 JS	14.5 JS	11.3 JS	X51.2 JS	12.5 JS	23.2 JS	13.2 S	X26.6 S	X79.4 JS
Wet Chemistry													
Total organic halogens (TOX) (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons ()													
Total Petroleum Hydrocarbons, C10-C28 (UG/KG)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons, C6-C10 (UG/KG)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

Shading indicates detections

NA - Not analyzed

BS

JS

KS

LS

S - Reported value determined by the Method of Standard Additions (MSA)

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PG/G - Picograms per gram

UG/KG - Micrograms per kilogram

Station ID	CAS07-SO010	CAS07-SO011	CAS07-SO012	CAS07-SO013		CAS07-SO014			CAS07-SO015		CAS07-SO016	CAS07-SO017	CAS07-SO018
Sample ID	NWSY-90-7-SC-FLR-145	NWSY-90-7-SC-FLR-146	NWSY-90-7-SC-FLR-147	NWSY-90-7-SC-PER-148	NWSY-90-7-SC-PER-149	NWSY-90-7-SC-PER-150	NWSY-90-7-SC-PER-151	NWSY-90-7-SC-PER-152	NWSY-90-7-SC-PER-153	NWSY-90-7-SC-PER-154	NWSY-90-7-SC-PER-159	NWSY-90-7-SC-FLR-160	NWSY-90-7-SC-PER-162
Sample Date	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/29/08	02/29/08	02/29/08
Chemical Name													
Volatile Organic Compounds (UG/KG)													
1,1,1-Trichloroethane	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
1,1,2,2-Tetrachloroethane	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 UJ	6.9 U	6.7 U	7.7 U	6.3 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
1,1,2-Trichloroethane	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
1,1-Dichloroethane	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
1,1-Dichloroethene	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
1,2,3-Trichlorobenzene	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 UJ	6.9 UL	6.7 U	7.7 U	6.3 U
1,2,4-Trichlorobenzene	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 UJ	6.9 UL	6.7 U	7.7 U	6.3 U
1,2-Dibromo-3-chloropropane	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 UJ	6.9 UL	6.7 U	7.7 U	6.3 U
1,2-Dibromoethane	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
1,2-Dichlorobenzene	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 UJ	6.9 U	6.7 U	7.7 U	6.3 U
1,2-Dichloroethane	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
1,2-Dichloropropane	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
1,3-Dichlorobenzene	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 UJ	6.9 U	6.7 U	7.7 U	6.3 U
1,4-Dichlorobenzene	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 UJ	6.9 U	6.7 U	7.7 U	6.3 U
2-Butanone	29 U	42 U	40 U	64 UJ	33 U	65 U	32 U	35 U	34 U	35 UL	33 U	38 U	32 U
2-Hexanone	29 U	42 U	40 U	64 UJ	33 U	65 U	32 U	35 U	34 U	35 UL	33 U	38 U	32 U
4-Methyl-2-pentanone	29 U	42 U	40 U	64 UJ	33 U	65 U	32 U	35 U	34 U	35 UL	33 U	38 U	32 U
Acetone	57 U	84 U	80 U	130 UJ	65 U	130 U	64 U	69 U	68 U	69 U	67 U	77 U	63 U
Benzene	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Bromochloromethane	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Bromodichloromethane	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Bromoform	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Bromomethane	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Carbon disulfide	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Carbon tetrachloride	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Chlorobenzene	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Chloroethane	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Chloroform	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Chloromethane	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
cis-1,2-Dichloroethene	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
cis-1,3-Dichloropropene	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 UL	6.7 U	7.7 U	6.3 U
Cyclohexane	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Dibromochloromethane	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Dichlorodifluoromethane (Freon-12)	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Ethylbenzene	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Isopropylbenzene	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
m- and p-Xylene	11 U	17 U	16 U	25 UJ	13 U	26 U	13 U	14 U	14 U	14 U	13 U	15 U	13 U
Methyl acetate	29 U	42 U	40 U	64 UJ	33 U	65 U	32 U	35 U	34 U	35 U	33 U	38 U	32 U
Methylcyclohexane	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Methylene chloride	X57.3 BS	X77.9 BS	X87.9 BS	X123 BS	X13.1 BS	X14.8 BS	X11 BS	X9.8 BS	X13.5 BS	X14.8 BS	X33.1 BS	X36.9 BS	X25 BS
Methyl-tert-butyl ether (MTBE)	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
o-Xylene	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Styrene	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Tetrachloroethene	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Toluene	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
trans-1,2-Dichloroethene	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
trans-1,3-Dichloropropene	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Trichloroethene	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Trichlorofluoromethane (Freon-11)	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Vinyl chloride	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Xylene, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds (UG/KG)													
1,1-Biphenyl	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
1,2,4,5-Tetrachlorobenzene	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
1,4-Dioxane	290 UJ	420 UJ	400 UJ	640 UJ	330 UJ	650 UJ	320 UJ	350 UJ	340 U	350 U	330 U	380 UJ	320 UJ
1-Methylnaphthalene	310 U	300 U	290 U	380 U	330 U	380 U	320 U	310 U	330 U	290 U	280 U	310 U	300 U
2,2'-Oxybis(1-chloropropane)	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
2,3,4,6-Tetrachlorophenol	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
2,4,5-Trichlorophenol	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
2,4,6-Trichlorophenol	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
2,4-Dichlorophenol	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
2,4-Dimethylphenol	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
2,4-Dinitrophenol	950 U	940 U	920 U	1,200 U	1,000 U	1,200 U	990 U	980 U	1,000 U	920 U	890 U	950 U	950 U
2,4-Dinitrotoluene	220 U	210 U	220 U	220 U	200 U	220 U	200 U	240 U	250 U	250 U	240 U	240 U	240 U
2,6-Dinitrotoluene	190 U	190 U	180 U	220 U	200 U	220 U	200 U	200 U	210 U	180 U	240 U	240 U	240 U
2-Chloronaphthalene	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
2-Chlorophenol	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
2-Methylnaphthalene	310 U	300 U	290 U	380 U	330 U	380 U	320 U	310 U	330 U	290 U	280 U	310 U	300 U
2-Methylphenol	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
2-Nitroaniline	380 U	380 U	370 U	480 U	410 U	480 U	400 U	390 U	410 U	370 U	360 U	380 U	380 U
2-Nitrophenol	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
3- and 4-Methylphenol	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
3,3'-Dichlorobenzidine	380 U	380 UL	370 U	480 U	410 U	480 U	400 U	390 U	410 UL	370 U	360 U	380 U	380 U
3-Nitroaniline	380 U	380 U	370 U	480 U	410 U	480 U	400 U	390 U	410 U	370 U	360 U	380 U	380 U
4,6-Dinitro-2-methylphenol	380 U	380 U	370 U	480 U	410 U	480 U	400 U	390 U	410 U	370 U	360 U	380 U	380 U
4-Bromophenyl-phenylether	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
4-Chloro-3-methylphenol	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
4-Chloroaniline	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
4-Chlorophenyl-phenylether	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
4-Nitroaniline	380 U	380 U	370 U	480 U	410 U	480 U	400 U	390 U	410 U	370 U	360 U	380 U	380 U

Station ID	CAS07-SO010	CAS07-SO011	CAS07-SO012	CAS07-SO013		CAS07-SO014			CAS07-SO015		CAS07-SO016	CAS07-SO017	CAS07-SO018
Sample ID	NWSY-90-7-SC-FLR-145	NWSY-90-7-SC-FLR-146	NWSY-90-7-SC-FLR-147	NWSY-90-7-SC-PER-148	NWSY-90-7-SC-PER-149	NWSY-90-7-SC-PER-150	NWSY-90-7-SC-PER-151	NWSY-90-7-SC-PER-152	NWSY-90-7-SC-PER-153	NWSY-90-7-SC-PER-154	NWSY-90-7-SC-PER-159	NWSY-90-7-SC-FLR-160	NWSY-90-7-SC-PER-162
Sample Date	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/29/08	02/29/08	02/29/08
Chemical Name													
4-Nitrophenol	950 U	940 U	920 U	1,200 U	1,000 U	1,200 U	990 U	980 U	1,000 U	920 U	890 U	950 U	950 U
Acenaphthene	310 U	300 U	290 U	380 U	330 U	380 U	320 U	310 U	330 U	290 U	280 U	310 U	300 U
Acenaphthylene	310 U	300 U	290 U	380 U	330 U	380 U	320 U	310 U	330 U	290 U	280 U	310 U	300 U
Acetophenone	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
Anthracene	310 U	300 U	290 U	380 U	330 U	380 U	320 U	310 U	330 U	290 U	280 U	310 U	300 U
Atrazine	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 UL	180 U	180 U	190 U	190 U
Benzaldehyde	950 U	940 U	920 U	1,200 U	1,000 U	1,200 U	990 U	980 U	1,000 U	920 U	890 U	950 U	950 U
Benzo(a)anthracene	61 U	60 U	59 U	76 U	66 U	76 U	63 U	63 U	66 U	59 U	57 U	61 U	61 U
Benzo(a)pyrene	61 U	60 U	59 U	76 U	66 U	76 U	63 U	63 U	66 U	59 U	57 U	61 U	61 U
Benzo(b)fluoranthene	61 U	60 U	59 U	76 U	66 U	76 U	63 U	63 U	66 U	59 U	57 U	61 U	61 U
Benzo(g,h,i)perylene	61 U	60 U	59 U	76 U	66 U	76 U	63 U	63 U	66 U	59 U	57 U	61 U	61 U
Benzo(k)fluoranthene	61 U	60 U	59 U	76 U	66 U	76 U	63 U	63 U	66 U	59 U	57 U	61 U	61 U
bis(2-Chloroethoxy)methane	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
bis(2-Chloroethyl)ether	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
bis(2-Ethylhexyl)phthalate	380 U	256 JS	370 U	480 U	410 U	480 U	400 U	390 U	410 U	370 U	360 U	380 U	380 U
Butylbenzylphthalate	380 U	380 U	370 U	480 U	410 U	480 U	400 U	390 U	410 U	370 U	360 U	380 U	380 U
Caprolactam	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
Carbazole	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
Chrysene	61 U	60 U	59 U	76 U	66 U	76 U	63 U	63 U	66 U	59 U	57 U	61 U	61 U
Dibenz(a,h)anthracene	61 U	60 U	59 U	76 U	66 U	76 U	63 U	63 U	66 U	59 U	57 U	61 U	61 U
Dibenzofuran	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
Diethylphthalate	380 U	380 U	370 U	480 U	410 U	480 U	400 U	390 U	410 U	370 U	360 U	380 U	380 U
Dimethyl phthalate	380 U	380 U	370 U	480 U	410 U	480 U	400 U	390 U	410 U	370 U	360 U	380 U	380 U
Di-n-butylphthalate	380 U	380 U	370 U	480 U	410 U	480 U	400 U	390 U	410 U	370 U	360 U	380 U	380 U
Di-n-octylphthalate	380 U	380 U	370 U	480 U	410 U	480 U	400 U	390 U	410 U	370 U	360 U	380 U	380 U
Fluoranthene	310 U	300 U	290 U	380 U	330 U	380 U	320 U	310 U	330 U	290 U	280 U	310 U	300 U
Fluorene	310 U	300 U	290 U	380 U	330 U	380 U	320 U	310 U	330 U	290 U	280 U	310 U	300 U
Hexachlorobenzene	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
Hexachlorobutadiene	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
Hexachlorocyclopentadiene	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 UL	180 U	180 U	190 U	190 U
Hexachloroethane	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 UL	180 U	180 UL	190 UL	190 UL
Indeno(1,2,3-cd)pyrene	61 U	60 U	59 U	76 U	66 U	76 U	63 U	63 U	66 U	59 U	57 U	61 U	61 U
Isophorone	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
Naphthalene	310 U	300 U	290 U	380 U	330 U	380 U	320 U	310 U	330 U	290 U	280 U	310 U	300 U
n-Nitroso-di-n-propylamine	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
n-Nitrosodiphenylamine	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
Nitrobenzene	190 U	190 U	180 U	220 U	200 U	220 U	200 U	200 U	210 U	180 U	240 U	240 U	240 U
Pentachlorophenol	950 U	940 U	920 U	1,200 U	1,000 U	1,200 U	990 U	980 U	1,000 U	920 U	890 U	950 U	950 U
Phenanthrene	310 U	300 U	290 U	380 U	330 U	380 U	320 U	310 U	330 U	290 U	280 U	310 U	300 U
Phenol	190 U	190 U	180 U	240 U	210 U	240 U	200 U	200 U	210 U	180 U	180 U	190 U	190 U
Pyrene	310 U	300 U	290 U	380 U	330 U	380 U	320 U	310 U	330 U	290 U	280 U	310 U	300 U
Pesticide/Polychlorinated Biphenyls (UG/KG)													
4,4'-DDD	3.8 U	3.8 U	3.6 U	4.7 U	4.1 U	4.6 U	4 U	3.9 U	4.1 U	3.6 U	3.6 U	3.8 U	3.8 U
4,4'-DDE	3.8 U	3.8 U	3.6 U	4.7 U	4.1 U	4.6 U	4 U	3.9 U	4.1 U	3.6 U	3.6 U	3.8 U	3.8 U
4,4'-DDT	3.8 U	3.8 U	3.6 U	4.7 U	4.1 U	4.6 U	4 U	3.9 U	4.1 U	3.6 U	3.6 U	3.8 U	3.8 U
Aldrin	1.9 U	1.9 U	1.8 U	2.3 U	2.1 U	2.3 U	2 U	1.9 U	2.1 U	1.8 U	1.8 U	1.9 U	1.9 U
alpha-BHC	1.9 U	1.9 U	1.8 U	2.3 U	2.1 U	2.3 U	2 U	1.9 U	2.1 U	1.8 U	1.8 U	1.9 U	1.9 U
alpha-Chlordane	1.9 U	1.9 U	1.8 U	2.3 U	2.1 U	2.3 U	2 U	1.9 U	2.1 U	1.8 U	1.8 U	1.9 U	1.9 U
Aroclor-1016	19 U	19 U	18 U	23 U	21 U	23 U	20 U	19 U	21 U	18 U	18 U	19 U	19 U
Aroclor-1221	19 U	19 U	18 U	23 U	21 U	23 U	20 U	19 U	21 U	18 U	18 U	19 U	19 U
Aroclor-1232	19 U	19 U	18 U	23 U	21 U	23 U	20 U	19 U	21 U	18 U	18 U	19 U	19 U
Aroclor-1242	19 U	19 U	18 U	23 U	21 U	23 U	20 U	19 U	21 U	18 U	18 U	19 U	19 U
Aroclor-1248	19 U	19 U	18 U	23 U	21 U	23 U	20 U	19 U	21 U	18 U	18 U	19 U	19 U
Aroclor-1254	19 U	19 U	18 U	23 U	21 U	23 U	20 U	19 U	21 U	18 U	18 U	19 U	19 U
Aroclor-1260	19 U	19 U	18 U	23 U	21 U	23 U	20 U	19 U	21 U	18 U	18 U	19 U	19 U
Aroclor-1262	19 U	19 U	18 U	23 U	21 U	23 U	20 U	19 U	21 U	18 U	18 U	19 U	19 U
Aroclor-1268	19 U	19 U	18 U	23 U	21 U	23 U	20 U	19 U	21 U	18 U	18 U	19 U	19 U
beta-BHC	1.9 U	1.9 U	1.8 U	2.3 U	2.1 U	2.3 U	2 U	1.9 U	2.1 U	1.8 U	1.8 U	1.9 U	1.9 U
delta-BHC	1.9 U	1.9 U	1.8 U	2.3 U	2.1 U	2.3 U	2 U	1.9 U	2.1 U	1.8 U	1.8 U	1.9 U	1.9 U
Dieldrin	1.9 U	1.9 U	1.8 U	2.3 U	2.1 U	2.3 U	2 U	1.9 U	2.1 U	1.8 U	1.8 U	1.9 U	1.9 U
Endosulfan I	1.9 U	1.9 U	1.8 U	2.3 U	2.1 U	2.3 U	2 U	1.9 U	2.1 U	1.8 U	1.8 U	1.9 U	1.9 U
Endosulfan II	3.8 U	3.8 U	3.6 U	4.7 U	4.1 U	4.6 U	4 U	3.9 U	4.1 U	3.6 U	3.6 U	3.8 U	3.8 U
Endosulfan sulfate	3.8 U	3.8 U	3.6 U	4.7 U	4.1 U	4.6 U	4 U	3.9 U	4.1 U	3.6 U	3.6 U	3.8 U	3.8 U
Endrin	3.8 U	3.8 U	3.6 U	4.7 U	4.1 U	4.6 U	4 U	3.9 U	4.1 U	3.6 U	3.6 U	3.8 U	3.8 U
Endrin aldehyde	3.8 U	3.8 U	3.6 U	4.7 U	4.1 U	4.6 U	4 U	3.9 U	4.1 U	3.6 U	3.6 U	3.8 U	3.8 U
Endrin ketone	3.8 U	3.8 U	3.6 U	4.7 U	4.1 U	4.6 U	4 U	3.9 U	4.1 U	3.6 U	3.6 U	3.8 U	3.8 U
gamma-BHC (Lindane)	1.9 U	1.9 U	1.8 U	2.3 U	2.1 U	2.3 U	2 U	1.9 U	2.1 U	1.8 U	1.8 U	1.9 U	1.9 U
gamma-Chlordane	1.9 U	1.9 U	1.8 U	2.3 U	2.1 U	2.3 U	2 U	1.9 U	2.1 U	1.8 U	1.8 U	1.9 U	1.9 U
Heptachlor	1.9 U	1.9 U	1.8 U	2.3 U	2.1 U	2.3 U	2 U	1.9 U	2.1 U	1.8 U	1.8 U	1.9 U	1.9 U
Heptachlor epoxide	1.9 U	1.9 U	1.8 U	2.3 U	2.1 U	2.3 U	2 U	1.9 U	2.1 U	1.8 U	1.8 U	1.9 U	1.9 U
Methoxychlor	3.8 U	3.8 U	3.6 U	4.7 U	4.1 U	4.6 U	4 U	3.9 UL	4.1 U	3.6 U	3.6 U	3.8 U	3.8 U
Polychlorinated biphenyls (PCBs)	38 U	38 U	36 U	47 U	41 U	46 U	40 U	39 U	41 U	36 U	36 U	38 U	38 U
Toxaphene	94 U	95 U	91 U	120 U	100 U	120 U	99 U	96 U	100 U	91 U	89 U	94 U	95 U
Dioxin/Furans (PG/G)													
2,3,7,8-TCDD (dioxin)	0.175 U	0.104 JS	0.102 JS	0.289 U	0.104 U	0.217 JS	0.088 U	0.15 U	0.272 U	0.457 U	0.0712 U	0.361 U	0.187 U
Explosives (UG/KG)													
1,3,5-Trinitrobenzene	220 U	210 U	220 U	220 U	200 U	220 U	200 U	240 U	250 U	250 U	240 U	240 U	240 U
1,3-Dinitrobenzene	220 U	210 U	220 U	220 U	200 U	220 U	200 U	240 U	250 U	250 U	240 U	240 U	240 U
2,4,6-Trinitrotoluene	220 U	210 U	220 U	220 U	200 U	220 U	200 U	240 U	250 U	250 U	240 U	240 U	240 U
2-Amino-4,6-dinitrotoluene	220 U	210 U	220 U	220 U	200 U	220 U	200 U	240 U	250 U	250 U	240 U	240 U	240 U
2-Nitrotoluene	220 U	210 U	220 U	220 U	200 U	220 U	200 U	240 U	250 U	250 U	240 U	240 U	240 U

Station ID	CAS07-SO010	CAS07-SO011	CAS07-SO012	CAS07-SO013		CAS07-SO014			CAS07-SO015		CAS07-SO016	CAS07-SO017	CAS07-SO018
Sample ID	NWSY-90-7-SC-FLR-145	NWSY-90-7-SC-FLR-146	NWSY-90-7-SC-FLR-147	NWSY-90-7-SC-PER-148	NWSY-90-7-SC-PER-149	NWSY-90-7-SC-PER-150	NWSY-90-7-SC-PER-151	NWSY-90-7-SC-PER-152	NWSY-90-7-SC-PER-153	NWSY-90-7-SC-PER-154	NWSY-90-7-SC-PER-159	NWSY-90-7-SC-FLR-160	NWSY-90-7-SC-PER-162
Sample Date	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/29/08	02/29/08	02/29/08
Chemical Name													
3-Nitrotoluene	220 U	210 U	220 U	220 U	200 U	220 U	200 U	240 U	250 U	250 U	240 U	240 U	240 U
4-Amino-2,6-dinitrotoluene	220 U	210 U	220 U	220 U	200 U	220 U	200 U	240 U	250 U	250 U	240 U	240 U	240 U
4-Nitrotoluene	220 U	210 U	220 U	220 U	200 U	220 U	200 U	240 U	250 U	250 U	240 U	240 U	240 U
HMX	220 U	210 U	220 U	220 U	200 U	220 U	200 U	240 U	250 U	250 U	240 U	240 U	240 U
RDX	220 U	210 U	220 U	220 U	200 U	220 U	200 U	240 U	250 U	250 U	240 U	240 U	240 U
Tetryl	430 U	420 U	430 U	450 U	400 U	430 U	390 U	490 U	500 U	500 U	490 U	480 U	480 U
Total Metals (MG/KG)													
Aluminum	6,370 S	7,140 S	8,830 JS	6,990 JS	7,630 JS	7,760 JS	7,190 JS	7,300 JS	7,150 JS	4,010 JS	6,220 JS	12,100 JS	8,460 JS
Antimony	3.4 UL	3.3 UL	3.2 UL	4.1 UL	3.5 UL	4.2 UL	3.4 UL	3.5 UL	3.6 UL	3.2 UL	3.2 UL	3.4 UL	3.3 UL
Arsenic	X1.1 S	X2.1 S	X1.8 LS	X24.3 S	X1.9 S	X2 S	X1.5 S	X1.4 S	X1.6 S	X3.5 S	X1.4 S	X1.7 S	X1.4 S
Barium	44.5 JS	57.5 JS	48.3 JS	X250 JS	56.8 JS	42 JS	54 JS	54.3 JS	X54.6 JS	17.8 JS	42.6 JS	48.3 JS	51.4 JS
Beryllium	0.52 S	X0.75 S	X0.57 S	X0.94 S	X0.7 S	0.5 S	X0.69 S	X0.61 S	X0.74 S	X1.6 S	0.39 S	0.43 S	0.48 S
Cadmium	0.23 U	0.22 U	0.21 UL	0.12 JS	0.24 U	0.28 U	0.23 U	0.23 U	0.24 U	1.1 U	0.21 U	1.2 U	0.22 U
Calcium	483 S	576 S	1,060 JS	X24800 JS	1,250 JS	1,640 JS	988 JS	907 JS	1,180 JS	485 JS	594 JS	1,210 JS	762 JS
Chromium	X5.3 JS	X6.8 JS	X8.7 JS	X18 JS	X6.3 JS	X7.7 JS	X5 JS	X5.6 JS	X5.9 JS	X16.2 JS	X7 JS	X16.5 JS	X8.3 JS
Cobalt	X2.3 JS	X2.2 JS	X2.2 LS	X2 JS	X2.1 JS	X1.9 JS	X2.1 JS	X1.8 JS	X2.1 JS	X4 S	X1.6 JS	X1.6 JS	X1.9 JS
Copper	2.4 JS	X9.8 JS	2.6 S	X42.7 S	X3.6 S	X4.9 S	3 S	2.7 S	3.8 S	X4.8 S	X3.4 JS	X6.1 JS	2.5 JS
Cyanide	0.14 U	0.13 U	0.13 U	0.33 S	0.15 U	0.24 S	0.13 U	0.14 U	0.15 U	0.13 U	0.12 U	0.14 U	0.14 U
Iron	X4450 S	X4690 S	X8060 JS	X4240 JS	X4730 JS	X6760 JS	X4010 JS	X4410 JS	X5150 JS	X19800 JS	X6480 JS	X20000 JS	X8230 JS
Lead	8 JS	X41.5 JS	6.4 JS	X42.1 JS	X11.5 JS	15.6 JS	X10.3 JS	8.1 JS	11.8 JS	1.8 JS	X10.8 JS	X23.2 JS	X9.2 JS
Magnesium	395 S	412 S	493 JS	X1320 JS	505 JS	605 JS	366 JS	399 JS	442 JS	170 JS	450 JS	723 JS	560 JS
Manganese	50.3 JS	X122 JS	X92.9 JS	X466 JS	X89.4 JS	X102 JS	X204 JS	X110 JS	X125 JS	X100 JS	31.6 JS	15.3 JS	37.4 JS
Mercury	0.019 KS	X0.037 KS	0.027 KS	X0.048 KS	0.026 KS	X0.058 KS	0.03 KS	0.019 KS	X0.1 KS	0.092 U	0.015 KS	0.033 KS	0.085 U
Nickel	3.2 S	4.1 S	3.2 JS	6.6 JS	3.7 JS	3.9 JS	3.4 JS	3.2 JS	3.4 JS	2.8 JS	2.2 JS	2.9 JS	3 JS
Potassium	356 BS	337 BS	430 BS	610 BS	401 BS	575 BS	337 BS	362 BS	416 BS	335 BS	432 BS	700 BS	475 BS
Selenium	0.41 JS	0.63 JS	X0.77 LS	0.33 JS	0.52 JS	X0.82 JS	0.63 JS	0.48 JS	0.47 JS	X1.7 JS	0.51 JS	X1.5 JS	X0.78 JS
Silver	0.57 U	0.56 U	0.53 UL	0.68 U	0.59 U	0.71 U	0.57 U	0.58 U	0.6 U	0.54 U	0.53 U	0.57 U	0.55 U
Sodium	173 BS	194 BS	209 BS	345 BS	166 BS	246 BS	176 BS	185 BS	194 BS	227 BS	185 BS	247 BS	220 BS
Thallium	0.57 U	0.56 U	0.53 UL	2.7 U	0.59 U	0.71 U	0.57 U	0.58 U	0.6 U	X1.4 S	X0.37 JS	X1.2 S	0.55 U
Vanadium	9.5 JS	10 JS	15.5 JS	16.3 JS	11.2 JS	18.4 JS	9.3 JS	10.2 JS	10.6 JS	18.6 JS	12.4 JS	30.2 JS	15.9 JS
Zinc	10.2 JS	X29 JS	9.8 LS	X119 S	20.3 S	23.3 S	13.7 S	11.6 S	18.5 S	16.4 S	8.3 JS	X34.3 JS	9.2 JS
Wet Chemistry													
Total organic halogens (TOX) (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons ()													
Total Petroleum Hydrocarbons, C10-C28 (UG/KG)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons, C6-C10 (UG/KG)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

Shading indicates detections

NA - Not analyzed

BS

JS

KS

LS

S - Reported value determined by the Method of Standard Additions (MSA)

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PG/G - Picograms per gram

UG/KG - Micrograms per kilogram

Station ID	CAS07-SO019	CAS07-SO020	CAS07-SO021	CAS07-SO022	CAS07-SO023			CAS07-SO024			CAS07-SO025	CAS07-SO026
Sample ID	NWSY-90-7-SC-PER-164	NWSY-90-7-SC-FLR-165	NWSY-90-7-SC-FLR-166	NWSY-90-7-SC-FLR-167	NWSY-90-7-SC-PER-169	NWSY-90-7-SC-PER-170	NWSY-90-7-SC-PER-187	NWSY-90-7-SC-PER-172	NWSY-90-7-SC-PER-188	NWSY-90-7-SC-PER-193	NWSY-90-7-SC-FLR-173	NWSY-90-7-SC-FLR-174
Sample Date	02/29/08	02/29/08	02/29/08	02/29/08	02/29/08	02/29/08	04/09/08	02/29/08	04/09/08	04/09/08	02/29/08	02/29/08
Chemical Name												
Volatile Organic Compounds (UG/KG)												
1,1,1-Trichloroethane	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
1,1,2,2-Tetrachloroethane	7.5 U	6.5 U	7.6 UJ	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
1,1,2-Trichloroethane	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
1,1-Dichloroethane	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
1,1-Dichloroethene	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
1,2,3-Trichlorobenzene	7.5 U	6.5 U	7.6 UJ	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
1,2,4-Trichlorobenzene	7.5 U	6.5 U	7.6 UJ	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
1,2-Dibromo-3-chloropropane	7.5 U	6.5 U	7.6 UJ	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
1,2-Dibromoethane	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
1,2-Dichlorobenzene	7.5 U	6.5 U	7.6 UJ	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
1,2-Dichloroethane	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
1,2-Dichloropropane	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
1,3-Dichlorobenzene	7.5 U	6.5 U	7.6 UJ	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
1,4-Dichlorobenzene	7.5 U	6.5 U	7.6 UJ	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
2-Butanone	38 U	33 U	38 U	31 U	31 U	34 U	34 U	32 U	41 U	44 U	43 U	32 U
2-Hexanone	38 U	33 U	38 U	31 U	31 U	34 U	34 U	32 U	41 U	44 U	43 U	32 U
4-Methyl-2-pentanone	38 U	33 U	38 U	31 U	31 U	34 U	34 U	32 U	41 U	44 U	43 U	32 U
Acetone	75 U	65 U	76 U	61 U	63 U	68 U	69 U	65 U	83 U	88 UJ	85 U	65 U
Benzene	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Bromochloromethane	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Bromodichloromethane	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Bromoform	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Bromomethane	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Carbon disulfide	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Carbon tetrachloride	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Chlorobenzene	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Chloroethane	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Chloroform	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Chloromethane	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
cis-1,2-Dichloroethene	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
cis-1,3-Dichloropropene	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Cyclohexane	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Dibromochloromethane	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Dichlorodifluoromethane (Freon-12)	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Ethylbenzene	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Isopropylbenzene	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
m- and p-Xylene	15 U	13 U	15 U	12 U	13 U	14 U	14 U	13 U	17 U	18 U	17 U	13 U
Methyl acetate	38 U	33 U	38 U	31 U	31 U	34 U	34 U	32 U	41 U	44 U	43 U	32 U
Methylcyclohexane	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Methylene chloride	X15.2 BS	X23 BS	X11 BS	X25.7 BS	X21.8 BS	X12.1 BS	X29.7 BS	X13.3 BS	X25.5 BS	X24.6 BS	X15.4 BS	X17.9 BS
Methyl-tert-butyl ether (MTBE)	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
o-Xylene	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Styrene	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Tetrachloroethene	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Toluene	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
trans-1,2-Dichloroethene	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
trans-1,3-Dichloropropene	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Trichloroethene	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Trichlorofluoromethane (Freon-11)	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Vinyl chloride	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Xylene, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds (UG/KG)												
1,1-Biphenyl	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
1,2,4,5-Tetrachlorobenzene	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
1,4-Dioxane	380 U	330 UJ	380 UJ	310 UJ	310 UJ	340 U	340 U	320 UJ	410 U	440 U	430 U	320 U
1-Methylnaphthalene	310 U	310 U	320 U	290 U	300 U	310 U	320 U	310 U	320 U	320 U	310 U	300 U
2,2'-Oxybis(1-chloropropane)	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
2,3,4,6-Tetrachlorophenol	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
2,4,5-Trichlorophenol	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
2,4,6-Trichlorophenol	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
2,4-Dichlorophenol	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
2,4-Dimethylphenol	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
2,4-Dinitrophenol	960 U	960 U	1,000 U	920 U	950 U	970 U	1,000 U	970 U	1,000 U	990 U	980 U	930 U
2,4-Dinitrotoluene	250 U	250 U	250 U	250 U	240 U	240 U	190 U	250 U	190 U	200 U	240 U	250 U
2,6-Dinitrotoluene	250 U	250 U	250 U	250 U	240 U	240 U	190 U	250 U	190 U	200 U	240 U	250 U
2-Chloronaphthalene	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
2-Chlorophenol	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
2-Methylnaphthalene	310 U	310 U	320 U	290 U	300 U	310 U	320 U	310 U	320 U	320 U	310 U	300 U
2-Methylphenol	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
2-Nitroaniline	390 U	380 U	400 U	370 U	380 U	390 U	400 U	390 U	400 U	400 U	390 U	370 U
2-Nitrophenol	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
3- and 4-Methylphenol	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
3,3'-Dichlorobenzidine	390 U	380 U	400 U	370 U	380 U	390 U	400 U	390 U	400 U	400 U	390 U	370 U
3-Nitroaniline	390 U	380 U	400 U	370 U	380 U	390 U	400 U	390 U	400 U	400 U	390 U	370 U
4,6-Dinitro-2-methylphenol	390 U	380 U	400 U	370 U	380 U	390 U	400 U	390 U	400 U	400 U	390 U	370 U
4-Bromophenyl-phenylether	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
4-Chloro-3-methylphenol	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
4-Chloroaniline	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
4-Chlorophenyl-phenylether	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
4-Nitroaniline	390 U	380 U	400 U	370 U	380 U	390 U	400 U	390 U	400 U	400 U	390 U	370 U

Station ID	CAS07-SO019	CAS07-SO020	CAS07-SO021	CAS07-SO022	CAS07-SO023			CAS07-SO024			CAS07-SO025	CAS07-SO026
Sample ID	NWSY-90-7-SC-PER-164	NWSY-90-7-SC-FLR-165	NWSY-90-7-SC-FLR-166	NWSY-90-7-SC-FLR-167	NWSY-90-7-SC-PER-169	NWSY-90-7-SC-PER-170	NWSY-90-7-SC-PER-187	NWSY-90-7-SC-PER-172	NWSY-90-7-SC-PER-188	NWSY-90-7-SC-PER-193	NWSY-90-7-SC-FLR-173	NWSY-90-7-SC-FLR-174
Sample Date	02/29/08	02/29/08	02/29/08	02/29/08	02/29/08	02/29/08	04/09/08	02/29/08	04/09/08	04/09/08	02/29/08	02/29/08
Chemical Name												
4-Nitrophenol	960 U	960 U	1,000 U	920 U	950 U	970 U	1,000 U	970 U	1,000 U	990 U	980 U	930 U
Acenaphthene	310 U	310 U	320 U	290 U	300 U	310 U	320 U	310 U	320 U	320 U	310 U	300 U
Acenaphthylene	310 U	310 U	320 U	290 U	300 U	310 U	320 U	310 U	320 U	320 U	310 U	300 U
Acetophenone	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
Anthracene	310 U	310 U	320 U	290 U	300 U	310 U	320 U	310 U	320 U	320 U	310 U	300 U
Atrazine	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
Benzaldehyde	960 U	960 U	1,000 U	920 U	950 U	970 U	1,000 U	970 U	1,000 U	990 U	980 U	930 U
Benzo(a)anthracene	62 U	61 U	64 U	59 U	61 U	62 U	64 U	62 U	64 U	63 U	63 U	59 U
Benzo(a)pyrene	62 U	61 U	64 U	59 U	61 U	62 U	64 U	62 U	64 U	63 U	63 U	59 U
Benzo(b)fluoranthene	62 U	61 U	64 U	59 U	61 U	62 U	64 U	62 U	64 U	63 U	63 U	59 U
Benzo(g,h,i)perylene	62 U	61 U	64 U	59 U	61 U	62 U	64 U	62 U	64 U	63 U	63 U	59 U
Benzo(k)fluoranthene	62 U	61 U	64 U	59 U	61 U	62 U	64 U	62 U	64 U	63 U	63 U	59 U
bis(2-Chloroethoxy)methane	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
bis(2-Chloroethyl)ether	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
bis(2-Ethylhexyl)phthalate	390 U	380 U	400 U	370 U	380 U	390 U	400 U	390 U	400 U	400 U	390 U	370 U
Butylbenzylphthalate	390 U	380 U	400 U	370 U	380 U	390 U	400 U	390 U	400 U	400 U	390 U	370 U
Caprolactam	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
Carbazole	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
Chrysene	62 U	61 U	64 U	59 U	61 U	62 U	64 U	62 U	64 U	63 U	63 U	59 U
Dibenz(a,h)anthracene	62 U	61 U	64 U	59 U	61 U	62 U	64 U	62 U	64 U	63 U	63 U	59 U
Dibenzofuran	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
Diethylphthalate	390 U	380 U	400 U	370 U	380 U	390 U	400 U	390 U	400 U	400 U	390 U	370 U
Dimethyl phthalate	390 U	380 U	400 U	370 U	380 U	390 U	400 U	390 U	400 U	400 U	390 U	370 U
Di-n-butylphthalate	390 U	380 U	400 U	370 U	380 U	390 U	400 U	390 U	400 U	400 U	390 U	370 U
Di-n-octylphthalate	390 U	380 U	400 U	370 U	380 U	390 U	400 U	390 U	400 U	400 U	390 U	370 U
Fluoranthene	310 U	310 U	320 U	290 U	300 U	310 U	320 U	310 U	320 U	320 U	310 U	300 U
Fluorene	310 U	310 U	320 U	290 U	300 U	310 U	320 U	310 U	320 U	320 U	310 U	300 U
Hexachlorobenzene	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
Hexachlorobutadiene	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
Hexachlorocyclopentadiene	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
Hexachloroethane	190 UL	190 UL	200 UL	180 UL	190 UL	190 UL	200 U	190 UL	200 U	200 U	200 UL	190 UL
Indeno(1,2,3-cd)pyrene	62 U	61 U	64 U	59 U	61 U	62 U	64 U	62 U	64 U	63 U	63 U	59 U
Isophorone	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
Naphthalene	310 U	310 U	320 U	290 U	300 U	310 U	320 U	310 U	320 U	320 U	310 U	300 U
n-Nitroso-di-n-propylamine	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
n-Nitrosodiphenylamine	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
Nitrobenzene	250 U	250 U	250 U	250 U	240 U	240 U	190 U	250 U	190 U	200 U	240 U	250 U
Pentachlorophenol	960 U	960 U	1,000 U	920 U	950 U	970 U	1,000 U	970 U	1,000 U	990 U	980 U	930 U
Phenanthrene	310 U	310 U	320 U	290 U	300 U	310 U	320 U	310 U	320 U	320 U	310 U	300 U
Phenol	190 U	190 U	200 U	180 U	190 U	190 U	200 U	190 U	200 U	200 U	200 U	190 U
Pyrene	310 U	310 U	320 U	290 U	300 U	310 U	320 U	310 U	320 U	320 U	310 U	300 U
Pesticide/Polychlorinated Biphenyls (UG/KG)												
4,4'-DDD	3.9 U	3.8 U	4 U	3.7 U	3.8 U	3.9 U	4.1 U	3.9 U	4 U	4.1 U	4 U	3.8 U
4,4'-DDE	3.9 U	3.8 U	4 U	3.7 U	3.8 U	3.9 U	4.1 U	3.9 U	4 U	4.1 U	4 U	3.8 U
4,4'-DDT	3.9 U	3.8 U	4 U	3.7 U	3.8 U	3.9 U	4.1 U	3.9 U	4 U	4.1 U	4 U	3.8 U
Aldrin	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U	2 U	2 U	2 U	1.9 U
alpha-BHC	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U	2 U	2 U	2 U	1.9 U
alpha-Chlordane	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U	2 U	2 U	2 U	1.9 U
Aroclor-1016	19 U	19 U	20 U	19 U	19 U	19 U	20 U	20 U	20 U	20 U	20 U	19 U
Aroclor-1221	19 U	19 U	20 U	19 U	19 U	19 U	20 U	20 U	20 U	20 U	20 U	19 U
Aroclor-1232	19 U	19 U	20 U	19 U	19 U	19 U	20 U	20 U	20 U	20 U	20 U	19 U
Aroclor-1242	19 U	19 U	20 U	19 U	19 U	19 U	20 U	20 U	20 U	20 U	20 U	19 U
Aroclor-1248	19 U	19 U	20 U	19 U	19 U	19 U	20 U	20 U	20 U	20 U	20 U	19 U
Aroclor-1254	19 U	19 U	20 U	19 U	19 U	19 U	20 U	20 U	20 U	20 U	20 U	19 U
Aroclor-1260	19 U	19 U	20 U	19 U	19 U	19 U	20 U	20 U	20 U	20 U	20 U	19 U
Aroclor-1262	19 U	19 U	20 U	19 U	19 U	19 U	20 U	20 U	20 U	20 U	20 U	19 U
Aroclor-1268	19 U	19 U	20 U	19 U	19 U	19 U	20 U	20 U	20 U	20 U	20 U	19 U
beta-BHC	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U	2 U	2 U	2 U	1.9 U
delta-BHC	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U	2 U	2 U	2 U	1.9 U
Dieldrin	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U	2 U	2 U	2 U	1.9 U
Endosulfan I	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U	2 U	2 U	2 U	1.9 U
Endosulfan II	3.9 U	3.8 U	4 U	3.7 U	3.8 U	3.9 U	4.1 U	3.9 U	4 U	4.1 U	4 U	3.8 U
Endosulfan sulfate	3.9 U	3.8 U	4 U	3.7 U	3.8 U	3.9 U	4.1 U	3.9 U	4 U	4.1 U	4 U	3.8 U
Endrin	3.9 U	3.8 U	4 U	3.7 U	3.8 U	3.9 U	4.1 U	3.9 U	4 U	4.1 U	4 U	3.8 U
Endrin aldehyde	3.9 U	3.8 U	4 U	3.7 U	3.8 U	3.9 U	4.1 UJ	3.9 U	4 UJ	4.1 UJ	4 U	3.8 U
Endrin ketone	3.9 U	3.8 U	4 U	3.7 U	3.8 U	3.9 U	4.1 U	3.9 U	4 U	4.1 U	4 U	3.8 U
gamma-BHC (Lindane)	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U	2 U	2 U	2 U	1.9 U
gamma-Chlordane	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U	2 U	2 U	2 U	1.9 U
Heptachlor	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U	2 U	2 U	2 U	1.9 U
Heptachlor epoxide	1.9 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U	2 U	2 U	2 U	1.9 U
Methoxychlor	3.9 U	3.8 U	4 U	3.7 U	3.8 U	3.9 U	4.1 U	3.9 U	4 U	4.1 U	4 U	3.8 U
Polychlorinated biphenyls (PCBs)	39 U	38 U	40 U	37 U	38 U	39 U	41 U	39 U	40 U	41 U	40 U	38 U
Toxaphene	96 U	96 U	100 U	93 U	95 U	97 U	100 U	99 U	100 U	100 U	99 U	94 U
Dioxin/Furans (PG/G)												
2,3,7,8-TCDD (dioxin)	0.127 U	0.181 U	0.506 U	0.348 U	0.176 U	0.163 U	0.205 U	0.188 U	0.233 U	0.187 U	0.174 U	0.121 U
Explosives (UG/KG)												
1,3,5-Trinitrobenzene	250 U	250 U	250 U	250 U	240 U	240 U	190 U	250 U	190 U	200 U	240 U	250 U
1,3-Dinitrobenzene	250 U	250 U	250 U	250 U	240 U	240 U	190 U	250 U	190 U	200 U	240 U	250 U
2,4,6-Trinitrotoluene	250 U	250 U	250 U	250 U	240 U	240 U	190 U	250 U	190 U	200 U	240 U	250 U
2-Amino-4,6-dinitrotoluene	250 U	250 U	250 U	250 U	240 U	240 U	190 U	250 U	190 U	200 U	240 U	250 U
2-Nitrotoluene	250 U	250 U	250 U	250 U	240 U	240 U	190 U	250 U	190 U	200 U	240 U	250 U

Station ID	CAS07-SO019	CAS07-SO020	CAS07-SO021	CAS07-SO022	CAS07-SO023			CAS07-SO024			CAS07-SO025	CAS07-SO026
Sample ID	NWSY-90-7-SC-PER-164	NWSY-90-7-SC-FLR-165	NWSY-90-7-SC-FLR-166	NWSY-90-7-SC-FLR-167	NWSY-90-7-SC-PER-169	NWSY-90-7-SC-PER-170	NWSY-90-7-SC-PER-187	NWSY-90-7-SC-PER-172	NWSY-90-7-SC-PER-188	NWSY-90-7-SC-PER-193	NWSY-90-7-SC-FLR-173	NWSY-90-7-SC-FLR-174
Sample Date	02/29/08	02/29/08	02/29/08	02/29/08	02/29/08	02/29/08	04/09/08	02/29/08	04/09/08	04/09/08	02/29/08	02/29/08
Chemical Name												
3-Nitrotoluene	250 U	250 U	250 U	250 U	240 U	240 U	190 U	250 U	190 U	200 U	240 U	250 U
4-Amino-2,6-dinitrotoluene	250 U	250 U	250 U	250 U	240 U	240 U	190 U	250 U	190 U	200 U	240 U	250 U
4-Nitrotoluene	250 U	250 U	250 U	250 U	240 U	240 U	190 U	250 U	190 U	200 U	240 U	250 U
HMX	250 U	250 U	250 U	250 U	240 U	240 U	190 U	250 U	190 U	200 U	240 U	250 U
RDX	250 U	250 U	250 U	250 U	240 U	240 U	190 U	250 U	190 U	200 U	240 U	250 U
Tetryl	500 U	500 U	500 U	500 U	480 U	490 U	370 U	500 U	380 U	400 U	480 U	500 U
Total Metals (MG/KG)												
Aluminum	7,000 JS	6,850 JS	7,140 JS	8,190 JS	9,100 JS	8,610 JS	8,390 S	7,080 JS	9,730 S	11,900 S	X17300 JS	10,600 JS
Antimony	3.4 UL	3.4 UL	3.5 UL	3.3 UL	3.3 UL	3.4 UL	14 UL	3.4 UL	14 UL	14 UL	0.29 LS	3.4 UL
Arsenic	X1.4 S	X1.5 S	X1.6 S	X2.1 S	X1.4 S	X1.5 S	X1.8 JS	X1.4 S	X2.3 S	X2.9 S	X2.6 S	X1.8 S
Barium	50.4 JS	54.2 JS	64.8 JS	64.9 JS	47.2 JS	47.7 JS	X80.3 S	60.8 JS	83.4 S	X98.5 S	25.5 JS	49.9 JS
Beryllium	X0.73 S	X0.91 S	X0.93 S	X0.53 S	X0.61 S	X0.58 S	X1 JS	X0.98 S	X1.2 S	X1.3 S	X0.67 S	X0.57 S
Cadmium	0.22 U	0.23 U	0.23 U	0.22 U	0.88 U	0.92 U	0.95 U	0.23 U	0.91 U	0.96 U	2.3 U	0.23 U
Calcium	449 JS	518 JS	1,010 JS	1,020 JS	902 JS	980 JS	999 JS	685 JS	758 JS	976 JS	2,050 JS	867 JS
Chromium	X6.2 JS	X4.8 JS	X5.9 JS	X10.1 JS	X9.6 JS	X9.5 JS	X6.8 S	X5.2 JS	X6.3 S	X8.1 S	X39 JS	X11.8 JS
Cobalt	X2.3 JS	X3.1 S	X2.9 S	X2.6 JS	X2.2 JS	X2 JS	X4.1 JS	X4.1 S	X5 JS	X5.8 JS	X2 JS	X2.1 JS
Copper	1.5 JS	2.5 JS	X14.3 JS	X3.7 JS	2.1 JS	2.2 JS	X5.1 JS	X6.5 JS	X5.5 JS	X6.4 S	2.9 JS	X3.4 JS
Cyanide	0.14 U	0.14 U	0.14 U	0.13 U	0.13 U	0.14 U	0.14 U	0.14 U	0.13 U	0.14 U	0.14 U	0.13 U
Iron	X5550 JS	X3890 JS	X3900 JS	X10200 JS	X8820 JS	X8750 JS	X5070 S	X3800 JS	X4820 S	X5820 S	X57800 JS	X10700 JS
Lead	4.8 JS	7.3 JS	X58.5 JS	4 JS	6.3 JS	8 JS	X18.9 JS	X20.4 JS	X12.8 JS	X13.9 JS	5.8 U	7.5 JS
Magnesium	439 JS	406 JS	434 JS	574 JS	577 JS	562 JS	526 JS	394 JS	520 JS	679 JS	889 JS	676 JS
Manganese	X63.5 JS	X124 JS	X196 JS	33.2 JS	27.7 JS	29 JS	X241 S	X157 JS	X225 S	X270 S	17 JS	22.1 JS
Mercury	0.019 KS	0.019 KS	X0.042 KS	0.088 U	0.031 KS	X0.043 KS	0.088 U	0.025 KS	0.027 JS	0.027 JS	0.014 KS	0.026 KS
Nickel	3.2 JS	3.9 JS	4.6 JS	3.1 JS	3.7 JS	3.4 JS	5.2 JS	4 JS	5.6 JS	7 JS	3.2 JS	3.7 JS
Potassium	371 BS	359 BS	381 BS	563 BS	493 BS	489 BS	X750 BS	367 BS	722 BS	815 BS	X1030 BS	590 BS
Selenium	0.59 JS	0.36 JS	0.51 JS	X0.67 JS	X0.73 JS	0.63 JS	24 U	0.36 JS	23 U	24 U	X2.9 JS	X0.81 JS
Silver	0.56 U	0.57 U	0.58 U	0.55 U	0.55 U	0.57 U	2.4 U	0.57 U	2.3 U	2.4 U	0.58 U	0.56 U
Sodium	178 BS	170 BS	184 BS	240 BS	211 BS	210 BS	265 BS	202 BS	244 BS	273 BS	408 BS	237 BS
Thallium	0.56 U	0.57 U	0.58 U	0.55 U	X0.33 JS	X0.41 JS	2.4 U	0.57 U	2.3 U	2.4 U	X1.6 S	X0.57 S
Vanadium	11 JS	8.2 JS	9.5 JS	18.7 JS	17.4 JS	16.9 JS	9.6 JS	7.8 JS	9.2 JS	11.8 JS	X63.1 JS	21 JS
Zinc	8.2 JS	11.3 JS	X39.3 JS	9.4 JS	9.4 JS	9.9 JS	21.2 S	17.4 JS	14.9 S	19.6 S	15.3 JS	20.2 JS
Wet Chemistry												
Total organic halogens (TOX) (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons ()												
Total Petroleum Hydrocarbons, C10-C28 (UG/KG)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons, C6-C10 (UG/KG)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

Shading indicates detections

NA - Not analyzed

BS

JS

KS

LS

S - Reported value determined by the Method of Standard Additions (MSA)

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PG/G - Picograms per gram

UG/KG - Micrograms per kilogram

Station ID	CAS07-SO027		CAS07-SO028			CAS07-SO029	CAS07-SO030	CAS07-SO031	CAS07-SO032	CAS07-SO033	CAS07-SO034
Sample ID	NWSY-90-7-SC-PER-175	NWSY-90-7-SC-PER-176	NWSY-90-7-SC-PER-177	NWSY-90-7-SC-PER-178	NWSY-90-7-SC-PER-179	NWSY-90-7-SC-FLR-189	NWSY-90-7-SC-FLR-190	NWSY-90-7-SC-FLR-191	NWSY-90-7-SC-FLR-192	NWSY-90-7-BF-197	NWSY-90-7-TS-198
Sample Date	02/29/08	02/29/08	02/29/08	02/29/08	02/29/08	04/09/08	04/09/08	04/09/08	04/09/08	04/15/08	04/15/08
Chemical Name											
Volatile Organic Compounds (UG/KG)											
1,1,1-Trichloroethane	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
1,1,2,2-Tetrachloroethane	5.5 U	6 U	6.4 UJ	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 UJ	14 UJ
1,1,2-Trichloroethane	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
1,1-Dichloroethane	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
1,1-Dichloroethene	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
1,2,3-Trichlorobenzene	5.5 U	6 U	6.4 UJ	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
1,2,4-Trichlorobenzene	5.5 U	6 U	6.4 UJ	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
1,2-Dibromo-3-chloropropane	5.5 U	6 U	6.4 UJ	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
1,2-Dibromoethane	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
1,2-Dichlorobenzene	5.5 U	6 U	6.4 UJ	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
1,2-Dichloroethane	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
1,2-Dichloropropane	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
1,3-Dichlorobenzene	5.5 U	6 U	6.4 UJ	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
1,4-Dichlorobenzene	5.5 U	6 U	6.4 UJ	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
2-Butanone	28 U	30 U	32 U	34 U	30 U	35 U	32 U	38 U	39 U	57 U	72 U
2-Hexanone	28 U	30 U	32 U	34 U	30 U	35 U	32 U	38 U	39 U	57 U	72 U
4-Methyl-2-pentanone	28 U	30 U	32 U	34 U	30 U	35 U	32 U	38 U	39 U	57 U	72 U
Acetone	55 U	60 U	64 U	68 U	61 U	71 U	65 U	77 U	77 UJ	110 U	126 JS
Benzene	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
Bromochloromethane	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
Bromodichloromethane	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
Bromoform	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
Bromomethane	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 UJ	14 UJ
Carbon disulfide	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
Carbon tetrachloride	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
Chlorobenzene	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
Chloroethane	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 UJ	14 UJ
Chloroform	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
Chloromethane	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
cis-1,2-Dichloroethene	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
cis-1,3-Dichloropropene	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
Cyclohexane	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
Dibromochloromethane	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
Dichlorodifluoromethane (Freon-12)	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
Ethylbenzene	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
Isopropylbenzene	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
m- and p-Xylene	11 U	12 U	13 U	14 U	12 U	14 U	13 U	15 U	15 U	23 U	29 U
Methyl acetate	28 U	30 U	32 U	34 U	30 U	35 U	32 U	38 U	39 U	57 U	72 U
Methylcyclohexane	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 UJ	14 UJ
Methylene chloride	X11.2 BS	X16.5 BS	X13.5 BS	X16.7 BS	X15.3 BS	X21.8 BS	X13.4 BS	X14.2 BS	X12.2 BS	X47 BS	29 UJ
Methyl-tert-butyl ether (MTBE)	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
o-Xylene	5.5 U	6 U	6.4 U	7.3 JS	6.1 UJ	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
Styrene	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
Tetrachloroethene	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
Toluene	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
trans-1,2-Dichloroethene	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
trans-1,3-Dichloropropene	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
Trichloroethene	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
Trichlorofluoromethane (Freon-11)	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 UJ	14 UJ
Vinyl chloride	5.5 U	6 U	6.4 U	6.8 U	6.1 U	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
Xylene, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	34 U	43 U
Semivolatile Organic Compounds (UG/KG)											
1,1-Biphenyl	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
1,2,4,5-Tetrachlorobenzene	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
1,4-Dioxane	280 UJ	300 U	320 U	340 U	300 U	350 UJ	320 UJ	380 U	390 U	570 U	720 U
1-Methylnaphthalene	310 U	310 U	370 U	310 U	310 U	310 U	310 U	300 U	310 U	310 U	320 U
2,2'-Oxybis(1-chloropropane)	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
2,3,4,6-Tetrachlorophenol	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
2,4,5-Trichlorophenol	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
2,4,6-Trichlorophenol	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
2,4-Dichlorophenol	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
2,4-Dimethylphenol	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
2,4-Dinitrophenol	970 U	960 U	1,100 U	970 U	960 U	980 U	960 U	940 U	970 U	970 U	990 U
2,4-Dinitrotoluene	240 U	240 U	250 U	240 U	240 U	170 U	210 U	190 U	200 U	X219 S	X239 S
2,6-Dinitrotoluene	240 U	240 U	250 U	240 U	240 U	170 U	210 U	190 U	200 U	X123 JS	X136 JS
2-Chloronaphthalene	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
2-Chlorophenol	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
2-Methylnaphthalene	310 U	310 U	370 U	310 U	310 U	310 U	310 U	300 U	310 U	310 U	320 U
2-Methylphenol	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
2-Nitroaniline	390 U	380 U	460 U	390 U	390 U	390 U	380 U	380 U	390 U	390 U	400 U
2-Nitrophenol	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
3- and 4-Methylphenol	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
3,3'-Dichlorobenzidine	390 U	380 U	460 U	390 U	390 U	390 U	380 U	380 U	390 U	390 U	400 U
3-Nitroaniline	390 U	380 U	460 U	390 U	390 U	390 U	380 U	380 U	390 U	390 U	400 U
4,6-Dinitro-2-methylphenol	390 U	380 U	460 U	390 U	390 U	390 U	380 U	380 U	390 U	390 U	400 U
4-Bromophenyl-phenylether	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
4-Chloro-3-methylphenol	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
4-Chloroaniline	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
4-Chlorophenyl-phenylether	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
4-Nitroaniline	390 U	380 U	460 U	390 U	390 U	390 U	380 U	380 U	390 U	390 U	400 U

Station ID	CAS07-SO027		CAS07-SO028			CAS07-SO029	CAS07-SO030	CAS07-SO031	CAS07-SO032	CAS07-SO033	CAS07-SO034
Sample ID	NWSY-90-7-SC-PER-175	NWSY-90-7-SC-PER-176	NWSY-90-7-SC-PER-177	NWSY-90-7-SC-PER-178	NWSY-90-7-SC-PER-179	NWSY-90-7-SC-FLR-189	NWSY-90-7-SC-FLR-190	NWSY-90-7-SC-FLR-191	NWSY-90-7-SC-FLR-192	NWSY-90-7-BF-197	NWSY-90-7-TS-198
Sample Date	02/29/08	02/29/08	02/29/08	02/29/08	02/29/08	04/09/08	04/09/08	04/09/08	04/09/08	04/15/08	04/15/08
Chemical Name											
4-Nitrophenol	970 U	960 U	1,100 U	970 U	960 U	980 U	960 U	940 U	970 U	970 U	990 U
Acenaphthene	310 U	310 U	370 U	310 U	310 U	310 U	310 U	300 U	310 U	310 U	320 U
Acenaphthylene	310 U	310 U	370 U	310 U	310 U	310 U	310 U	300 U	310 U	310 U	320 U
Acetophenone	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
Anthracene	310 U	310 U	370 U	310 U	310 U	310 U	310 U	300 U	310 U	310 U	320 U
Atrazine	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
Benzaldehyde	970 U	960 U	1,100 U	970 U	960 U	980 U	960 U	940 U	970 U	970 U	990 U
Benzo(a)anthracene	62 U	61 U	73 U	62 U	62 U	63 U	62 U	60 U	62 U	63 U	63 U
Benzo(a)pyrene	62 U	61 U	73 U	62 U	62 U	63 U	62 U	60 U	62 U	63 U	63 U
Benzo(b)fluoranthene	62 U	61 U	73 U	62 U	62 U	63 U	62 U	60 U	62 U	63 U	63 U
Benzo(g,h,i)perylene	62 U	61 U	73 U	62 U	62 U	63 U	62 U	60 U	62 U	63 U	63 U
Benzo(k)fluoranthene	62 U	61 U	73 U	62 U	62 U	63 U	62 U	60 U	62 U	63 U	63 U
bis(2-Chloroethoxy)methane	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
bis(2-Chloroethyl)ether	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
bis(2-Ethylhexyl)phthalate	390 U	380 U	460 U	390 U	390 U	390 U	380 U	380 U	390 U	390 U	400 U
Butylbenzylphthalate	390 U	380 U	460 U	390 U	390 U	390 U	380 U	380 U	390 U	390 U	400 U
Caprolactam	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
Carbazole	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
Chrysene	62 U	61 U	73 U	62 U	62 U	63 U	62 U	60 U	62 U	63 U	63 U
Dibenz(a,h)anthracene	62 U	61 U	73 U	62 U	62 U	63 U	62 U	60 U	62 U	63 U	63 U
Dibenzofuran	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
Diethylphthalate	390 U	380 U	460 U	390 U	390 U	390 U	380 U	380 U	390 U	390 U	400 U
Dimethyl phthalate	390 U	380 U	460 U	390 U	390 U	390 U	380 U	380 U	390 U	390 U	400 U
Di-n-butylphthalate	390 U	380 U	460 U	390 U	390 U	390 U	380 U	380 U	390 U	390 U	400 U
Di-n-octylphthalate	390 U	380 U	460 U	390 U	390 U	390 U	380 U	380 U	390 U	390 U	400 U
Fluoranthene	310 U	310 U	370 U	310 U	310 U	310 U	310 U	300 U	310 U	310 U	320 U
Fluorene	310 U	310 U	370 U	310 U	310 U	310 U	310 U	300 U	310 U	310 U	320 U
Hexachlorobenzene	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
Hexachlorobutadiene	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
Hexachlorocyclopentadiene	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
Hexachloroethane	190 UL	190 UL	230 UL	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
Indeno(1,2,3-cd)pyrene	62 U	61 U	73 U	62 U	62 U	63 U	62 U	60 U	62 U	63 U	63 U
Isophorone	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
Naphthalene	310 U	310 U	370 U	310 U	310 U	310 U	310 U	300 U	310 U	310 U	320 U
n-Nitroso-di-n-propylamine	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
n-Nitrosodiphenylamine	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
Nitrobenzene	240 U	240 U	250 U	240 U	240 U	170 U	210 U	190 U	200 U	190 U	200 U
Pentachlorophenol	970 U	960 U	1,100 U	970 U	960 U	980 U	960 U	940 U	970 U	970 U	990 U
Phenanthrene	310 U	310 U	370 U	310 U	310 U	310 U	310 U	300 U	310 U	310 U	320 U
Phenol	190 U	190 U	230 U	190 U	190 U	200 U	190 U	190 U	190 U	190 U	200 U
Pyrene	310 U	310 U	370 U	310 UJ	310 UJ	310 U	310 U	300 U	310 U	310 U	320 U
Pesticide/Polychlorinated Biphenyls (UG/KG)											
4,4'-DDD	3.9 U	3.8 U	4.6 U	3.9 U	3.9 U	3.9 U	3.8 U	3.9 U	3.9 U	3.9 U	3.9 U
4,4'-DDE	3.9 U	3.8 U	4.6 UL	3.9 U	3.9 U	3.9 U	3.8 U	3.9 U	3.9 U	3.9 UL	2.2 JS
4,4'-DDT	3.9 U	3.8 U	46 UL	3.9 U	3.9 U	3.9 U	3.8 U	3.9 U	3.9 U	3.9 U	39 U
Aldrin	1.9 U	1.9 U	2.3 U	2 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U
alpha-BHC	1.9 U	1.9 U	2.3 U	2 U	1.9 U	2 U	1.9 U	1.9 UL	1.9 U	2 U	2 U
alpha-Chlordane	1.9 U	1.9 U	2.3 UL	2 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U
Aroclor-1016	19 U	19 U	23 U	20 U	19 U	20 U	19 U	19 U	19 U	20 U	20 U
Aroclor-1221	19 U	19 U	23 U	20 U	19 U	20 U	19 U	19 U	19 U	20 U	20 U
Aroclor-1232	19 U	19 U	23 U	20 U	19 U	20 U	19 U	19 U	19 U	20 U	20 U
Aroclor-1242	19 U	19 U	23 U	20 U	19 U	20 U	19 U	19 U	19 U	20 U	20 U
Aroclor-1248	19 U	19 U	23 U	20 U	19 U	20 U	19 U	19 U	19 U	20 U	20 U
Aroclor-1254	19 U	19 U	23 U	20 U	19 U	20 U	19 U	19 U	19 U	20 U	20 U
Aroclor-1260	19 U	19 U	23 U	20 U	19 U	20 U	19 U	19 U	19 U	20 U	20 U
Aroclor-1262	19 U	19 U	23 U	20 U	19 U	20 U	19 U	19 U	19 U	20 U	20 U
Aroclor-1268	19 U	19 U	23 U	20 U	19 U	20 U	19 U	19 U	19 U	20 U	20 U
beta-BHC	1.9 U	1.9 U	2.3 U	2 U	1.9 U	2 U	1.9 U	1.9 UL	1.9 U	2 U	2 U
delta-BHC	1.9 U	1.9 U	2.3 U	2 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U
Dieldrin	1.9 U	1.9 U	2.3 UL	2 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U
Endosulfan I	1.9 U	1.9 U	2.3 U	2 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U
Endosulfan II	3.9 U	3.8 U	4.6 UL	3.9 U	3.9 U	3.9 U	3.8 U	3.9 U	3.9 U	3.9 U	3.9 U
Endosulfan sulfate	3.9 U	3.8 U	4.6 UL	3.9 U	3.9 U	3.9 U	3.8 U	3.9 U	3.9 U	3.9 U	3.9 U
Endrin	3.9 U	3.8 U	4.6 U	3.9 U	3.9 U	3.9 U	3.8 U	3.9 U	3.9 U	3.9 U	3.9 U
Endrin aldehyde	3.9 U	3.8 U	4.6 UL	3.9 U	3.9 U	3.9 UJ	3.8 UJ	3.9 UJ	3.9 UJ	3.9 U	3.9 U
Endrin ketone	3.9 U	3.8 U	4.6 U	3.9 U	3.9 U	3.9 U	3.8 U	3.9 U	3.9 U	3.9 U	3.9 U
gamma-BHC (Lindane)	1.9 U	1.9 U	2.3 U	2 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U
gamma-Chlordane	1.9 U	1.9 U	2.3 UL	2 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U
Heptachlor	1.9 U	1.9 U	23 UL	2 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	20 U
Heptachlor epoxide	1.9 U	1.9 U	2.3 UL	2 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U
Methoxychlor	3.9 U	3.8 U	46 U	3.9 U	3.9 U	3.9 U	3.8 U	3.9 U	3.9 U	3.9 U	39 U
Polychlorinated biphenyls (PCBs)	39 U	38 U	46 U	39 U	39 U	39 U	38 U	39 U	39 U	39 U	39 U
Toxaphene	97 U	94 U	110 U	98 U	96 U	98 U	95 U	97 U	97 U	99 U	98 U
Dioxin/Furans (PG/G)											
2,3,7,8-TCDD (dioxin)	0.132 U	0.153 U	0.19 U	0.136 U	0.181 U	0.139 U	0.123 JS	0.13 U	0.195 U	0.14 U	0.172 JS
Explosives (UG/KG)											
1,3,5-Trinitrobenzene	240 U	240 U	250 U	240 U	240 U	170 U	210 U	190 U	200 U	190 U	200 U
1,3-Dinitrobenzene	240 U	240 U	250 U	240 U	240 U	170 U	210 U	190 U	200 U	190 U	200 U
2,4,6-Trinitrotoluene	240 U	240 U	250 U	240 U	240 U	170 U	210 U	190 U	200 U	190 U	200 U
2-Amino-4,6-dinitrotoluene	240 U	240 U	250 U	240 U	240 U	170 U	210 U	190 U	200 U	190 U	200 U
2-Nitrotoluene	240 U	240 U	250 U	240 U	240 U	170 U	210 U	190 U	200 U	190 U	200 U

Station ID	CAS07-SO027		CAS07-SO028			CAS07-SO029	CAS07-SO030	CAS07-SO031	CAS07-SO032	CAS07-SO033	CAS07-SO034
Sample ID	NWSY-90-7-SC-PER-175	NWSY-90-7-SC-PER-176	NWSY-90-7-SC-PER-177	NWSY-90-7-SC-PER-178	NWSY-90-7-SC-PER-179	NWSY-90-7-SC-FLR-189	NWSY-90-7-SC-FLR-190	NWSY-90-7-SC-FLR-191	NWSY-90-7-SC-FLR-192	NWSY-90-7-BF-197	NWSY-90-7-TS-198
Sample Date	02/29/08	02/29/08	02/29/08	02/29/08	02/29/08	04/09/08	04/09/08	04/09/08	04/09/08	04/15/08	04/15/08
Chemical Name											
3-Nitrotoluene	240 U	240 U	250 U	240 U	240 U	170 U	210 U	190 U	200 U	190 U	200 U
4-Amino-2,6-dinitrotoluene	240 U	240 U	250 U	240 U	240 U	170 U	210 U	190 U	200 U	190 U	200 U
4-Nitrotoluene	240 U	240 U	250 U	240 U	240 U	170 U	210 U	190 U	200 U	190 U	200 U
HMX	240 U	240 U	250 U	240 U	240 U	170 U	210 U	190 U	200 U	190 U	200 U
RDX	240 U	240 U	250 U	240 U	240 U	170 U	210 U	190 U	200 U	190 U	200 U
Tetryl	490 U	490 U	500 U	480 U	490 U	350 U	420 U	390 U	400 U	380 U	400 U
Total Metals (MG/KG)											
Aluminum	X13500 JS	9,590 S	6,810 S	7,910 S	7,840 S	12,300 S	7,730 S	9,250 S	10,600 S	X15300 JS	8,560 JS
Antimony	3.3 UL	3.3 UL	4.1 UL	3.5 UL	3.3 UL	0.49 LS	3.3 UL	14 UL	14 UL	X1.2 LS	3.5 U
Arsenic	X1.1 S	X1.5 S	X2 S	X1.3 S	X1.1 S	X1.7 S	X3.3 S	X2.1 S	X3.1 S	X2.3 LS	X1.5 S
Barium	33.2 JS	52.6 S	X76 S	54.6 S	53.1 S	45.7 S	56 S	X103 S	X99.1 S	X68.6 JS	35.3 JS
Beryllium	0.43 S	X0.69 S	X0.9 S	X0.75 S	X0.77 S	0.28 JS	X0.62 S	X1.1 S	X1.2 S	X0.74 S	0.29 S
Cadmium	0.88 U	0.22 U	0.27 U	0.23 U	0.22 U	0.92 U	0.22 U	0.91 U	0.91 U	1.2 UL	0.23 U
Calcium	1,490 JS	744 S	2,190 S	546 S	555 S	1,200 S	752 S	1,340 S	1,120 S	39.8 JS	383 S
Chromium	X19 JS	X10 S	X6.7 S	X6.7 S	X6.6 S	X15.5 S	X7.2 S	X7.2 S	X10.3 S	X20 JS	X8.1 JS
Cobalt	X2 JS	X2.4 JS	X2.8 JS	X2.9 S	X2.9 S	X1.7 JS	X4 S	X3.7 JS	X5.1 JS	X3.2 JS	X1.2 JS
Copper	2.6 JS	X3.4 S	X8.9 S	2.5 S	2.7 S	1.6 S	X8.2 S	2.9 JS	X9.1 S	X9.6 JS	3.6 JS
Cyanide	0.14 U	0.14 U	0.16 U	0.14 U	0.14 U	0.14 U	0.13 S	0.18 S	0.14 U	0.14 U	0.14 U
Iron	X18000 JS	X8480 S	X4240 S	X5300 S	X5230 S	X13900 S	X5720 S	X5410 S	X6660 S	X18500 JS	X3230 JS
Lead	3.1 JS	7.2 JS	X62.9 JS	6.5 JS	7 JS	X8.9 KS	X43.2 S	X14.9 JS	X57.1 S	11.8 JS	X22.6 JS
Magnesium	877 JS	615 S	573 S	522 S	513 S	770 S	511 S	595 JS	708 JS	637 JS	379 JS
Manganese	14.4 JS	36.2 S	X166 S	56.7 S	X57.3 S	13.8 S	54.9 S	X256 S	X219 S	12.5 JS	28.3 JS
Mercury	X0.041 KS	0.013 KS	X0.071 KS	0.022 KS	0.023 KS	0.026 JS	0.026 JS	X0.038 JS	X0.043 JS	0.013 KS	X0.071 JS
Nickel	3.3 JS	4 S	4.2 S	4.1 S	4 S	3.2 S	4.8 S	5.6 JS	6.7 JS	6.9 JS	3.2 JS
Potassium	X810 BS	499 BS	639 BS	421 BS	406 BS	613 BS	413 BS	773 BS	809 BS	682 BS	356 BS
Selenium	X1.5 JS	X0.7 JS	X0.66 JS	0.42 JS	0.38 JS	5.7 U	5.5 U	23 U	23 U	5.9 UL	5.8 U
Silver	0.56 U	0.55 U	0.68 U	0.58 U	0.55 U	0.57 U	0.55 U	2.3 U	2.3 U	0.59 U	0.58 U
Sodium	279 BS	223 BS	158 BS	194 BS	188 BS	76 BS	83.1 BS	269 BS	283 BS	92.6 BS	82.6 BS
Thallium	X0.44 JS	0.55 U	0.68 U	0.58 U	0.55 U	2.3 U	2.2 U	2.3 U	2.3 U	1 U	0.58 U
Vanadium	X29 JS	17.9 S	9.6 S	11.6 S	11.2 S	25.1 S	11 S	10.1 JS	13.6 S	X38.1 JS	13.3 JS
Zinc	11.3 JS	13.5 JS	X35.5 JS	9.6 JS	9.7 JS	10.5 S	X32.3 S	18.5 S	X44.7 S	X28.4 JS	11.7 JS
Wet Chemistry											
Total organic halogens (TOX) (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U
Total Petroleum Hydrocarbons ()											
Total Petroleum Hydrocarbons, C10-C28 (UG/KG)	NA	NA	NA	NA	NA	NA	NA	NA	NA	9,900 U	16,200 JS
Total Petroleum Hydrocarbons, C6-C10 (UG/KG)	NA	NA	NA	NA	NA	NA	NA	NA	NA	15,000 U	16,000 U

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Notes:

Shading indicates detections

NA - Not analyzed

BS

JS

KS

LS

S - Reported value determined by the Method of Standard Additions (MSA)

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PG/G - Picograms per gram

UG/KG - Micrograms per kilogram

Station ID	CAS07-SO001		CAS07-SO002		CAS07-SO003	CAS07-SO004	CAS07-SO005	CAS07-SO006	CAS07-SO007	CAS07-SO008			CAS07-SO009
Sample ID	NWSY-90-7-SC-PER-132	NWSY-90-7-SC-PER-133	NWSY-90-7-SC-PER-135	NWSY-90-7-SC-PER-183	NWSY-90-7-SC-FLR-136	NWSY-90-7-SC-FLR-137	NWSY-90-7-SC-FLR-138	NWSY-90-7-SC-FLR-139	NWSY-90-7-SC-FLR-140	NWSY-90-7-SC-PER-143	NWSY-90-7-SC-PER-184	NWSY-90-7-SC-PER-185	NWSY-90-7-SC-FLR-144
Sample Date	02/28/08	02/28/08	02/28/08	04/09/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	04/09/08	04/09/08	02/28/08
Chemical Name													
Volatile Organic Compounds (UG/KG)													
Acetone	47 U	77 U	74 U	77 U	65 U	84 U	81 U	69 U	63 U	86 U	78 U	84 U	81 U
o-Xylene	4.7 U	7.7 U	7.4 U	7.7 U	6.5 U	8.4 U	8.1 U	6.9 U	6.3 U	8.6 U	7.8 U	8.4 U	8.1 U
Xylene, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds (UG/KG)													
2,4-Dinitrotoluene	220 U	210 U	200 U	200 U	190 U	190 U	180 U	220 U	200 U	190 U	200 U	200 U	200 U
2,6-Dinitrotoluene	210 U	180 U	190 U	200 U	190 U	190 U	180 U	190 U	190 U	190 U	200 U	200 UL	190 U
Benzo(a)anthracene	67 U	58 U	61 U	63 U	59 U	71 U	63 U	62 U	62 U	63 U	62 U	62 U	X18.4 JS
Benzo(b)fluoranthene	67 U	58 U	61 U	63 U	59 U	71 U	63 U	62 U	62 U	63 U	62 U	62 U	16.6 JS
bis(2-Ethylhexyl)phthalate	420 U	370 U	380 U	390 U	370 U	440 U	390 U	380 U	380 U	390 U	380 U	390 U	380 U
Chrysene	67 U	58 U	61 U	63 U	59 U	71 U	63 U	62 U	62 U	63 U	62 U	62 U	22.5 JS
Pesticide/Polychlorinated Biphenyls (UG/KG)													
4,4'-DDE	4.2 U	3.7 U	3.8 U	3.9 U	3.8 U	4.5 U	3.9 U	3.8 U	3.9 U	3.8 U	3.9 U	3.8 U	3.9 U
Endrin	2.4 JS	3.7 U	3.8 U	3.9 U	3.8 U	4.5 U	3.9 U	3.8 U	3.9 U	3.8 U	3.9 U	3.8 U	3.9 U
Dioxin/Furans (PG/G)													
2,3,7,8-TCDD (dioxin)	0.248 U	0.19 U	0.138 U	0.119 JS	0.177 U	0.199 U	0.19 U	X0.267 JS	0.182 U	0.201 U	0.109 U	0.135 JS	0.189 U
Explosives (UG/KG)													
No Detections	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (MG/KG)													
Aluminum	11,200 S	3,530 S	6,710 S	9,730 S	12,600 S	X20300 S	X14100 S	6,880 S	11,000 S	7,400 S	7,350 S	8,900 S	7,220 S
Antimony	3.7 UL	3.3 UL	3.4 UL	13 UL	0.3 BS	0.6 BS	0.54 BS	3.4 UL	3.3 UL	3.5 UL	3.4 UL	0.23 LS	3.3 UL
Arsenic	X4.3 LS	X1.4 S	X1.5 S	X2.6 S	X1.9 S	X1.3 S	X2 S	X1.5 S	X1.2 S	X1.4 S	X1.8 S	X1.9 S	X1.8 S
Barium	24.2 JS	19.6 JS	57.7 JS	X90.4 S	48.8 JS	35.7 JS	51.7 JS	X101 JS	42.2 JS	69.1 JS	X57.6 S	X53.7 S	X90.1 JS
Beryllium	0.47 S	0.33 S	X0.97 S	X1.3 S	0.4 S	X0.6 S	X0.6 S	X1.1 S	0.39 S	X0.91 S	0.39 S	0.41 S	X0.85 S
Cadmium	0.25 UL	0.22 U	0.23 U	0.9 U	0.84 U	2.6 U	1.2 U	0.23 U	1.1 U	0.23 U	0.22 U	0.22 U	0.22 U
Calcium	1,480 LS	407 S	458 S	770 JS	1,150 S	2,070 S	1,090 S	883 S	1,200 S	781 S	556 S	1,000 S	873 S
Chromium	X23.3 JS	X10.9 JS	X5.1 JS	X7.4 S	X16.8 JS	X41.1 JS	X16.3 JS	X7.6 JS	X15.3 JS	X7.6 JS	X7.4 S	X10 S	X11.6 JS
Cobalt	X1.1 JS	X3.4 S	X3.3 S	X5.1 JS	X1.5 JS	X2.3 JS	X1.9 JS	X2.8 JS	X2 JS	X2.9 S	X2.1 JS	X2.3 JS	X2.4 JS
Copper	X7.5 JS	X4.6 JS	X3.3 JS	2.9 JS	2 JS	2.7 JS	X3.5 JS	X12.9 JS	X3.7 JS	X5.2 JS	2.9 S	X7 S	X39.6 JS
Cyanide	0.14 U	0.13 U	0.13 U	0.14 U	0.13 U	0.16 U	0.14 U	0.14 U	0.13 U	0.14 U	0.13 U	0.13 U	0.14 U
Iron	X11100 S	X4530 S	X4050 S	X5750 S	X20300 S	X64000 S	X15400 S	X3640 S	X17000 S	X3680 S	X6200 S	X7850 S	X7120 S
Lead	X20.2 JS	X16.4 JS	6.9 JS	10 JS	1.1 JS	26 U	6.6 JS	X84.3 JS	2.2 JS	X81.9 JS	13.6 S	X37.3 S	X204 JS
Magnesium	957 S	661 S	429 S	610 JS	779 S	X1390 S	916 S	454 S	715 S	429 S	481 S	563 S	427 S
Manganese	16.1 JS	49.4 JS	X126 JS	X258 S	9.1 JS	15.6 JS	20.1 JS	X169 JS	15 JS	X114 JS	30.4 S	X69.2 S	X184 JS
Mercury	X0.044 KS	0.032 KS	0.021 KS	0.025 JS	X0.05 KS	X0.18 KS	X0.036 KS	X0.043 KS	X0.047 KS	0.031 KS	0.025 JS	X0.08 JS	X0.043 KS
Nickel	2.5 S	4.2 S	3.7 S	6 JS	2.7 S	4.1 S	3.7 S	4.9 S	2.5 S	3.9 S	3.5 S	3.9 S	4.6 S
Selenium	X1 LS	0.41 JS	0.47 JS	22 U	X1.6 JS	X3.5 JS	X1.2 JS	0.37 JS	X1.2 JS	0.26 JS	5.6 U	5.5 U	0.58 JS
Thallium	X0.38 JS	0.54 U	0.57 U	2.2 U	X1.3 S	X2.4 S	X0.87 S	0.57 U	X1 S	0.58 U	2.2 U	2.2 U	0.56 U
Vanadium	34.3 JS	12.7 JS	8.1 JS	10.5 JS	30.7 JS	X53.8 JS	28.5 JS	7.2 JS	26.1 JS	7.5 JS	12.7 S	15.7 S	10.2 JS
Zinc	22.9 JS	X41.7 JS	14.2 JS	15.3 S	9.2 JS	14.5 JS	11.3 JS	X51.2 JS	12.5 JS	23.2 JS	13.2 S	X26.6 S	X79.4 JS
Wet Chemistry													
Total organic halogens (TOX) (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons ()													
Total Petroleum Hydrocarbons, C10-C28 (UG/KG)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons, C6-C10 (UG/KG)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

C:\Users\kmalley\Documents\Work\Graycochea_Kathleen\JULY\July 19 - CAX Site 7\[Appendix I Soil Analytical Data.xls], Victoria Brynildsen, 07/28/2011

Notes:

Shading indicates detections

NA - Not analyzed

BS

JS

KS

LS

S - Reported value determined by the Method of Standard Additions (MSA)

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PG/G - Picograms per gram

UG/KG - Micrograms per kilogram

Station ID	CAS07-SO010	CAS07-SO011	CAS07-SO012	CAS07-SO013		CAS07-SO014			CAS07-SO015		CAS07-SO016	CAS07-SO017	CAS07-SO018
Sample ID	NWSY-90-7-SC-FLR-145	NWSY-90-7-SC-FLR-146	NWSY-90-7-SC-FLR-147	NWSY-90-7-SC-PER-148	NWSY-90-7-SC-PER-149	NWSY-90-7-SC-PER-150	NWSY-90-7-SC-PER-151	NWSY-90-7-SC-PER-152	NWSY-90-7-SC-PER-153	NWSY-90-7-SC-PER-154	NWSY-90-7-SC-PER-159	NWSY-90-7-SC-FLR-160	NWSY-90-7-SC-PER-162
Sample Date	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/28/08	02/29/08	02/29/08	02/29/08
Chemical Name													
Volatile Organic Compounds (UG/KG)													
Acetone	57 U	84 U	80 U	130 UJ	65 U	130 U	64 U	69 U	68 U	69 U	67 U	77 U	63 U
o-Xylene	5.7 U	8.4 U	8 U	13 UJ	6.5 U	13 U	6.4 U	6.9 U	6.8 U	6.9 U	6.7 U	7.7 U	6.3 U
Xylene, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds (UG/KG)													
2,4-Dinitrotoluene	220 U	210 U	220 U	220 U	200 U	220 U	200 U	240 U	250 U	250 U	240 U	240 U	240 U
2,6-Dinitrotoluene	190 U	190 U	180 U	220 U	200 U	220 U	200 U	200 U	210 U	180 U	240 U	240 U	240 U
Benzo(a)anthracene	61 U	60 U	59 U	76 U	66 U	76 U	63 U	63 U	66 U	59 U	57 U	61 U	61 U
Benzo(b)fluoranthene	61 U	60 U	59 U	76 U	66 U	76 U	63 U	63 U	66 U	59 U	57 U	61 U	61 U
bis(2-Ethylhexyl)phthalate	380 U	256 JS	370 U	480 U	410 U	480 U	400 U	390 U	410 U	370 U	360 U	380 U	380 U
Chrysene	61 U	60 U	59 U	76 U	66 U	76 U	63 U	63 U	66 U	59 U	57 U	61 U	61 U
Pesticide/Polychlorinated Biphenyls (UG/KG)													
4,4'-DDE	3.8 U	3.8 U	3.6 U	4.7 U	4.1 U	4.6 U	4 U	3.9 U	4.1 U	3.6 U	3.6 U	3.8 U	3.8 U
Endrin	3.8 U	3.8 U	3.6 U	4.7 U	4.1 U	4.6 U	4 U	3.9 U	4.1 U	3.6 U	3.6 U	3.8 U	3.8 U
Dioxin/Furans (PG/G)													
2,3,7,8-TCDD (dioxin)	0.175 U	0.104 JS	0.102 JS	0.289 U	0.104 U	0.217 JS	0.088 U	0.15 U	0.272 U	0.457 U	0.0712 U	0.361 U	0.187 U
Explosives (UG/KG)													
No Detections	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (MG/KG)													
Aluminum	6,370 S	7,140 S	8,830 JS	6,990 JS	7,630 JS	7,760 JS	7,190 JS	7,300 JS	7,150 JS	4,010 JS	6,220 JS	12,100 JS	8,460 JS
Antimony	3.4 UL	3.3 UL	3.2 UL	4.1 UL	3.5 UL	4.2 UL	3.4 UL	3.5 UL	3.6 UL	3.2 UL	3.2 UL	3.4 UL	3.3 UL
Arsenic	X1.1 S	X2.1 S	X1.8 LS	X24.3 S	X1.9 S	X2 S	X1.5 S	X1.4 S	X1.6 S	X3.5 S	X1.4 S	X1.7 S	X1.4 S
Barium	44.5 JS	57.5 JS	48.3 JS	X250 JS	56.8 JS	42 JS	54 JS	54.3 JS	X54.6 JS	17.8 JS	42.6 JS	48.3 JS	51.4 JS
Beryllium	0.52 S	X0.75 S	X0.57 S	X0.94 S	X0.7 S	0.5 S	X0.69 S	X0.61 S	X0.74 S	X1.6 S	0.39 S	0.43 S	0.48 S
Cadmium	0.23 U	0.22 U	0.21 UL	0.12 JS	0.24 U	0.28 U	0.23 U	0.23 U	0.24 U	1.1 U	0.21 U	1.2 U	0.22 U
Calcium	483 S	576 S	1,060 JS	X24800 JS	1,250 JS	1,640 JS	988 JS	907 JS	1,180 JS	485 JS	594 JS	1,210 JS	762 JS
Chromium	X5.3 JS	X6.8 JS	X8.7 JS	X18 JS	X6.3 JS	X7.7 JS	X5 JS	X5.6 JS	X5.9 JS	X16.2 JS	X7 JS	X16.5 JS	X8.3 JS
Cobalt	X2.3 JS	X2.2 JS	X2.2 LS	X2 JS	X2.1 JS	X1.9 JS	X2.1 JS	X1.8 JS	X2.1 JS	X4 S	X1.6 JS	X1.6 JS	X1.9 JS
Copper	2.4 JS	X9.8 JS	2.6 S	X42.7 S	X3.6 S	X4.9 S	3 S	2.7 S	3.8 S	X4.8 S	X3.4 JS	X6.1 JS	2.5 JS
Cyanide	0.14 U	0.13 U	0.13 U	0.33 S	0.15 U	0.24 S	0.13 U	0.14 U	0.15 U	0.13 U	0.12 U	0.14 U	0.14 U
Iron	X4450 S	X4690 S	X8060 JS	X4240 JS	X4730 JS	X6760 JS	X4010 JS	X4410 JS	X5150 JS	X19800 JS	X6480 JS	X20000 JS	X8230 JS
Lead	8 JS	X41.5 JS	6.4 JS	X42.1 JS	X11.5 JS	15.6 JS	X10.3 JS	8.1 JS	11.8 JS	1.8 JS	X10.8 JS	X23.2 JS	X9.2 JS
Magnesium	395 S	412 S	493 JS	X1320 JS	505 JS	605 JS	366 JS	399 JS	442 JS	170 JS	450 JS	723 JS	560 JS
Manganese	50.3 JS	X122 JS	X92.9 JS	X466 JS	X89.4 JS	X102 JS	X204 JS	X110 JS	X125 JS	X100 JS	31.6 JS	15.3 JS	37.4 JS
Mercury	0.019 KS	X0.037 KS	0.027 KS	X0.048 KS	0.026 KS	X0.058 KS	0.03 KS	0.019 KS	X0.1 KS	0.092 U	0.015 KS	0.033 KS	0.085 U
Nickel	3.2 S	4.1 S	3.2 JS	6.6 JS	3.7 JS	3.9 JS	3.4 JS	3.2 JS	3.4 JS	2.8 JS	2.2 JS	2.9 JS	3 JS
Selenium	0.41 JS	0.63 JS	X0.77 LS	0.33 JS	0.52 JS	X0.82 JS	0.63 JS	0.48 JS	0.47 JS	X1.7 JS	0.51 JS	X1.5 JS	X0.78 JS
Thallium	0.57 U	0.56 U	0.53 UL	2.7 U	0.59 U	0.71 U	0.57 U	0.58 U	0.6 U	X1.4 S	X0.37 JS	X1.2 S	0.55 U
Vanadium	9.5 JS	10 JS	15.5 JS	16.3 JS	11.2 JS	18.4 JS	9.3 JS	10.2 JS	10.6 JS	18.6 JS	12.4 JS	30.2 JS	15.9 JS
Zinc	10.2 JS	X29 JS	9.8 LS	X119 S	20.3 S	23.3 S	13.7 S	11.6 S	18.5 S	16.4 S	8.3 JS	X34.3 JS	9.2 JS
Wet Chemistry													
Total organic halogens (TOX) (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons ()													
Total Petroleum Hydrocarbons, C10-C28 (UG/KG)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons, C6-C10 (UG/KG)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

Shading indicates detections

NA - Not analyzed

BS

JS

KS

LS

S - Reported value determined by the Method of Standard Additions (MSA)

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PG/G - Picograms per gram

UG/KG - Micrograms per kilogram

Station ID	CAS07-SO019	CAS07-SO020	CAS07-SO021	CAS07-SO022	CAS07-SO023			CAS07-SO024			CAS07-SO025	CAS07-SO026
Sample ID	NWSY-90-7-SC-PER-164	NWSY-90-7-SC-FLR-165	NWSY-90-7-SC-FLR-166	NWSY-90-7-SC-FLR-167	NWSY-90-7-SC-PER-169	NWSY-90-7-SC-PER-170	NWSY-90-7-SC-PER-187	NWSY-90-7-SC-PER-172	NWSY-90-7-SC-PER-188	NWSY-90-7-SC-PER-193	NWSY-90-7-SC-FLR-173	NWSY-90-7-SC-FLR-174
Sample Date	02/29/08	02/29/08	02/29/08	02/29/08	02/29/08	02/29/08	04/09/08	02/29/08	04/09/08	04/09/08	02/29/08	02/29/08
Chemical Name												
Volatile Organic Compounds (UG/KG)												
Acetone	75 U	65 U	76 U	61 U	63 U	68 U	69 U	65 U	83 U	88 UJ	85 U	65 U
o-Xylene	7.5 U	6.5 U	7.6 U	6.1 U	6.3 U	6.8 U	6.9 U	6.5 U	8.3 U	8.8 U	8.5 U	6.5 U
Xylene, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds (UG/KG)												
2,4-Dinitrotoluene	250 U	250 U	250 U	250 U	240 U	240 U	190 U	250 U	190 U	200 U	240 U	250 U
2,6-Dinitrotoluene	250 U	250 U	250 U	250 U	240 U	240 U	190 U	250 U	190 U	200 U	240 U	250 U
Benzo(a)anthracene	62 U	61 U	64 U	59 U	61 U	62 U	64 U	62 U	64 U	63 U	63 U	59 U
Benzo(b)fluoranthene	62 U	61 U	64 U	59 U	61 U	62 U	64 U	62 U	64 U	63 U	63 U	59 U
bis(2-Ethylhexyl)phthalate	390 U	380 U	400 U	370 U	380 U	390 U	400 U	390 U	400 U	400 U	390 U	370 U
Chrysene	62 U	61 U	64 U	59 U	61 U	62 U	64 U	62 U	64 U	63 U	63 U	59 U
Pesticide/Polychlorinated Biphenyls (UG/KG)												
4,4'-DDE	3.9 U	3.8 U	4 U	3.7 U	3.8 U	3.9 U	4.1 U	3.9 U	4 U	4.1 U	4 U	3.8 U
Endrin	3.9 U	3.8 U	4 U	3.7 U	3.8 U	3.9 U	4.1 U	3.9 U	4 U	4.1 U	4 U	3.8 U
Dioxin/Furans (PG/G)												
2,3,7,8-TCDD (dioxin)	0.127 U	0.181 U	0.506 U	0.348 U	0.176 U	0.163 U	0.205 U	0.188 U	0.233 U	0.187 U	0.174 U	0.121 U
Explosives (UG/KG)												
No Detections	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (MG/KG)												
Aluminum	7,000 JS	6,850 JS	7,140 JS	8,190 JS	9,100 JS	8,610 JS	8,390 S	7,080 JS	9,730 S	11,900 S	X17300 JS	10,600 JS
Antimony	3.4 UL	3.4 UL	3.5 UL	3.3 UL	3.3 UL	3.4 UL	14 UL	3.4 UL	14 UL	14 UL	0.29 LS	3.4 UL
Arsenic	X1.4 S	X1.5 S	X1.6 S	X2.1 S	X1.4 S	X1.5 S	X1.8 JS	X1.4 S	X2.3 S	X2.9 S	X2.6 S	X1.8 S
Barium	50.4 JS	54.2 JS	64.8 JS	64.9 JS	47.2 JS	47.7 JS	X80.3 S	60.8 JS	83.4 S	X98.5 S	25.5 JS	49.9 JS
Beryllium	X0.73 S	X0.91 S	X0.93 S	X0.53 S	X0.61 S	X0.58 S	X1 JS	X0.98 S	X1.2 S	X1.3 S	X0.67 S	X0.57 S
Cadmium	0.22 U	0.23 U	0.23 U	0.22 U	0.88 U	0.92 U	0.95 U	0.23 U	0.91 U	0.96 U	2.3 U	0.23 U
Calcium	449 JS	518 JS	1,010 JS	1,020 JS	902 JS	980 JS	999 JS	685 JS	758 JS	976 JS	2,050 JS	867 JS
Chromium	X6.2 JS	X4.8 JS	X5.9 JS	X10.1 JS	X9.6 JS	X9.5 JS	X6.8 S	X5.2 JS	X6.3 S	X8.1 S	X39 JS	X11.8 JS
Cobalt	X2.3 JS	X3.1 S	X2.9 S	X2.6 JS	X2.2 JS	X2 JS	X4.1 JS	X4.1 S	X5 JS	X5.8 JS	X2 JS	X2.1 JS
Copper	1.5 JS	2.5 JS	X14.3 JS	X3.7 JS	2.1 JS	2.2 JS	X5.1 JS	X6.5 JS	X5.5 JS	X6.4 S	2.9 JS	X3.4 JS
Cyanide	0.14 U	0.14 U	0.14 U	0.13 U	0.13 U	0.14 U	0.14 U	0.14 U	0.13 U	0.14 U	0.14 U	0.13 U
Iron	X5550 JS	X3890 JS	X3900 JS	X10200 JS	X8820 JS	X8750 JS	X5070 S	X3800 JS	X4820 S	X5820 S	X57800 JS	X10700 JS
Lead	4.8 JS	7.3 JS	X58.5 JS	4 JS	6.3 JS	8 JS	X18.9 JS	X20.4 JS	X12.8 JS	X13.9 JS	5.8 U	7.5 JS
Magnesium	439 JS	406 JS	434 JS	574 JS	577 JS	562 JS	526 JS	394 JS	520 JS	679 JS	889 JS	676 JS
Manganese	X63.5 JS	X124 JS	X196 JS	33.2 JS	27.7 JS	29 JS	X241 S	X157 JS	X225 S	X270 S	17 JS	22.1 JS
Mercury	0.019 KS	0.019 KS	X0.042 KS	0.088 U	0.031 KS	X0.043 KS	0.088 U	0.025 KS	0.027 JS	0.027 JS	0.014 KS	0.026 KS
Nickel	3.2 JS	3.9 JS	4.6 JS	3.1 JS	3.7 JS	3.4 JS	5.2 JS	4 JS	5.6 JS	7 JS	3.2 JS	3.7 JS
Selenium	0.59 JS	0.36 JS	0.51 JS	X0.67 JS	X0.73 JS	0.63 JS	24 U	0.36 JS	23 U	24 U	X2.9 JS	X0.81 JS
Thallium	0.56 U	0.57 U	0.58 U	0.55 U	X0.33 JS	X0.41 JS	2.4 U	0.57 U	2.3 U	2.4 U	X1.6 S	X0.57 S
Vanadium	11 JS	8.2 JS	9.5 JS	18.7 JS	17.4 JS	16.9 JS	9.6 JS	7.8 JS	9.2 JS	11.8 JS	X63.1 JS	21 JS
Zinc	8.2 JS	11.3 JS	X39.3 JS	9.4 JS	9.4 JS	9.9 JS	21.2 S	17.4 JS	14.9 S	19.6 S	15.3 JS	20.2 JS
Wet Chemistry												
Total organic halogens (TOX) (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons ()												
Total Petroleum Hydrocarbons, C10-C28 (UG/KG)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons, C6-C10 (UG/KG)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

Shading indicates detections

NA - Not analyzed

BS

JS

KS

LS

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U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PG/G - Picograms per gram

UG/KG - Micrograms per kilogram

Station ID	CAS07-SO027		CAS07-SO028			CAS07-SO029	CAS07-SO030	CAS07-SO031	CAS07-SO032	CAS07-SO033	CAS07-SO034
Sample ID	NWSY-90-7-SC-PER-175	NWSY-90-7-SC-PER-176	NWSY-90-7-SC-PER-177	NWSY-90-7-SC-PER-178	NWSY-90-7-SC-PER-179	NWSY-90-7-SC-FLR-189	NWSY-90-7-SC-FLR-190	NWSY-90-7-SC-FLR-191	NWSY-90-7-SC-FLR-192	NWSY-90-7-BF-197	NWSY-90-7-TS-198
Sample Date	02/29/08	02/29/08	02/29/08	02/29/08	02/29/08	04/09/08	04/09/08	04/09/08	04/09/08	04/15/08	04/15/08
Chemical Name											
Volatile Organic Compounds (UG/KG)											
Acetone	55 U	60 U	64 U	68 U	61 U	71 U	65 U	77 U	77 UJ	110 U	126 JS
o-Xylene	5.5 U	6 U	6.4 U	7.3 JS	6.1 UJ	7.1 U	6.5 U	7.7 U	7.7 U	11 U	14 U
Xylene, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	34 U	43 U
Semivolatile Organic Compounds (UG/KG)											
2,4-Dinitrotoluene	240 U	240 U	250 U	240 U	240 U	170 U	210 U	190 U	200 U	X219 S	X239 S
2,6-Dinitrotoluene	240 U	240 U	250 U	240 U	240 U	170 U	210 U	190 U	200 U	X123 JS	X136 JS
Benzo(a)anthracene	62 U	61 U	73 U	62 U	62 U	63 U	62 U	60 U	62 U	63 U	63 U
Benzo(b)fluoranthene	62 U	61 U	73 U	62 U	62 U	63 U	62 U	60 U	62 U	63 U	63 U
bis(2-Ethylhexyl)phthalate	390 U	380 U	460 U	390 U	390 U	390 U	380 U	380 U	390 U	390 U	400 U
Chrysene	62 U	61 U	73 U	62 U	62 U	63 U	62 U	60 U	62 U	63 U	63 U
Pesticide/Polychlorinated Biphenyls (UG/KG)											
4,4'-DDE	3.9 U	3.8 U	4.6 UL	3.9 U	3.9 U	3.9 U	3.8 U	3.9 U	3.9 U	3.9 UL	2.2 JS
Endrin	3.9 U	3.8 U	4.6 U	3.9 U	3.9 U	3.9 U	3.8 U	3.9 U	3.9 U	3.9 U	3.9 U
Dioxin/Furans (PG/G)											
2,3,7,8-TCDD (dioxin)	0.132 U	0.153 U	0.19 U	0.136 U	0.181 U	0.139 U	0.123 JS	0.13 U	0.195 U	0.14 U	0.172 JS
Explosives (UG/KG)											
No Detections	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (MG/KG)											
Aluminum	X13500 JS	9,590 S	6,810 S	7,910 S	7,840 S	12,300 S	7,730 S	9,250 S	10,600 S	X15300 JS	8,560 JS
Antimony	3.3 UL	3.3 UL	4.1 UL	3.5 UL	3.3 UL	0.49 LS	3.3 UL	14 UL	14 UL	X1.2 LS	3.5 U
Arsenic	X1.1 S	X1.5 S	X2 S	X1.3 S	X1.1 S	X1.7 S	X3.3 S	X2.1 S	X3.1 S	X2.3 LS	X1.5 S
Barium	33.2 JS	52.6 S	X76 S	54.6 S	53.1 S	45.7 S	56 S	X103 S	X99.1 S	X68.6 JS	35.3 JS
Beryllium	0.43 S	X0.69 S	X0.9 S	X0.75 S	X0.77 S	0.28 JS	X0.62 S	X1.1 S	X1.2 S	X0.74 S	0.29 S
Cadmium	0.88 U	0.22 U	0.27 U	0.23 U	0.22 U	0.92 U	0.22 U	0.91 U	0.91 U	1.2 UL	0.23 U
Calcium	1,490 JS	744 S	2,190 S	546 S	555 S	1,200 S	752 S	1,340 S	1,120 S	39.8 JS	383 S
Chromium	X19 JS	X10 S	X6.7 S	X6.7 S	X6.6 S	X15.5 S	X7.2 S	X7.2 S	X10.3 S	X20 JS	X8.1 JS
Cobalt	X2 JS	X2.4 JS	X2.8 JS	X2.9 S	X2.9 S	X1.7 JS	X4 S	X3.7 JS	X5.1 JS	X3.2 JS	X1.2 JS
Copper	2.6 JS	X3.4 S	X8.9 S	2.5 S	2.7 S	1.6 S	X8.2 S	2.9 JS	X9.1 S	X9.6 JS	3.6 JS
Cyanide	0.14 U	0.14 U	0.16 U	0.14 U	0.14 U	0.14 U	0.13 S	0.18 S	0.14 U	0.14 U	0.14 U
Iron	X18000 JS	X8480 S	X4240 S	X5300 S	X5230 S	X13900 S	X5720 S	X5410 S	X6660 S	X18500 JS	X3230 JS
Lead	3.1 JS	7.2 JS	X62.9 JS	6.5 JS	7 JS	X8.9 KS	X43.2 S	X14.9 JS	X57.1 S	11.8 JS	X22.6 JS
Magnesium	877 JS	615 S	573 S	522 S	513 S	770 S	511 S	595 JS	708 JS	637 JS	379 JS
Manganese	14.4 JS	36.2 S	X166 S	56.7 S	X57.3 S	13.8 S	54.9 S	X256 S	X219 S	12.5 JS	28.3 JS
Mercury	X0.041 KS	0.013 KS	X0.071 KS	0.022 KS	0.023 KS	0.026 JS	0.026 JS	X0.038 JS	X0.043 JS	0.013 KS	X0.071 JS
Nickel	3.3 JS	4 S	4.2 S	4.1 S	4 S	3.2 S	4.8 S	5.6 JS	6.7 JS	6.9 JS	3.2 JS
Selenium	X1.5 JS	X0.7 JS	X0.66 JS	0.42 JS	0.38 JS	5.7 U	5.5 U	23 U	23 U	5.9 UL	5.8 U
Thallium	X0.44 JS	0.55 U	0.68 U	0.58 U	0.55 U	2.3 U	2.2 U	2.3 U	2.3 U	1 U	0.58 U
Vanadium	X29 JS	17.9 S	9.6 S	11.6 S	11.2 S	25.1 S	11 S	10.1 JS	13.6 S	X38.1 JS	13.3 JS
Zinc	11.3 JS	13.5 JS	X35.5 JS	9.6 JS	9.7 JS	10.5 S	X32.3 S	18.5 S	X44.7 S	X28.4 JS	11.7 JS
Wet Chemistry											
Total organic halogens (TOX) (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U
Total Petroleum Hydrocarbons ()											
Total Petroleum Hydrocarbons, C10-C28 (UG/KG)	NA	NA	NA	NA	NA	NA	NA	NA	NA	9,900 U	16,200 JS
Total Petroleum Hydrocarbons, C6-C10 (UG/KG)	NA	NA	NA	NA	NA	NA	NA	NA	NA	15,000 U	16,000 U

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Notes:

Shading indicates detections

NA - Not analyzed

BS

JS

KS

LS

S - Reported value determined by the Method of Standard Additions (MSA)

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PG/G - Picograms per gram

UG/KG - Micrograms per kilogram

Response to Comments

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

November 2, 2011

Ms. Krista Parra
NAVFAC MIDLANT, Building N-26
Hampton Roads Restoration Product Line, Code OPHREV4
9742 Maryland Avenue
Norfolk, VA 23511-3095

Subject: Draft Site Inspection Report for Site 7-Old DuPont Disposal Area. September 2011.

Ms. Parra:

Thank you for the opportunity to review the subject document. EPA would like to provide the following comments at this time.

EPA RPM Comment 1: 15-20' of shoreline eroded in to the river. See BTAG Comments.

EPA RPM Comment 2: Step 2b. It is hard to make some of these more realistic assumptions with the limited amount of data at the SI Stage (comparatively to the RI). COPC identified during the PA/SI risk screening (vs RSL and 95% UTL/UCLs) should be carried through and sampled for during the RI. Risk management decisions can then be made on the larger dataset of the RI.

EPA RPM Comment 3: Page 2-1. It is strange to use a supplemental background dataset when we have an approved background dataset. It also makes it somewhat unclear which background dataset was used for screening. In this case, I don't believe the "site specific" background has undergone the proper statistical analysis to be used as a background dataset.

EPA RPM Comment 4: Page 3-2. Is it correct to say no MEC were discovered at the site? Also, the details of the removal are not clear. Was it only surficial dumping of munitions? Was there any sort of GPR done to determine if MEC was BGS?

EPA RPM Comment 5: Page 3-2. 2,3,7,8 TCDD? Was this a specific congener analysis? Or was this a full dioxin analysis where a TEQ was calculated?

EPA RPM Comment 6: Page 3-4. Chromium. Chromium should be carried through as a COPC. Risk management decisions can be made as part of the RI.

EPA RPM Comment 7: Page 3-5. Section 3.2.4. Ecological Risk Screening. I generally don't agree with the idea of assuming it has been diluted as the reason for not sampling. Decisions made at the site should be scientifically defensible. See BTAG Comments.

EPA RPM Comment 8: Page 3-6. Section 3.3 Site Specific Background. I was not able to find any data from wells MW-1 and 2. Please include this data on table 3-4 or indicate why it was not included.

EPA RPM Comment 9: Page 3-8. Section 3.4.2. I generally don't agree that COCs exceeding risk screening levels and 95% UTL/UCL of background should be screened out at the SI stage.

EPA RPM Comment 10: Page 3-9. It is highly unlikely that the dioxin detected is attributable to forest fires and more likely attributable to the ash layer at the site.

EPA RPM Comment 11: Page 3-10. RDX should be looked at further upgradient from the Site 7 background well.

EPA RPM Comment 12: Page 3-10. Chloroform should be considered site related since other CVOCs are present at the site (TCE).

EPA RPM Comment 13: Page 3-10. Pesticides. Was the background detection in the sites specific background wells or in the actual background study?

EPA RPM Comment 14: Was the backfill certified clean fill or was it from an onsite source?

EPA RPM Comment 15: Page 3-13. Please see BTAG Comments on using mean HQs.

EPA RPM Comment 16: Page 3-14 and 3-15. Please see BTAG Comments on using the mean.

EPA RPM Comment 17: Page 3-16. Naturally occurring chloroform. See EPA RPM Comment 12.

EPA Tox Comment 1: **Section 2.2:** It would be helpful to note that the 2011 soil sampling effort focused only on pH measurements (rather than chemical analyses) because extensive confirmatory sampling (TCL/TAL/dioxin) had been performed in 2008 (as reported in Table 2-1 of the report), and was considered for this SI.

EPA Tox Comment 2: **Appendix A:** For chemicals like arsenic, where non-cancer endpoints dominate as the upper end of the cancer risk range is approached, a non-cancer evaluation of risk should also be performed.

EPA BTAG General Comment: One of the recurring issues noted in the review is the use of mean concentrations when assessing risk. It must be noted that EPA ecological risk assessment guidance clearly states that "For the screening-level risk assessment, the highest contaminant concentrations measured on the site should be documented for each medium." It also clearly states that "Risk is estimated by comparing maximum documented exposure concentrations…" Region 3 BTAG uses mean concentrations to better understand the nature of contamination and potential exposure at a site; other uses are generally not appropriate or accepted.

EPA BTAG Comment 1: Section 3.2.4 provided a screening evaluation of soil concentrations to sediment screening levels to assess the potential risk from soil that had eroded into the York River as a result of Hurricane Isabel in 2003. The evaluation concluded that unacceptable ecological risks in the York River from potential historical soil transport from the site are very unlikely. It is unclear why this approach was taken. It would be more appropriate to sample sediment in the York River as a more direct measure of what eroded from the bluff into the river. The screening evaluation is not sufficient to eliminate potential contamination in the York River from further consideration. It is not clear from the soil samples collected that the highest concentrations were detected as sampling was very limited. The volume of contaminated soil would also be an important factor in concentrations that would result in the river. This approach also does not consider historical soil or contaminants that may have been transported into the river. BTAG recommends that sediment samples be collected in the York River to better assess this migration pathway.

EPA BTAG Comment 2: Section 3.2.4 on page 3-5 discusses the ecological risk screening that was performed at the site. The soil data used in this analysis was from the top two feet of fill material as these samples were collected in 2011 for pH analysis. It is still not clear what the date (pre-hurricane Isabel (2003), 2004, 2008 post removal, 2011) or the depth (backfill, 0 to 24 inches, 0-6 inches) of the soil samples were that determined contaminant concentrations used in this report. Indicate if any confirmation wall and floor samples were collected and analyzed during the removal action at this site. If so, it would be helpful to include these data in this report.

EPA BTAG Comment 3: Section 3.2.4 on page 3-5 states that when evaluating ecological risk, "The initial COPCs [contaminants of potential concern] were then evaluated using more realistic assumptions to select refined COPCs." It is premature to refine exposure assumptions to less conservative levels and eliminate chemicals from further consideration at this point in the risk assessment process.

EPA BTAG Comment 4: Section 3.2.4 on page 3-6 states that "Buried debris has subsequently been removed from the site, and the potential for future contaminant migration via erosion or surface runoff to sediment is no longer a complete pathway." This statement is not supported by the facts that the site is still adjacent to the York River and is still subject to the effects of hurricanes (Hurricane Isabel in 2003 eroded 15 to 20 feet of shoreline from Site 7). This supports the future possibility of erosion of Site 7 and any associated contaminants onto the beach and into the York River.

EPA BTAG Comment 5: Section 3.2.4 on page 3-6 states that because of the continual erosion (e.g., net loss of sediment from the vicinity of Site 7) documented by the Center for Coastal Resource Management, sediment data collected at present from along the Site 7 shoreline would not be useful in determining whether or not a CERCLA release occurred from Site 7. The location of the erosion in the York River needs to be more specific than in the vicinity of Site 7. The fact that erosion in the York River in the vicinity of Site 7 is continual does not mean that contamination from Site 7 may not be found. Also, the data shown to date does not indicate any sampling of the beach area between the landfill (Site 7) and the York River or of the sediment in the York River. Therefore, assessment of risk to ecological receptors within these habitats is based on assumptions and not site specific data. As stated previously, BTAG recommends that samples be collected from the York River to assess this pathway.

EPA BTAG Comment 6: Section 3.4.2 on pages 3-10 states that hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) detected at the site is less than the concentration detected in the upgradient well and is not likely attributable to a release from buried debris. If the RDX in groundwater did not come from Site 7, a potential source may be present further inland. An investigation of upgradient areas may be warranted to identify other potential sources of RDX to groundwater.

EPA BTAG Comment 7: Section 3.4.3 on page 3-13 states that eight inorganic chemicals and one organic chemical exceeded screening levels based on maximum concentrations. The mean concentrations of six of the inorganic chemicals was less than screening levels, therefore it was concluded that these chemicals were not COPCs. It is not appropriate to eliminate chemicals based on the comparison to means at this phase of the project.

EPA BTAG Comment 8: Section 3.4.3 on page 3-14 states that the surface water values used to screen groundwater considered the salinity of the receiving water body (York River) to determine whether to apply freshwater or marine values. As such, marine values were used, where available, although freshwater values were extrapolated to the site if marine values were not available. Because the York River is brackish in the vicinity of the site, the lower of the marine and freshwater values should be used to evaluate impacts from discharging groundwater.

<u>Appendix B – Ecological Risk Screening</u>

EPA BTAG Comment 9: Section B.2 on page B-1 states "Soil screenings were conducted using all 2008 post-removal samples that were within the 0 to 24 inch depth range relative to the current (backfilled) site elevation; samples of the backfill material, however, were not included in the evaluation." This statement is confusing. The data from the 0 to 24 inch depth either represents soil that is no longer present on site or represents backfilled material that is on site. In the former case, the data is no longer relevant to this site. In the latter case, the data is relevant, but soil data below this layer, particularly along the eroding edge of the landfill still needs to be evaluated for potential ecological risk.

EPA BTAG Comment 10: Page B-2, Section B.2 on page B-2 states "…ecological exposures are generally considered to be confined to the top two feet of the soil column." This approach may not be appropriate in areas susceptible to erosion. Since the eastern face of the landfill is eroding into the York River with the top of the landfill approximately 15 feet above the York River, the contamination on the eastern face of the landfill should be evaluated as this material may eventually erode in the river where ecological exposure would occur.

EPA BTAG Comment 11: Section B.2 on page B-2 states that background UTLs were used for comparison. The reasons for using UTLs, as opposed to UCLs, need to be provided. The text needs to clearly indicate why UTLs are used here and UCLs are used in Section B.3.2.

EPA BTAG Comment 12: Section B.3.3 on page B-5 states that nitroglycerine (0.23 µg/l) [no screening value available] was not retained as a refined COPC because its concentration was lower than marine based screening values for other explosives. It is not clear that this methodology is reasonable as not all explosives have the same toxicity. Other supporting evidence should be provided to support this decision.

<u>Appendix H - Pre-TCRA Ecological Risk Screening</u>

EPA BTAG Comment 13: Section H-1 on page H-1 states "The ecological risk screening for this potential soil to sediment pathway assumed that the concentrations in the pre-TCRA surface soil (0 to 6 inches) data from samples at the site perimeter adjacent to the river were an appropriate representation of the potential concentrations in the sediment." While this might represent the concentrations in the surface layer, it does not represent the concentrations throughout the vertical depth of the landfill.

EPA BTAG Comment 14: Section H.1 on page H-1 states "This historical pathway, which is no longer complete, following the completion of remedial action on the site, is the subject of the evaluation in this appendix." It is not clear if this historical pathway is the pathway in Appendix B or the transport of debris and soil from the site to the York River. In addition, it is not clear that this pathway "…is no longer complete".

EPA BTAG Comment 15: Section H.2 on page H-2 discusses the use of the ER-L and ER-M to evaluate risk in the river. While using ER-L and ER-M values as guidelines (meaning a 5% to 20% chance of risk if the concentration is below the ER-L or 75% to 100% chance of risk is the concentrations is above the ER-M value) are appropriate, it is not appropriate to use the ER-M value as a "less conservative" measure of risk to ecological receptors as it means there is a 21% to 74% chance of risk if the contaminant concentration is between the ER-L and ER-M values. This percent of risk to ecological receptors is too large to calculate an acceptable HQ (see Table H-3).

EPA BTAG Comment 16: Section H.2 on page H-2 states that mean concentrations were used

as a less conservative screen. See previous comments regarding the use of mean concentrations

EPA BTAG Comment 17: Section H.3 on page H-3 (first bullet) indicates beryllium would likely be B-flagged if the data were validated. Support for this statement is needed.

EPA BTAG Comment 18: Section H.3 on page H-3 states "Consequently, the ecological risk evaluation determined that unacceptable ecological risks in the York River from potential historical soil transport from the site are very unlikely." From the comments provided, it is not clear that this statement is supported, since no beach soil/sediment samples were collected and no sediment/pore water/surface water samples were collected and analyzed from the York River. Sampling in the York River is needed to more directly assess this pathway.

EPA BTAG Comment 19: Table H-4 shows exceedances of site soils as sediment. This table has two columns labeled "Marine Sediment Screening Value 1" and Marine Sediment Screening Value 2." Clarification should be provided on how these values were derived.

In January 2011, BTAG provided comments to Susanne Haug, EPA on the responses to comments on the Sampling and Analysis Plan for this site. These issues were later discussed with her. Based on a review of sections of the above document, it is unclear that all of these previous comments have been adequately addressed. Those that appear to have not been addressed are included below.

EPA BTAG Comment 20: The Navy seems to be making a distinction between debris and contamination. While contamination may be associated with debris, it is also not necessarily visible and associated with sediment and surface water. The removal of debris from Site 7 and/or the shoreline/York River sediment does not mean that contamination from this site is not in areas adjacent to this landfill/dump.

EPA BTAG Comment 21: It is still not clear what contaminant concentrations still exist at this site, including both the landfill and the adjacent shoreline. It is not clear what stabilization activities took place to ensure future erosion of this edge of the landfill did not occur.

EPA BTAG Comment 22: How much erosion occurs in the vicinity of this site? More information is needed to better define/support use of the term "unlikely." The net loss of sediment needs to be quantified on an annual basis, such that the reader can have an idea of how much sediment (mm, cm lost each year) is transported out of the Site 7 vicinity?

EPA BTAG Comment 23: Sampling of the shoreline and sediment in the York River is needed to confirm the assumption that it is unlikely that sediment data collected from along the Site 7 shoreline would be indicative of a CERCLA release at Site 7.

EPA BTAG Comment 24: The variability that does occur in contaminant concentrations in

sediment makes this conclusion of ecological risk being unlikely uncertain.

EPA BTAG Comment 25: Assessing ecological risk due to contaminated groundwater needs to involve sediment and surface water, at a minimum. Therefore, it is clear that this ecological risk screening will only deal with one of three contaminant migration pathways and not all three. Since sediment and surface water samples are not proposed in this SAP for groundwater, this analyses is needed to reduce uncertainty.

EPA BTAG Comment 26: Another issue that needs to be addressed is how much landfill (e.g., vertical feet, area) remains at Site 7 beneath the backfill material and what are the contaminant concentrations in that material that could be released through erosion. Also, how has the landfill edge facing the York River been stabilized such that erosion is minimized or eliminated?

EPA BTAG Comment 27: Sediment in the York River needs to be added to the media to be sampled because it is in the migration pathway from the site.

If you have any questions, please contact me at 215-814-3378.

Sincerely,

John Burchette
Remedial Project Manager

cc: Wade Smith, VDEQ

COMMONWEALTH of VIRGINIA

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November 10, 2011

Ms. Krista Parra
NAVFAC MIDLANT, Building N-26
Hampton Roads Restoration Product Line, Code OPHREV4
9742 Maryland Avenue
Norfolk, VA 23511-3095

RE: Draft Site Inspection Report
Site 7 – Old DuPont Disposal Area
Naval Weapons Station Yorktown
Cheatham Annex
Williamsburg, Virginia

Dear Ms. Parra:

The Virginia Department of Environmental Quality (DEQ) has received the *Draft Site Inspection Report, Site 7 – Old DuPont Disposal Area* (SI Report) for Naval Weapons Station Yorktown, Cheatham Annex (CAX), Williamsburg, Virginia. The September 2011 SI Report, prepared by CH2M HILL, was received by the DEQ on September 19, 2011.

Thank you for providing the DEQ's Office of Remediation Programs the opportunity to review the above-referenced SI Report. Subsequent to DEQ's internal review and per discussions conducted during the CAX Partnering Meeting on September 14, 2011, this office concurs with the recommendation to conduct an expanded SI to include additional soil sampling, groundwater sampling, and the installation of additional groundwater monitoring wells necessary to further delineate groundwater contamination.

Please contact me at (804) 698-4125 or wade.smith@deq.virginia.gov with any additional questions.

Sincerely,

Wade M. Smith
Remediation Project Manager
Office of Remediation Programs

cc: John Burchette, EPA

Response to Comments

Draft Site Inspection Report
Site 7

Naval Weapons Station Yorktown Cheatham Annex
Williamsburg, VA
January 11, 2012

EPA RPM Comments:

EPA RPM Comment 1: *15-20' of shoreline eroded in to the river. See BTAG Comments.*

Response: No response required.

EPA RPM Comment 2: *Step 2b. It is hard to make some of these more realistic assumptions with the limited amount of data at the SI Stage (comparatively to the RI). COPC identified during the PA/SI risk screening (vs RSL and 95% UTL/UCLs) should be carried through and sampled for during the RI. Risk management decisions can then be made on the larger dataset of the RI.*

Response: Although the data collected from Site 7 were presented in an SI Report, it is the Navy's position that the amount of data collected is sufficient to perform the semi-quantitative risk evaluations using more realistic assumptions, as illustrated in Section 1.1.1. The sample collection approach, including the media to be sampled and the number and location of samples, and the data evaluation approach and procedures that were conducted for the SI were all included in the Site 7 SI UFP-SAP which was approved by the EPA and VADEQ in advance of the execution of the SI.

To address this comment, it is proposed that Section 1.1.1 of the SI Report will be revised to clarify the objectives of the SI. Please note that the more realistic risk evaluation presented in the SI was conducted to determine if those constituents exceeding conservative screening values likely pose a potential risk to human health and the environment and to provide an indication of data gaps that need to be filled by further investigation activities. The SI report does not state that any constituents should not be analyzed in future sampling events. Since the recommended path forward for Site 7 is an Expanded SI, the entire SI and pre-SI data set would be carried forward for use in future quantitative risk assessment activities that are deemed necessary by the team. Proposed sampling locations, media to be sampled, and analytes for implementation of the Expanded SI will be submitted under separate cover in a forthcoming UFP-SAP.

EPA RPM Comment 3: *Page 2-1. It is strange to use a supplemental background dataset when we have an approved background dataset. It also makes it somewhat unclear which background dataset was used for screening. In this case, I don't believe the "site specific" background has undergone the proper statistical analysis to be used as a background dataset.*

Response: The site-specific background dataset was used as an additional point of comparison in conjunction with the approved background dataset for the base. At the time the UFP-SAP was drafted, the CAX Partnering Team had not yet approved the background 95% UTLs; therefore, in order to prevent delays with completing the Site 7 SI Report, the installation of two site-specific background monitoring wells was included as part of the SI. As stated in the UFP-SAP, groundwater samples from these wells

were collected to provide a background dataset for comparison against site groundwater samples (Page 37 of the final UFP-SAP).

Since the background dataset was approved by the Yorktown/CAX Partnering Teams before the submittal of this SI Report, the Site 7 groundwater results were first compared to the background 95% UTLs in the approved background data set and then to the site-specific background dataset. The text will be revised to make this more clear; however, no changes regarding the use of the site-specific background data set are proposed.

EPA RPM Comment 4: Page 3-2. *Is it correct to say no MEC were discovered at the site? Also, the details of the removal are not clear. Was it only surficial dumping of munitions? Was there any sort of GPR done to determine if MEC was BGS?*

Response: During the 2004 beach clean-up along the Site 7 shoreline, an item suspected to be ordnance-related was found and labeled as "an unfused, unfired 3-inch projectile." It is unclear if it actually had originated from Site 7 or had washed up onto the beach. Nonetheless, all work conducted at Site 7 from that point forward included MEC/unexploded ordnance (UXO) avoidance support to be most conservative and safe. During the 2006 Geotube installation on the beach (large, sand-filled fabric "bags" used to protect the shoreline from wave erosion), all excavated materials were screened and sifted for MEC. The construction close-out report noted approximately 86 pounds of munitions debris (MD) consisting mainly of lifting lugs and fuse adapters were recovered. Although these items were identified as MEC, they can be used for non-ordnance-related applications. No munitions or UXO items were found during the Geotube installation. During the 2008 soil and debris removal action, a UXO technician was on-site as a conservative safety measure. Each test pit and removal area was inspected by a UXO technician using a magnetic gradiometer to screen for the presence of iron- or steel-bearing objects near and below the surface. No MEC or UXO items were encountered during the 2008 soil and debris removal action. Therefore, it is likely that the items recovered during the Geotube installation were metal debris and not MEC. (Details of the beach clean-up and Geotube installation are included in the 2007 Bhate Project Completion Report.)

There is no record of surficial or subsurface disposal of munitions at the site and none have been discovered during subsurface magnetic gradiometer screening and excavation activities. The SI Report will be revised to clarify that no MEC or UXO were encountered during the 2008 soil and debris removal action.

EPA RPM Comment 5: *Page 3-2. 2,3,7,8 TCDD? Was this a specific congener analysis? Or was this a full dioxin analysis where a TEQ was calculated?*

Response: For the 2008 soil and debris removal action, 2,3,7,8-TCDD was the only dioxin congener analyzed since it is the most toxic congener. (Full dioxin congener analysis did occur for the ash sample collected in 2004)

EPA RPM Comment 6: Page 3-4. *Chromium. Chromium should be carried through as a COPC. Risk management decisions can be made as part of the RI.*

Response: The SI report does not state that chromium should not be evaluated in the recommended Expanded SI or that the existing chromium data should not be carried forward for further quantitative risk analysis. This subsection of the SI report documents the risk evaluation that was performed in accordance with the Site 7 SI UFP-SAP and presents the results and conclusions of that evaluation. Moreover, the referenced page discusses potential human health risks associated with soil collected in 2004, prior to the completion of the TCRA. As a result of the 2008 soil and debris removal action, the soil

associated with these potential chromium risks has been removed from the site (i.e., the results of the risk screening conducted on the post-removal confirmation soil samples [Section 3.4.3] indicate no potential risk to human health as a result of chromium concentrations). No changes to the SI Report are proposed to address this comment.

EPA RPM Comment 7: *Page 3-5. Section 3.2.4. Ecological Risk Screening. I generally don't agree with the idea of assuming it has been diluted as the reason for not sampling. Decisions made at the site should be scientifically defensible. See BTAG Comments.*

Response: As discussed in the last bullet of this section, Site 7 borders a portion of the York River that is documented to be continually eroding based on the results of a scientific study (CCRM & VIMS, 2010). Any fine-grained material that was transported into the York River by the extensive storm surge during the 2003 hurricane (or other storms that have occurred since that time), would likely be widely dispersed and buried relative to pre-hurricane contaminant concentrations in the landfill area. There is uncertainty that contaminated material from the former landfill area remains in place today in the river adjacent to the site and at concentrations posing environmental risk.

Additionally, there are potential non-site-related and non-Navy sources of contamination to the York River similar to the soil contamination found at Site 7 that would make it extremely difficult to determine if any identified York River sediment contamination originated at Site 7. The Navy plans to complete a Watershed Contaminated Source Document (WCSD) to help identify other potential sources of contamination in the York River and which could assist with future risk management decisions. No changes to the SI Report are proposed to address this comment.

EPA RPM Comment 8: *Page 3-6. Section 3.3 Site Specific Background. I was not able to find any data from wells MW-1 and 2. Please include this data on table 3-4 or indicate why it was not included.*

Response: The site-specific background data are included in Table 3-2. However, since these data are being used in part to determine if COPCs are site-related contaminants, Table 3-4 will be revised to include a column with the maximum site-specific background value.

EPA RPM Comment 9: Page 3-8. *Section 3.4.2. I generally don't agree that COCs exceeding risk screening levels and 95% UTL/UCL of background should be screened out at the SI stage.*

Response: Comment noted. As discussed by the CAX Partnering Team on November 7, 2011, the team agreed to eliminate the use of the maximum background concentrations identified in the 2011 Background Study Report in the SI phase. The SI Report will be revised to remove all references to these maximum background concentrations.

EPA RPM Comment 10: *Page 3-9. It is highly unlikely that the dioxin detected is attributable to forest fires and more likely attributable to the ash layer at the site.*

Response: In accordance with EPA guidance and the UFP-SAP, a CERCLA-related release is characterized by site dioxin concentrations in exceedance of site-specific background levels (Page 45 of the Final UFP-SAP). Since select dioxin congeners were detected at similar concentrations in the upgradient (as depicted in Figure 3-4) site-specific background monitoring wells, which have not been impacted by the on-site ash layer, it is more likely that these concentrations are naturally occurring or the result of a non-site-related anthropogenic source (e.g., atmospheric deposition) and not related to the on-site ash layer. It is proposed that the end of the last sentence on page 3-9 be revised to read: "…the detected octachlorodibenzo-p-dioxin concentrations are likely not attributable to a release from the site and may

be naturally occurring (e.g., forest fire) or from a non-site-related anthropogenic source (e.g., atmospheric deposition)."

EPA RPM Comment 11: *Page 3-10. RDX should be looked at further upgradient from the Site 7 background well.*

Response: The Navy agrees that the source of RDX should be identified; however, due to the fact that it was detected in the upgradient, background monitoring wells, the RDX detections are not likely related to historical activities at Site 7. The Navy recommends the CAX Partnering Team discuss creating a new area of concern in order to determine the upgradient source of the RDX detections. No changes to the SI Report are proposed to address this comment.

EPA RPM Comment 12: *Page 3-10. Chloroform should be considered site related since other CVOCs are present at the site (TCE).*

Response: It is the Navy's position that the trace detections of chloroform in groundwater (the maximum detected concentration was estimated at 0.757J µg/L) are naturally occurring. However, since other clearly site-related VOCs were detected at concentrations that pose potential risk to receptors, the Navy has no objection to future groundwater samples (collected as part of the recommended Expanded SI) being analyzed for the full suite of VOCs, which includes chloroform. The details regarding implementation of the Expanded SI will be submitted under separate cover in an Expanded SI UFP-SAP. No changes to the SI Report are proposed to address this comment.

EPA RPM Comment 13: *Page 3-10. Pesticides. Was the background detection in the sites specific background wells or in the actual background study?*

Response: A background 95% UTL was not calculated for the detected base-wide pesticide concentrations; therefore, the site-specific background wells were used for comparison. The text of the SI Report will be revised to clarify that the site-specific background wells were used for comparison.

EPA RPM Comment 14: *Was the backfill certified clean fill or was it from an onsite source?*

Response: The backfill was brought to the site from an outside source and was certified clean. The removal action contractor, Shaw, verified the acceptability of the backfill through laboratory analytical testing; these results are provided in Appendix C of the Final CCR. No changes to the SI Report are proposed to address this comment.

EPA RPM Comment 15: *Page 3-13. Please see BTAG Comments on using mean HQs.*

Response: Please see the responses to EPA RPM Comment 2 (above) and BTAG Comment 3 (below).

EPA RPM Comment 16: *Page 3-14 and 3-15. Please see BTAG Comments on using the mean.*

Response: Please see the responses to EPA RPM Comment 2 (above) and BTAG Comment 3 (below).

EPA RPM Comment 17: *Page 3-16. Naturally occurring chloroform. See EPA RPM Comment 12.*

Response: Please see the response to EPA RPM Comment 12.

EPA Toxicologist Comments:

EPA Toxicologist Comment 1: ***Section 2.2:*** *It would be helpful to note that the 2011 soil sampling effort focused only on pH measurements (rather than chemical analyses) because extensive confirmatory*

sampling (TCL/TAL/dioxin) had been performed in 2008 (as reported in Table 2-1 of the report), and was considered for this SI.

Response: Agreed. Section 2.2 of the SI Report will be revised to note that the 2011 soil sampling focused on the collection of pH data because extensive soil sampling was completed in 2008 and was considered in the SI.

EPA Toxicologist Comment 2: ***Appendix A:*** *For chemicals like arsenic, where non-cancer endpoints dominate as the upper end of the cancer risk range is approached, a non-cancer evaluation of risk should also be performed.*

Response: The Navy's risk screening/risk ratio guidance (Overview of Screening, Risk Ratio, and Toxicological Evolution for Northern Division Human Health Risk Assessments, May 2000) was followed to conduct the evaluation. This guidance states "for chemicals that have both cancer and noncancer effects, in general, the RBC is based on cancer risk, and therefore only the cancer risk associated with that COPC is included in the risk ratio sum." In terms of arsenic, it is true that arsenic would be a COPC based on the noncancer endpoint (and an RSL derived based on noncancer risk). However, this would not change the conclusions of our human health risk screening assessment, which is that further evaluation is recommended for soil. No changes are proposed to the SI Report to address this comment.

EPA BTAG Comments:

EPA BTAG General Comment: *One of the recurring issues noted in the review is the use of mean concentrations when assessing risk. It must be noted that EPA ecological risk assessment guidance clearly states that "For the screening-level risk assessment, the highest contaminant concentrations measured on the site should be documented for each medium." It also clearly states that "Risk is estimated by comparing maximum documented exposure concentrations…" Region 3 BTAG uses mean concentrations to better understand the nature of contamination and potential exposure at a site; other uses are generally not appropriate or accepted.*

Response: The initial, screening-level risk evaluation did use and document maximum detected concentrations. Mean concentrations were only used in the subsequent refined analysis, which is comparable to ERA Step 3A (the first step of a baseline ERA).

EPA BTAG Comment 1: *Section 3.2.4 provided a screening evaluation of soil concentrations to sediment screening levels to assess the potential risk from soil that had eroded into the York River as a result of Hurricane Isabel in 2003. The evaluation concluded that unacceptable ecological risks in the York River from potential historical soil transport from the site are very unlikely. It is unclear why this approach was taken. It would be more appropriate to sample sediment in the York River as a more direct measure of what eroded from the bluff into the river. The screening evaluation is not sufficient to eliminate potential contamination in the York River from further consideration. It is not clear from the soil samples collected that the highest concentrations were detected as sampling was very limited. The volume of contaminated soil would also be an important factor in concentrations that would result in the river. This approach also does not consider historical soil or contaminants that may have been transported into the river. BTAG recommends that sediment samples be collected in the York River to better assess this migration pathway.*

Response: Please see the response to EPA RPM Comment 7. Additionally, according to the results of the Shaw removal action (Shaw, 2009), the boundary of the landfilled debris did not extend along the entire site shoreline, as depicted in the historical CSM (Figure 3-1 in the SI Report). There was likely only a small lobe (east of former Building 169) of potentially landfilled debris, contaminated fill material, and

ash that eroded into the River, but there is no confirmation as to the amount of material within that lobe. This information will be added to the SI Report.EPA BTAG Comment 2: *Section 3.2.4 on page 3-5 discusses the ecological risk screening that was performed at the site. The soil data used in this analysis was from the top two feet of fill material as these samples were collected in 2011 for pH analysis. It is still not clear what the date (pre-hurricane Isabel (2003), 2004, 2008 post removal, 2011) or the depth (backfill, 0 to 24 inches, 0-6 inches) of the soil samples were that determined contaminant concentrations used in this report. Indicate if any confirmation wall and floor samples were collected and analyzed during the removal action at this site. If so, it would be helpful to include these data in this report.*

Response: Section 3.2.4 describes the Pre-Hurricane Isabel Conceptual Site Model and the ecological risk screening conducted using the 2004, pre-TCRA surface soil (0 to 6 inches) and subsurface ash data to conservatively evaluate potential pre-TCRA soil to sediment transport from the site to the York River as a result of Hurricane Isabel. The first sentence of Section 3.2.4 states that the data evaluated in this subsection were collected in 2004 and refers the reader to the Appendix H tables, which also indicate that 2004 data were evaluated for this part of the document. There are no pre-hurricane data and the data used in the analysis in this subsection were not the data collected in 2011 for pH analysis.

Confirmation wall and floor samples were collected and analyzed during the removal action and were included in the SI report; however, these results are not discussed in Section 3.2.4, but rather in Sections 3.4.2 and 3.4.3, which discuss the post-removal action soil screening conducted using all 2008 post-removal samples (bottom and side wall) that were within the 0 to 24-inch depth range relative to the current (backfilled) site elevation. Samples of the backfill material were not included in the evaluation. The first sentence of Section 3.4.2 states that the data evaluated in this subsection were collected in 2008 during the removal action and in 2011. Section 3.4.3 refers the reader to the Appendix B tables, which also indicate that 2008 data were evaluated in this part of the document. Also, Table 3-3 includes the sample dates for the 2008 samples, and Figure 3-5 also indicates the sample dates and which samples were collected from the side wall or the floor. The 2011 soil samples were collected and analyzed only for pH, since pH was not measured in the 2008 samples, and the 2011 data were used to complete the Ecological Risk Evaluation included in Section 3.4.3. No changes are proposed to the SI Report to address this comment.

EPA BTAG Comment 3: *Section 3.2.4 on page 3-5 states that when evaluating ecological risk, "The initial COPCs [contaminants of potential concern] were then evaluated using more realistic assumptions to select refined COPCs." It is premature to refine exposure assumptions to less conservative levels and eliminate chemicals from further consideration at this point in the risk assessment process.*

Response: Please note that the more realistic risk evaluation presented in the SI was conducted to determine if those constituents exceeding conservative screening values likely pose a potential risk to human health and the environment and to provide an indication of data gaps that need to be filled by further investigation activities. Since the recommended path forward for Site 7 is an Expanded SI, the entire SI and pre-SI data set would be carried forward for use in future quantitative risk assessment activities that are deemed necessary by the team. This approach was presented in the Site 7 SI UFP-SAP which was approved by EPA and VADEQ. The Navy feels sufficient data were available to conduct the refined risk analysis, which approximates a Step 3A evaluation. The purpose of the refined analysis was to identify likely risk drivers (if any) to hone in on the significant environmental issues at the site and to aid in identifying any potential data gaps for planning future investigation activities. The methodology used for this evaluation is described in Appendix H.

In addition, the SI report does not conclude that any COPCs should be eliminated from further consideration. It evaluates the data that have been collected to date and recommends further investigation activities to close potential data gaps. All of the data collected to date would be carried forward to the next investigation stage until no further investigation activities are deemed to be warranted. Proposed future sampling locations, analytes, and number and types of samples will be presented in a forthcoming Expanded SI UFP-SAP which will be submitted to EPA and VADEQ for review and approval. No changes are proposed to the SI Report to address this comment.

EPA BTAG Comment 4: *Section 3.2.4 on page 3-6 states that "Buried debris has subsequently been removed from the site, and the potential for future contaminant migration via erosion or surface runoff to sediment is no longer a complete pathway." This statement is not supported by the facts that the site is still adjacent to the York River and is still subject to the effects of hurricanes (Hurricane Isabel in 2003 eroded 15 to 20 feet of shoreline from Site 7). This supports the future possibility of erosion of Site 7 and any associated contaminants onto the beach and into the York River.*

Response: It is true that Site 7 is located next to the York River and is still subject to the effects of hurricanes or other large storm events. However, the buried debris and adjacent soil contaminated above action levels that represented a potential source area for future contaminant migration to the York River have been removed. In addition, erosion protection was added to the Site 7 shoreline via the installation of Geotubes at the toe of the slope and via shoreline sloping activities conducted during the 2008 Removal Action (Shaw, 2009). Given that the evaluation performed as part of the SI concluded that the likelihood of historical impacts to the beach and York River sediments *prior to* the removal action is extremely unlikely, it is the Navy's position that any residual contamination remaining *after* the removal action does not represent an exposure risk. Although dispersion and burial would naturally accompany any potential contaminant migration from soil to river sediment, the results of the post-removal-action data presented in the SI indicate that none would be necessary to achieve concentrations well below any regulatory screening criteria. No changes are proposed to the SI Report to address this comment.

EPA BTAG Comment 5: *Section 3.2.4 on page 3-6 states that because of the continual erosion (e.g., net loss of sediment from the vicinity of Site 7) documented by the Center for Coastal Resource Management, sediment data collected at present from along the Site 7 shoreline would not be useful in determining whether or not a CERCLA release occurred from Site 7. The location of the erosion in the York River needs to be more specific than in the vicinity of Site 7. The fact that erosion in the York River in the vicinity of Site 7 is continual does not mean that contamination from Site 7 may not be found. Also, the data shown to date does not indicate any sampling of the beach area between the landfill (Site 7) and the York River or of the sediment in the York River. Therefore, assessment of risk to ecological receptors within these habitats is based on assumptions and not site specific data. As stated previously, BTAG recommends that samples be collected from the York River to assess this pathway.*

Response: Please see the response to EPA RPM Comment 7.

EPA BTAG Comment 6: *Section 3.4.2 on pages 3-10 states that hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) detected at the site is less than the concentration detected in the upgradient well and is not likely attributable to a release from buried debris. If the RDX in groundwater did not come from Site 7, a potential source may be present further inland. An investigation of upgradient areas may be warranted to identify other potential sources of RDX to groundwater.*

Response: Please see the response to EPA RPM Comment 11.

EPA BTAG Comment 7: *Section 3.4.3 on page 3-13 states that eight inorganic chemicals and one organic chemical exceeded screening levels based on maximum concentrations. The mean concentrations of six*

of the inorganic chemicals was less than screening levels, therefore it was concluded that these chemicals were not COPCs. It is not appropriate to eliminate chemicals based on the comparison to means at this phase of the project.

Response: Please see the response to EPA BTAG Comment 3.

EPA BTAG Comment 8: *Section 3.4.3 on page 3-14 states that the surface water values used to screen groundwater considered the salinity of the receiving water body (York River) to determine whether to apply freshwater or marine values. As such, marine values were used, where available, although freshwater values were extrapolated to the site if marine values were not available. Because the York River is brackish in the vicinity of the site, the lower of the marine and freshwater values should be used to evaluate impacts from discharging groundwater.*

Response: As discussed in Section 1.3.7, salinities in the York River estuary bordering CAX can be characterized as mesohaline (from 15 to 20 parts per thousand [ppt]). This salinity range supports the use of marine values (salinity > 10 ppt). Therefore, marine values are appropriate and were used to evaluate the potential for risks related to this potential transport pathway. Freshwater values were only extrapolated to the site if a marine value was not available. No changes are proposed to the SI Report to address this comment.

EPA BTAG Comment 9: *Section B.2 on page B-1 states "Soil screenings were conducted using all 2008 post-removal samples that were within the 0 to 24 inch depth range relative to the current (backfilled) site elevation; samples of the backfill material, however, were not included in the evaluation." This statement is confusing. The data from the 0 to 24 inch depth either represents soil that is no longer present on site or represents backfilled material that is on site. In the former case, the data is no longer relevant to this site. In the latter case, the data is relevant, but soil data below this layer, particularly along the eroding edge of the landfill still needs to be evaluated for potential ecological risk.*

Response: The samples used in the screening were within 24 inches (the depth of potential ecological exposures) of the current ground elevation (following backfilling) and were below the backfill material (i.e., soil in areas where less than 24 inches of backfill were placed). Thus, the use of these data is conservative since the samples are covered by backfill, which likely contains lower chemical concentrations, but less than 24 inches of backfill were present, which means that some ecological exposures to these samples are still possible. This explanation will be clarified in the text. In terms of evaluating erosion, please see the response to EPA BTAG Comment 4.

EPA BTAG Comment 10: *Page B-2, Section B.2 on page B-2 states "…ecological exposures are generally considered to be confined to the top two feet of the soil column." This approach may not be appropriate in areas susceptible to erosion. Since the eastern face of the landfill is eroding into the York River with the top of the landfill approximately 15 feet above the York River, the contamination on the eastern face of the landfill should be evaluated as this material may eventually erode in the river where ecological exposure would occur.*

Response: With the completion of the 2008 removal action, there is no landfilled material remaining to erode into the York River, and the slope has been graded back and seeded to prevent erosion. Please also see the response to EPA BTAG Comment 4.

EPA BTAG Comment 11: *Section B.2 on page B-2 states that background UTLs were used for comparison. The reasons for using UTLs, as opposed to UCLs, need to be provided. The text needs to clearly indicate why UTLs are used here and UCLs are used in Section B.3.2.*

Response: In accordance with the approved Final Site 7 UFP-SAP, data were compared to background 95% UTL values that were calculated as part of the Yorktown/CAX Background Study using facility-specific background data. The 95% UCLs (of the arithmetic mean) used in Section B.3.2 are exposure point concentrations used in the food web model, as discussed in the fifth bullet at the end of Section B.2. No changes are proposed to the SI Report to address this comment.

EPA BTAG Comment 12: *Section B.3.3 on page B-5 states that nitroglycerine (0.23 µg/l) [no screening value available] was not retained as a refined COPC because its concentration was lower than marine based screening values for other explosives. It is not clear that this methodology is reasonable as not all explosives have the same toxicity. Other supporting evidence should be provided to support this decision.*

Response: Marine surface water screening values for all explosives with screening values ranged from 8.00 µg/L to 5,000 µg/L (Table B-2), all of which are well above the maximum detected concentration (0.23 µg/L) of nitroglycerin. Note also in Table B-2 that the freshwater screening value for nitroglycerin is 138 µg/L, several orders of magnitude above the maximum detected concentration of nitroglycerin at the site. Thus, it is reasonable to screen out nitroglycerin on this basis. No changes are proposed to the SI Report to address this comment.

EPA BTAG Comment 13: *Section H-1 on page H-1 states "The ecological risk screening for this potential soil to sediment pathway assumed that the concentrations in the pre-TCRA surface soil (0 to 6 inches) data from samples at the site perimeter adjacent to the river were an appropriate representation of the potential concentrations in the sediment." While this might represent the concentrations in the surface layer, it does not represent the concentrations throughout the vertical depth of the landfill.*

Response: While there is some uncertainty associated with the use of these data, the surface layer is likely to be the best representation of the soil that washed out since it was at the top of the soil column when the 2003 storm event occurred. Also, since the concentrations in the surface strata were generally similar to, or higher than, the corresponding subsurface strata (where multiple depths were sampled) for the sample locations considered, the process used is likely to be a conservative representation of the available 2004 soil data set. This will be added to the text of the evaluation.

EPA BTAG Comment 14: *Section H.1 on page H-1 states "This historical pathway, which is no longer complete, following the completion of remedial action on the site, is the subject of the evaluation in this appendix." It is not clear if this historical pathway is the pathway in Appendix B or the transport of debris and soil from the site to the York River. In addition, it is not clear that this pathway "…is no longer complete".*

Response: The pathway being referred to is transport of landfilled debris and soil from the site to the York River during Hurricane Isabel. As discussed in the response to EPA BTAG Comment 4, this pathway is no longer complete because the landfilled debris and soil have been removed from the site and erosion protection was added to the Site 7 shoreline via the installation of Geotubes at the toe of the slope and via shoreline sloping activities conducted during the 2008 Removal Action (Shaw, 2009).

EPA BTAG Comment 15: *Section H.2 on page H-2 discusses the use of the ER-L and ER-M to evaluate risk in the river. While using ER-L and ER-M values as guidelines (meaning a 5% to 20% chance of risk if the concentration is below the ER-L or 75% to 100% chance of risk is the concentrations is above the ER-M value) are appropriate, it is not appropriate to use the ER-M value as a "less conservative" measure of risk to ecological receptors as it means there is a 21% to 74% chance of risk if the contaminant concentration is between the ER-L and ER-M values. This percent of risk to ecological receptors is too large to calculate an acceptable HQ (see Table H-3).*

Response: It In Section H.2, the only ER-M value used in the assessment was for lead. Based upon the data in Long et al. (1995), the cited reference for this value, concentrations between the ER-L and ER-M represent the "possible effect" range within which effects could occasionally occur. For lead, the incidence of adverse effects within this range is estimated to be 35.8 percent. The Navy feels the evaluation is appropriate and no changes are proposed to the SI report to address this comment.

EPA BTAG Comment 16: *Section H.2 on page H-2 states that mean concentrations were used as a less conservative screen. See previous comments regarding the use of mean concentrations*

Response: Please see the response to the previous comment and to EPA BTAG Comment 3.

EPA BTAG Comment 17: *Section H.3 on page H-3 (first bullet) indicates beryllium would likely be B-flagged if the data were validated. Support for this statement is needed.*

Response: Only half of the beryllium values were B-flagged. The bullet will be changed to read "For beryllium, half of the samples were B-flagged, while the rest were at or below the surface soil UTL (0.59 mg/kg), indicating that they were consistent with background levels. Thus, this constituent was not identified as a refined COPC."

EPA BTAG Comment 18: *Section H.3 on page H-3 states "Consequently, the ecological risk evaluation determined that unacceptable ecological risks in the York River from potential historical soil transport from the site are very unlikely." From the comments provided, it is not clear that this statement is supported, since no beach soil/sediment samples were collected and no sediment/pore water/surface water samples were collected and analyzed from the York River. Sampling in the York River is needed to more directly assess this pathway.*

Response: Please see the response to EPA RPM Comment 7.

EPA BTAG Comment 19: *Table H-4 shows exceedances of site soils as sediment. This table has two columns labeled "Marine Sediment Screening Value 1" and Marine Sediment Screening Value 2." Clarification should be provided on how these values were derived.*

Response: These labels will be changed to read "More Conservative Screening Value" and "Less Conservative Screening Value," respectively, to be consistent with Table H-3. The derivation of these values is described in Appendix I, Section I.2.

In January 2011, BTAG provided comments to Susanne Haug of EPA on the responses to comments on the Sampling and Analysis Plan for this site. These issues were later discussed with her. Based on a review of sections of the above document, it is unclear that all of these previous comments have been adequately addressed. Those that appear to have not been addressed are included below.

EPA BTAG Comment 20: *The Navy seems to be making a distinction between debris and contamination. While contamination may be associated with debris, it is also not necessarily visible and associated with sediment and surface water. The removal of debris from Site 7 and/or the shoreline/York River sediment does not mean that contamination from this site is not in areas adjacent to this landfill/dump.*

Response: Post removal confirmation soil samples were collected from the excavated area during the 2008 debris and soil removal action to ensure that, in addition to the landfilled debris, adjacent contaminated soil above action levels was removed. The excavated area was then backfilled with clean soil. The spatial extent of this removal action was agreed to by the Tier 1 partnering team when it approved the CCR.

EPA BTAG Comment 21: *It is still not clear what contaminant concentrations still exist at this site, including both the landfill and the adjacent shoreline. It is not clear what stabilization activities took place to ensure future erosion of this edge of the landfill did not occur.*

Response: Results of the removal action indicate that all buried debris has been removed from the site, as detailed in the CCR (Shaw, 2009). In addition, the results of post-removal confirmation samples indicate the range of contaminant concentrations remaining at the site following the removal action, which were evaluated as part of the SI. The stabilization activities included the 2006 installation of Geotubes at the toe of the slope to the Site 7 shoreline, and the shoreline sloping (and seeding) conducted after the 2008 removal action.

EPA BTAG Comment 22: *How much erosion occurs in the vicinity of this site? More information is needed to better define/support use of the term "unlikely." The net loss of sediment needs to be quantified on an annual basis, such that the reader can have an idea of how much sediment (mm, cm lost each year) is transported out of the Site 7 vicinity?*

Response: According to the *Estuarine Suspended Sediment Loads and Sediment Budgets in Tributaries of Chesapeake Bay*, conducted by the Center for Coastal Resource Management (CCRM) and the Virginia Institute of Marine Science (VIMS) (CCRM & VIMS, 2010), the shoreline erosion rate in the vicinity of Site 7 is 0.58 meters per year (Attachment 1). The SI Report will be updated to include this information.

EPA BTAG Comment 23: *Sampling of the shoreline and sediment in the York River is needed to confirm the assumption that it is unlikely that sediment data collected from along the Site 7 shoreline would be indicative of a CERCLA release at Site 7.*

Response: Please see the response to EPA RPM Comment 7.

EPA BTAG Comment 24: *The variability that does occur in contaminant concentrations in sediment makes this conclusion of ecological risk being unlikely uncertain.*

Response: Comment noted.

EPA BTAG Comment 25: *Assessing ecological risk due to contaminated groundwater needs to involve sediment and surface water, at a minimum. Therefore, it is clear that this ecological risk screening will only deal with one of three contaminant migration pathways and not all three. Since sediment and surface water samples are not proposed in this SAP for groundwater, this analyses is needed to reduce uncertainty.*

Response: Initial, screening-level assessments, as were conducted for this SI, are commonly conducted on groundwater data where surface water and sediment data are lacking from the receiving water body. Follow-on sampling of this pathway is generally only warranted if the screening-level assessment shows a potential risk, which appears not to be the case at this site (Appendix B).

EPA BTAG Comment 26: *Another issue that needs to be addressed is how much landfill (e.g., vertical feet, area) remains at Site 7 beneath the backfill material and what are the contaminant concentrations in that material that could be released through erosion. Also, how has the landfill edge facing the York River been stabilized such that erosion is minimized or eliminated?*

Response: Please see the responses to EPA BTAG Comments 4, 20, and 21.

EPA BTAG Comment 27: *Sediment in the York River needs to be added to the media to be sampled because it is in the migration pathway from the site.*

Response: See response to EPA RPM Comment 7 and BTAG Comment 25.

References

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Attachment 1

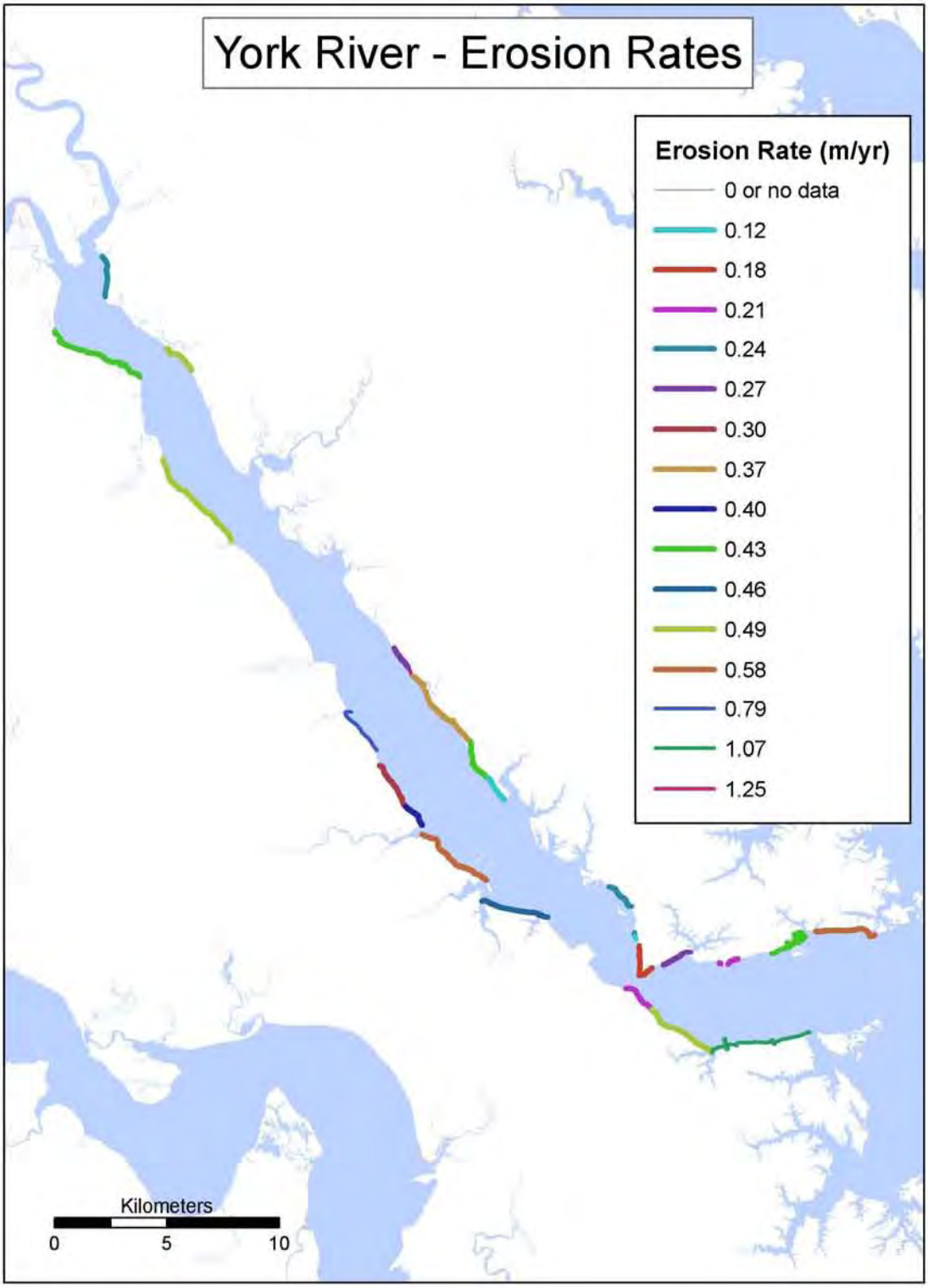

Figure 22. York River shoreline erosion rates (meters/year) using CBP analysis of Hardaway and others (1992). Only mainstem reaches were used.

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February 1, 2012

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Subject: Draft Site Inspection Report for Site 7-Old DuPont Disposal Area. September 2011.

Ms. Parra:

Thank you for the opportunity to review the subject document. EPA would like to provide the following comments at this time.

EPA RPM Comment 1: The idea that COC's in groundwater can be screened out simply because they are less than the upgradient well is an incorrect use of background and/or screening techniques regardless of what was in the SAP. This is also inconsistent with what we are doing at all other sites. EPA agrees that the technique could be used to determine if detected chemicals are site related, but contaminants detected that are lower the upgradient wells should not be screened out unless the groundwater is going to be deferred to another operable unit. Detections exceeding screening criteria (not including less than upgradient wells) should be carried through.

EPA RPM Comment 5 Response. What was the TEQ for the 2004 sample?

EPA RPM Comment 13 Response. Are the pesticide detections below the new "rule of thumb for intended use" number we have been using?

EPA RPM Comment 14 Response. Please clarify this in the text.

EPA BTAG Comment 1 recommended that sediment samples be collected in the York River to more directly assess the migration pathway from the site. As a result of a brief discussion with yourself and Krista Parra (Navy RPM), BTAG learned that discussions about sampling in the York River will occur after completion of the Watershed Contaminated Source Document which is expected in a few months (e.g., March-April 2012). However, no such agreement is presented

in these RTC. In fact, the RTCs actually provide considerable discussion on why sampling in the York River is not needed in the response to EPA RPM Comment # and EPA BTAG Comment 1. Several arguments were made for not wanting to sample in the river adjacent to the site. BTAG has comments on each of these statements.

a. The response to EPA RPM Comment 7 states that any material transported into the York River during storms would likely be widely dispersed and buried relative to pre-storm contaminant concentrations in the landfill area. This is entirely speculative, and no information is presented to support this statement. The sampling strategy must take transport of the material into account in order that potential risk may be assessed.

b. The response also states that there is uncertainty that contaminated material from the former landfill area remains in place today in the river adjacent to the site and at concentrations posing environmental risk. This uncertainty is exactly why sampling is needed. Sampling sediment is the most direct way to determine one way or the other whether contaminants were transported to the river.

c. The response also states that there are potential non-site related and non-Navy sources of contamination to the York River that would make it extremely difficult to determine if any identified York River sediment contamination originated at Site 7. No information is presented to support that there are other sources of contamination in the vicinity of Site 7. Therefore, this is not a valid argument for not sampling in the river off the site. BTAG is not aware of any other sources of contamination, particularly non-Navy sources, in this area of the river. Difficulty associated with the investigation and assessment does not preclude the need for it to occur.

d. The response to EPA BTAG Comment #1 states that there was likely a small lobe of potentially landfilled debris, contaminated fill material and ash that eroded into the York River, but there is no confirmation as to the amount of material within that lobe. The suspected erosion of this material further supports the need to sample sediment in the York River.

You emailed us a copy of a Table 3-5 Site 7 Decision Summary. This summary indicates that seven contaminants (endrin, arsenic, lead, manganese, mercury, selenium, thallium) had concentrations that exceeded background and ecological criteria. The conclusion is that an expanded SI would be completed to confirm selenium and thallium concentrations. The report needs to explain why concentrations of the other five contaminants listed above do not need to be confirmed.

The response to EPA BTAG Comment 1: It is not clear how much uncertainty exists in comparing soil concentrations to sediment screening values using post Hurricane Isabel (2003) data. If there were only a lobe of the landfill that was adjacent to the eroding bank, it is not clear that any of the soil data collected was from this lobe. The amount of material in this lobe is

unknown. It is uncertain if the highest concentrations were detected with the sampling that did occur. An adequate discussion of these issues needs to be added to the report. This uncertainty further supports additional sampling in the York River.

The response to EPA BTAG Comment 2 states "…all 2008 post-removal samples (bottom and side wall) were within the 0 to 24-inch depth range relative to the current (backfilled) site elevation." From this description, it is not clear why all samples within the 0 to 24-inch depth range would not be backfill material. The text needs to be clarified. The text needs to be clarified.

The response to EPA BTAG Comment 3: One purpose of an SI is to determine if a release has occurred. Limited samples were collected in the SI to make this determination. This limited sampling may be inadequate to properly assess risk to ecological receptors. The Navy needs to document that the spatial coverage of samples is adequate to support the screening level ecological risk assessment and the use of "…more reasonable assumptions to select refined COPCs."

The response to EPA BTAG Comment 4: With the uncertainties that have been identified by the Navy, it is unclear whether the site presents a risk to ecological receptors in and adjacent to the York River. The Navy identified debris from this site that was scattered far from the site in the river. What was released from this site to the York River is unknown and cannot be accurately estimated from existing data.

The response to EPA BTAG Comment 5 does not adequately address the BTAG recommendation.

The response to EPA BTAG Comment 7: There are enough uncertainties with the data and the methodologies used that it is likely the data could only be reasonably used to assess risk to ecological receptors at the screening-level stage.

The response to EPA BTAG Comment 11 needs to adequately explain why UTLs were used in one instance and UCLs were used in another instance. The Navy needs to clearly explain why background 95% UTLs were used instead of 95% UCLs and why 95% UCLs were used for exposure point concentrations and not UTLs.

The response to EPA BTAG Comment 12: While the data shown in this response does indicate that the marine and freshwater screening criteria used do exceed the maximum concentration of nitroglycerin. However, uncertainty still exists because there is no marine screening value for this contaminant. This uncertainty needs to be addressed.

The response to EPA BTAG Comment 13: The text needs to identify how many and which locations had multiple depths sampled. Using text like "…concentrations in the surface strata were generally similar to, or higher than, the corresponding subsurface strata…" can be interpreted to mean that some concentrations in the subsurface exceeded the concentrations in the surface strata.

The response to EPA BTAG Comment 15: The Navy suggests the use of the lead ER-M means the incidence of adverse effects is 35.8 percent. This means that over 1/3 of the organisms would experience adverse effects. This incidence of adverse effects is too high to be considered acceptable

The referred responses to EPA BTAG Comment 18 do not address this comment.

The response to EPA BTAG Comment 20 does not adequately address the potential for contamination from Site 7 to have entered the York River or its shoreline.

The response to EPA BTAG Comment 21: The confirmation sampling results and backfill contaminant concentrations need to be compared to screening values for terrestrial receptors (e.g., plants, invertebrates, birds, and mammals) to ensure that risk is not still present at this site.

The response to EPA BTAG Comments 22, 23, and 27: Information (e.g., shoreline erosion rate (0.58 meters per year), approximately 15 to 20 feet of erosion to the eastern bank of the landfill occurred in 2003, and Site 7 debris being found far from the site in the York River) needs to be used to plan additional sampling in the York River and adjacent shoreline areas.

The response to EPA BTAG Comment 25: There are sufficient uncertainties with the use of terrestrial data taken after the erosion occurred to support the collection and analysis of sediment and/or surface water samples from the York River and adjacent shoreline.

If you have any questions, please contact me at 215-814-3378.

Sincerely,

John Burchette
Remedial Project Manager

cc: Wade Smith, VDEQ

Response to Comments

Draft Site Inspection Report

Site 7

Naval Weapons Station Yorktown Cheatham Annex

Williamsburg, VA

February 29, 2012

EPA RPM Comments:

EPA RPM Comment 1: The idea that COC's in groundwater can be screened out simply because they are less than the upgradient well is an incorrect use of background and/or screening techniques regardless of what was in the SAP. This is also inconsistent with what we are doing at all other sites. EPA agrees that the technique could be used to determine if detected chemicals are site related, but contaminants detected that are lower the upgradient wells should not be screened out unless the groundwater is going to be deferred to another operable unit. Detections exceeding screening criteria (not including less than upgradient wells) should be carried through.

Response: Recommendations made in the Step 3 – Is Further Investigation or Action Required sub-section of Section 3.5 were revised to recommend an RI to characterize the extent of contamination from the site (i.e., any mention of specific contaminants that need to be verified and/or characterized at Site 7 was removed). In addition, as discussed in the response to EPA RPM Comment 2 in the January 11, 2012 RTC letter, Section 1.1.1 of the SI Report was revised to clarify the objectives of the SI. This section was revised to include text that states if the recommended path forward for the Site is an Expanded SI or Remedial Investigation, the entire SI data set would be carried forward for further quantitative risk assessment and if the recommended path forward is further investigation, the details regarding its implementation will be submitted under separate cover in a UFP-SAP.

EPA RPM Comment 5 Response. What was the TEQ for the 2004 sample?

Response: As shown in Table 3-1 of the SI Report, the Dioxin TEQ for CAS07N-SO04 (the only sample collected in 2004 that was analyzed for dioxins) was 33.5 picograms per gram.

EPA RPM Comment 13 Response. Are the pesticide detections below the new "rule of thumb for intended use" number we have been using?

Response: The pesticide concentrations referred to in this comment were detected in groundwater. At this time the CAX Partnering Team has not agreed to a "rule of thumb for intended use" concentration for pesticides detected in groundwater.

EPA RPM Comment 14 Response. Please clarify this [backfill was brought to the site from an outside source and certified clean] in the text.

Response: Section 3.1.3, 2008 Soil and Debris Removal, of the SI Report was revised to include a statement that the material used to backfill the site following the 2008 removal action came from off-base and was certified clean by the removal action contractor.

EPA BTAG Comments

EPA BTAG Comment 1: EPA BTAG Comment 1 recommended that sediment samples be collected in the York River to more directly assess the migration pathway from the site. As a result of a brief discussion with yourself and Krista Parra (Navy RPM), BTAG learned that discussions about sampling in the York

River will occur after completion of the Watershed Contaminated Source Document which is expected in a few months (e.g., March-April 2012). However, no such agreement is presented in these RTC. In fact, the RTCs actually provide considerable discussion on why sampling in the York River is not needed in the response to EPA RPM Comment # and EPA BTAG Comment 1. Several arguments were made for not wanting to sample in the river adjacent to the site. BTAG has comments on each of these statements.

> *a. The response to EPA RPM Comment 7 states that any material transported into the York River during storms would likely be widely dispersed and buried relative to pre-storm contaminant concentrations in the landfill area. This is entirely speculative, and no information is presented to support this statement. The sampling strategy must take transport of the material into account in order that potential risk may be assessed.*
>
> *b. The response also states that there is uncertainty that contaminated material from the former landfill area remains in place today in the river adjacent to the site and at concentrations posing environmental risk. This uncertainty is exactly why sampling is needed. Sampling sediment is the most direct way to determine one way or the other whether contaminants were transported to the river.*
>
> *c. The response also states that there are potential non-site related and non-Navy sources of contamination to the York River that would make it extremely difficult to determine if any identified York River sediment contamination originated at Site 7. No information is presented to support that there are other sources of contamination in the vicinity of Site 7. Therefore, this is not a valid argument for not sampling in the river off the site. BTAG is not aware of any other sources of contamination, particularly non-Navy sources, in this area of the river. Difficulty associated with the investigation and assessment does not preclude the need for it to occur.*
>
> *d. The response to EPA BTAG Comment #1 states that there was likely a small lobe of potentially landfilled debris, contaminated fill material and ash that eroded into the York River, but there is no confirmation as to the amount of material within that lobe. The suspected erosion of this material further supports the need to sample sediment in the York River.*

You emailed us a copy of a Table 3-5 Site 7 Decision Summary. This summary indicates that seven contaminants (endrin, arsenic, lead, manganese, mercury, selenium, thallium) had concentrations that exceeded background and ecological criteria. The conclusion is that an expanded SI would be completed to confirm selenium and thallium concentrations. The report needs to explain why concentrations of the other five contaminants listed above do not need to be confirmed.

Response: Comment noted. Since the January 11, 2012 Site 7 RTC letter was submitted, the Navy has agreed to prepare a Watershed Contaminant Source Document (WCSD) for the York River. Therefore, any York River sampling will be discussed during the Site 7 RI UFP-SAP, and no change to the SI is necessary. In addition, please see the response to EPA RPM Comment 1 above.

EPA BTAG Comment 2: The response to EPA BTAG Comment 1: It is not clear how much uncertainty exists in comparing soil concentrations to sediment screening values using post Hurricane Isabel (2003) data. If there were only a lobe of the landfill that was adjacent to the eroding bank, it is not clear that any of the soil data collected was from this lobe. The amount of material in this lobe is unknown. It is uncertain if the highest concentrations were detected with the sampling that did occur. An adequate discussion of these issues needs to be added to the report. This uncertainty further supports additional sampling in the York River.

Response: Figure 3-1 (the Historical Conceptual Site Model) in the SI Report was revised to include the soil sample locations collected in 2004 in order to clarify where historical soil samples were collected (i.e., inside/outside the lobe of landfill material). In addition, please see the response to BTAG Comment 1 above regarding sampling in the York River.

EPA BTAG Comment 3: The response to EPA BTAG Comment 2 states "…all 2008 post-removal samples (bottom and side wall) were within the 0 to 24-inch depth range relative to the current (backfilled) site elevation." From this description, it is not clear why all samples within the 0 to 24-inch depth range would not be backfill material. The text needs to be clarified.

Response: Excavation depths were determined by the depth of debris and ash that was present onsite and lead concentrations detected in the post-removal confirmation samples, as described in Section 3.1.3 of the SI Report and are not consistent throughout the site (Note: Shaw's 2008 CCR includes both pre- and post-backfill survey data). Therefore, post-removal confirmation soil samples that were collected from within 24" of the **current land surface** (36 out of the 47 soil samples) were used in evaluating potential ecological risks. As an example, if a post-excavation soil sample was collected, and one foot of backfill material was added above it, the post-excavation soil sample was used in the ecological risk evaluation because it was collected from a location that is **currently** within the 0-24" depth range for ecological receptors. However, if a post-excavation soil sample was collected and three feet of backfill was added above it, the post-excavation soil sample was not used in the risk evaluation because it is **currently** outside the 0-24" depth range for ecological receptors. The Ecological Risk Screening Results sub-section of Section 3.4.3 was revised to clarify that 36 out of the 47 post-removal confirmation soil samples are located within 24" of the **current** land surface and used to evaluate potential risk to ecological receptors.

EPA BTAG Comment 4: The response to EPA BTAG Comment 3: One purpose of an SI is to determine if a release has occurred. Limited samples were collected in the SI to make this determination. This limited sampling may be inadequate to properly assess risk to ecological receptors. The Navy needs to document that the spatial coverage of samples is adequate to support the screening level ecological risk assessment and the use of "…more reasonable assumptions to select refined COPCs."

Response: Forty-seven post removal confirmation samples were collected from throughout Site 7 (as depicted in Figure 3-5 of the SI) and evaluated in this SI (36 of which were used to evaluate potential risk to ecological receptors). The Navy feels the number of soil samples collected from this one-acre site is more than adequate to support the screening level ERA conducted in the SI. No changes to the SI Report are necessary.

EPA BTAG Comment 5: The response to EPA BTAG Comment 4: With the uncertainties that have been identified by the Navy, it is unclear whether the site presents a risk to ecological receptors in and adjacent to the York River. The Navy identified debris from this site that was scattered far from the site in the river. What was released from this site to the York River is unknown and cannot be accurately estimated from existing data.

Response: Please see the response to EPA BTAG Comment 1 above.

EPA BTAG Comment 6: The response to EPA BTAG Comment 5 does not adequately address the BTAG recommendation.

Response: Please see the response to EPA BTAG Comment 1 above.

EPA BTAG Comment 7: The response to EPA BTAG Comment 7: There are enough uncertainties with the data and the methodologies used that it is likely the data could only be reasonably used to assess risk to ecological receptors at the screening-level stage.

Response: Please see the response to EPA BTAG Comment 4 above.

EPA BTAG Comment 8: The response to EPA BTAG Comment 11 needs to adequately explain why UTLs were used in one instance and UCLs were used in another instance. The Navy needs to clearly explain why background 95% UTLs were used instead of 95% UCLs and why 95% UCLs were used for exposure point concentrations and not UTLs.

Response: The 95% UTL is a commonly used statistic for background evaluations and provides an upper bound estimate (tolerance limit) of the background concentration in an entire data set. The 95% UCL is a commonly used statistic in risk assessments and provides an upper bound estimate of an arithmetic mean concentration, that is, there is 95% confidence that the mean will be less than or equal to the 95% UCL value. Thus, the different purposes of the evaluations (background and risk assessment) determined which statistic (UTL vs. UCL) was appropriate.

EPA BTAG Comment 9: The response to EPA BTAG Comment 12: While the data shown in this response does indicate that the marine and freshwater screening criteria used do exceed the maximum concentration of nitroglycerin. However, uncertainty still exists because there is no marine screening value for this contaminant. This uncertainty needs to be addressed.

Response: Because this is an SI, there is no formal uncertainty section in the ecological risk screening appendix. However, the original response to EPA BTAG Comment 12 provided the information used to determine that the chemical could be screened out with acceptable uncertainty. This response is provided again below:

> Marine surface water screening values for all explosives with screening values ranged from 8.00 µg/L to 5,000 µg/L (Table B-2), all of which are well above the maximum detected concentration (0.23 µg/L) of nitroglycerin. Note also in Table B-2 that the freshwater screening value for nitroglycerin is 138 µg/L, several orders of magnitude above the maximum detected concentration of nitroglycerin at the site. Thus, it is reasonable to screen out nitroglycerin on this basis. No changes are proposed to the SI Report to address this comment.

EPA BTAG Comment 10: The response to EPA BTAG Comment 13: The text needs to identify how many and which locations had multiple depths sampled. Using text like "…concentrations in the surface strata were generally similar to, or higher than, the corresponding subsurface strata…" can be interpreted to mean that some concentrations in the subsurface exceeded the concentrations in the surface strata.

Response: Except for Sample 04 (the ash sample), all of the sample locations used in the SI had both a surface and a subsurface sample. None of the subsurface sample concentrations exceeded their corresponding surface sample concentrations. As noted in the original response, the use of the surface soil data resulted in a more conservative evaluation, and this will be clarified in the SI (Appendix H).

EPA BTAG Comment 11: The response to EPA BTAG Comment 15: The Navy suggests the use of the lead ER-M means the incidence of adverse effects is 35.8 percent. This means that over 1/3 of the organisms would experience adverse effects. This incidence of adverse effects is too high to be considered acceptable.

Response: As noted in the original response, concentrations between the ER-L and ER-M represent the "possible effect" range within which effects could occasionally occur. Thus, the ER-L and ER-M together

provide an estimate of the range of potential risks within the context of the conservative nature of the exposure estimates. In addition, the ER-L and ER-M values were used in the ecological risk screening, conducted using pre-TCRA soil data (2004), to estimate the historical potential soil to sediment transport from the site to the York River and as a result of the 2008 removal action, the soil associated with these samples has been removed from the site. The Navy will be completing a WCSD for the York River; therefore, any sampling of the York River and subsequent assessment of potential risk as a result of migration from Site 7 will be discussed during the Site 7 RI SAP, and no change to the SI is necessary.

EPA BTAG Comment 12: The referred responses to EPA BTAG Comment 18 do not address this comment.

Response: Please see the response to EPA BTAG Comment 1 above.

EPA BTAG Comment 13: The response to EPA BTAG Comment 20 does not adequately address the potential for contamination from Site 7 to have entered the York River or its shoreline.

Response: Please see the response to EPA BTAG Comment 1 above.

EPA BTAG Comment 14: The response to EPA BTAG Comment 21: The confirmation sampling results and backfill contaminant concentrations need to be compared to screening values for terrestrial receptors (e.g., plants, invertebrates, birds, and mammals) to ensure that risk is not still present at this site.

Response: Post-removal confirmation soil samples were compared to the screening values agreed to in the SI UFP-SAP (as shown in Table 3-3) and exceedances of these screening values are discussed in Section 3.4.2 of the SI Report. Since the backfill material was certified clean by the removal action contractor (see response to "EPA RPM Comment 14 Response," above, about clarifying this in the text) and previous comments received from the EPA, indicating that they were unclear as to why backfill material would be included in a ecological risk evaluation if it was certified clean by the removal subcontractor (May 2010 comments on the UFP-SAP), analytical data certifying that the backfill material was clean was not compared to screening criteria or evaluated in the SI. No changes will be made to the SI Report.

EPA BTAG Comment 15: The response to EPA BTAG Comments 22, 23, and 27: Information (e.g., shoreline erosion rate (0.58 meters per year), approximately 15 to 20 feet of erosion to the eastern bank of the landfill occurred in 2003, and Site 7 debris being found far from the site in the York River) needs to be used to plan additional sampling in the York River and adjacent shoreline areas.

Response: Please see the response to EPA BTAG Comment 1 above.

EPA BTAG Comment 16: The response to EPA BTAG Comment 25: There are sufficient uncertainties with the use of terrestrial data taken after the erosion occurred to support the collection and analysis of sediment and/or surface water samples from the York River and adjacent shoreline.

Response: Please see the response to EPA BTAG Comment 1 above.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

April 26, 2012

Mr. Scott Park
NAVFAC MIDLANT, Building N-26
Hampton Roads Restoration Product Line, Code OPHREV4
9742 Maryland Avenue
Norfolk, VA 23511-3095

Subject: Draft Site Inspection Report for Site 7-Old DuPont Disposal Area. September 2011.

Mr. Park:

Thank you for the opportunity to review the subject document. EPA would like to provide the following comments at this time.

1. The last part of BTAG Comment 1 stated that Table 3-5 in the decision summary indicates that seven contaminants (endrin, arsenic, lead, manganese, mercury, selenium, and thallium) had concentrations that exceeded background and ecological criteria. The conclusion is that an expanded site inspection (SI) would be completed to confirm selenium and thallium concentrations. BTAG stated that the report needed to explain why concentrations of the other five contaminants listed above do not need to be confirmed in the expanded SI. The response to comments (RTC) does not address this comment.

2. The response to BTAG Comment 2 indicates Figure 3-1 (Historical Conceptual Site Model) will be revised to show the soil sample locations collected in 2004. Upon further review of this and other figures, the eastern site boundary on the two conceptual site model figures (3-1 and 3-3) do not appear to match up with the eastern site boundaries shown on Figures 3-2, 3-4, 3-5, and 3-6. It would be helpful to show the lobe of waste/debris on the conceptual site model Figure 3-1 on all the other figures with sample locations and site boundaries.

3. The response to BTAG Comment 9 restates the original logic used in the report to eliminate an explosive with no marine surface water screening value. While the original logic is one way to address the issue, it leads to uncertainty. Another approach would be

to state there is no marine screening value for nitroglycerin, and while the maximum detected value of this compound is below the freshwater screening value, there is no way to compare it to the marine value for this compound. While uncertainty would still exist, the conclusion, it is not reasonable to screen out nitroglycerin, would be reasonable and more conservative.

4. BTAG Comment 14 stated that the confirmation sampling results and backfill contaminant concentrations need to be compared to screening values for terrestrial receptors (e.g., plants, invertebrates, birds, and mammals) to ensure that risk is not still present at this site. The RTC states that since the backfill material was certified clean by the removal action contractor, analytical data certifying that the backfill material was clean was not compared to screening criteria or evaluated in the SI. It would be helpful if information were provided indicating how the removal contractor certified that the backfill was clean.

If you have any questions, please contact me at 215-814-3378.

Sincerely,

John Burchette
Remedial Project Manager

cc: Wade Smith, VDEQ

Response to Comments

Draft Site Inspection Report
Site 7

Naval Weapons Station Yorktown Cheatham Annex
Williamsburg, VA
April 27, 2012

EPA Comment #1: *The last part of BTAG Comment 1 stated that Table 3-5 in the decision summary indicates that seven contaminants (endrin, arsenic, lead, manganese, mercury, selenium, and thallium) had concentrations that exceeded background and ecological criteria. The conclusion is that an expanded site inspection (SI) would be completed to confirm selenium and thallium concentrations. BTAG stated that the report needed to explain why concentrations of the other five contaminants listed above do not need to be confirmed in the expanded SI. The response to comments (RTC) does not address this comment.*

Response: According to the ecological risk screening in the SI (and the Step 2b column of Table 3-5), no refined COPCs were identified in soil, and it is concluded that there are no unacceptable ecological risks associated with this medium. However, there was some uncertainty with selenium, so it was carried into the Step 3 column of Table 3-5 as requiring further study. (Note: the reference to "thallium" in Step 3 was for human health, not ecological, risk.) Because of the Team's recent discussions between Step 2a (COPC identification) and Step 2b (COPC refinement) COPC selection in the SI phase, Step 3 of Table 3-5 and of Section 3.5 have been revised to state: "An RI is recommended to further characterize site related contamination and evaluate potential risk to human health and ecological receptors." This change allows the SI to conclude and opens up moving forward with the next investigation for Site 7. The Team will work out samples, analytes, data sets, etc. during development of the RI UFP-SAP.

EPA Comment #2: *The response to BTAG Comment 2 indicates Figure 3-1 (Historical Conceptual Site Model) will be revised to show the soil sample locations collected in 2004. Upon further review of this and other figures, the eastern site boundary on the two conceptual site model figures (3-1 and 3-3) do not appear to match up with the eastern site boundaries shown on Figures 3-2, 3-4, 3-5, and 3-6. It would be helpful to show the lobe of waste/debris on the conceptual site model Figure 3-1 on all the other figures with sample locations and site boundaries.*

Response: Figure 3-1 depicts historic, pre-Hurricane Isabel (i.e., pre- September 2003) conditions, while Figures 3-2 to 3-6 depict current conditions after the 2008 removal action. Following the removal action, the "lobe" and surrounding soil is gone, and the site elevation and grade has completely changed. The approximate location of the "lobe" can be added to Figure 3-2 (pre-TCRA conditions); however, it will be an approximate since these are aerial shots of current site conditions. There is really no reason or value added to depict the "lobe" after the removal action; therefore they will not be added to the Groundwater Contour Map (Figure 3-4), Post-Removal Soil Exceedance Results Figure 3-5), and Groundwater Exceedance Results (Figure 3-6).

EPA Comment #3: *The response to BTAG Comment 9 restates the original logic used in the report to eliminate an explosive with no marine surface water screening value. While the original logic is one way to address the issue, it leads to uncertainty. Another approach would be to state there is no marine screening value for nitroglycerin, and while the maximum detected value of this compound is below the freshwater screening value, there is no way to compare it to the marine value for this compound. While*

uncertainty would still exist, the conclusion, it is not reasonable to screen out nitroglycerin, would be reasonable and more conservative.

Response: Comment noted.

EPA Comment #4: *BTAG Comment 14 stated that the confirmation sampling results and backfill contaminant concentrations need to be compared to screening values for terrestrial receptors (e.g., plants, invertebrates, birds, and mammals) to ensure that risk is not still present at this site. The RTC states that since the backfill material was certified clean by the removal action contractor, analytical data certifying that the backfill material was clean was not compared to screening criteria or evaluated in the SI. It would be helpful if information were provided indicating how the removal contractor certified that the backfill was clean.*

Response: This information is included in Section 2.5 of the Construction Closeout Report (CCR), which states the acceptability of imported materials (i.e., backfill) was verified through laboratory analytical testing; the results are provided in **Appendix C** of the CCR. The CCR and use of the backfill material was reviewed and agreed upon by the Partnering Team.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

May 2, 2012

Mr. Scott Park
NAVFAC MIDLANT, Building N-26
Hampton Roads Restoration Product Line, Code OPHREV4
9742 Maryland Avenue
Norfolk, VA 23511-3095

Subject: Draft Site Inspection Report for Site 7-Old DuPont Disposal Area. September 2011.

Mr. Park:

Thank you for the opportunity to review the subject document. EPA would like to provide the following comments at this time.

The responses to comments 1 and 2 are acceptable.

The response to comment 3 is not acceptable. Noting the comment provides no assurance that the compound will be sufficiently addressed to the extent allowable by the existing literature and data.

The response to comment 4 is acceptable with the provision that the pertinent information from the construction completion report is provided for review and that data supports the assumption that the backfill material does not contain any contaminants at concentrations which pose an unacceptable ecological risk.

If you have any questions, please contact me at 215-814-3378.

Sincerely,

John Burchette
Remedial Project Manager

cc: Wade Smith, VDEQ

Response to Comments

Draft Site Inspection Report
Site 7

Naval Weapons Station Yorktown Cheatham Annex
Williamsburg, VA
May 5, 2012

EPA Comment (dated 5/2/12): The response to comment 3 is not acceptable. Noting the comment provides no assurance that the compound will be sufficiently addressed to the extent allowable by the existing literature and data.

Response: Looking at our original response more closely, we have noticed an error in the ecological risk screening text. Bullet 4 of Section B.3.3 states that nitroglycerin was identified as an initial COPC because it was detected and a screening value was not available. This is wrong, as there is an ecological screening value for nitroglycerin (138 µg/L, as shown in Table B-2). When the ecological screening statistics (Table B-18) were ran, the nitroglycerin screening value did not get pulled and "NSV" (No Screening Value) was assigned. Therefore, the text incorrectly states there is no screening value for nitroglycerin. The maximum detected concentration of nitroglycerin (0.23 µg/L) is several orders of magnitude below the ESV. Thus, it is reasonable to screen out nitroglycerin on this basis. We will revise the text (in Appendix B and the main body of the SI) to remove any discussion about nitroglycerin not having a screening value, and revise Tables B-18 and B-19 accordingly.

EPA Comment (dated 5/2/12): The response to comment 4 is acceptable with the provision that the pertinent information from the construction completion report is provided for review and that data supports the assumption that the backfill material does not contain any contaminants at concentrations which pose an unacceptable ecological risk.

Response: Since the CCR was submitted to the CAX Partnering team, the Navy, USEPA, VDEQ, and CH2M HILL should all have copies of the document to review. The document was also been uploaded to the Administrative Record and to NIRIS (Document Number 02419); however, since Appendix C of the CCR includes analytical data for all samples collected during the removal action, we've pulled the 300 pages of results that are pertinent to the backfill and attached for your information.

Analytical data for all samples collected during the removal action can be found in the

Final Construction Closeout Report

Shaw Environmental, Inc.

Cheatham Annex Site Post Decision File

(NIRIS Document Number **002419)**

If you have questions, please contact

Mr. Mark Piggott, Public Affairs Officer

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

June 12, 2012

Mr. Scott Park
NAVFAC MIDLANT, Building N-26
Hampton Roads Restoration Product Line, Code OPHREV4
9742 Maryland Avenue
Norfolk, VA 23511-3095

Subject: Draft Site Inspection Report for Site 7-Old DuPont Disposal Area. September 2011.

Mr. Park:

Thank you for the opportunity to review the subject document. The responses to comments are satisfactory and EPA has no additional comments on the document.

If you have any questions, please contact me at 215-814-3378.

Sincerely,

John Burchette
Remedial Project Manager

cc: Wade Smith, VDEQ