Final

# Record of Decision

Operable Unit 1, Site 1: Landfill Near Incinerator

Naval Weapons Station Yorktown, Cheatham Annex, Virginia

September, 2009

# 1 Declaration

This Record of Decision (ROD) presents the selected remedy of No Further Action (NFA) for all media (soil, groundwater, surface water, and sediments) at Operable Unit 1 (OU 1), also known as Environmental Restoration Program (ERP) Site 1, Landfill Near Incinerator, at Naval Weapons Station (WPNSTA) Yorktown, Cheatham Annex (CAX), Williamsburg, Virginia. The NFA determination has been made in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on information contained in the Administrative Record (AR) file for the site. Information not specifically summarized in this ROD or its references[1], but contained in the AR file has been considered and is relevant to the NFA determination for Site 1. Thus, this ROD is based upon and relies on the entire AR file for the site in making the decision.

The United States (U.S.) Department of the Navy (Navy) is the lead agency and provides funding for ERP activities at Site 1. The Navy and U.S. Environmental Protection Agency (USEPA) Region 3, the lead regulatory agency, issue this NFA ROD jointly. The Commonwealth of Virginia Department of Environmental Quality (VDEQ), the support regulatory agency, actively participated throughout the investigation process, has reviewed this ROD and the materials on which it is based, and concurs with this NFA decision.

Comprehensive environmental restoration activities at CAX began in 1984 under the Navy Assessment and Control of Installation Pollutants (NACIP) program, prior to state and federal regulatory oversight of environmental activities at the installation. The NACIP program was modified to become the ERP in 1986 (then known as the "Installation Restoration Program") to meet the requirements of CERCLA. CAX was added to the National Priorities List (NPL) in January 2001 (EPA ID: VA3170024605). A Federal Facilities Agreement (FFA) between the Navy and USEPA Region 3 was signed in March 2005. This agreement identified 12 sites and eight areas of concern (AOCs) for investigation and possible clean-up, and provided the framework and a schedule to accomplish this work (AOCs 4 and 5 were later determined to be part of Sites 4 and 1, respectively). Currently, there are 12 sites (five active and seven closed with NFA determinations) including Site 1, and six AOCs (all active) at CAX. These sites and AOCs either have been or are currently being evaluated in accordance with CERCLA and the NCP under the Navy's ERP, the status of which can be found in the AR file for CAX. The NFA determination documented in this ROD for Site 1 does not include or affect any other site at CAX.

## 1.1 Selected Remedy

As a result of environmental investigations and removal actions completed at Site 1, there is no unacceptable risk to human health or the environment under current or potential future site uses.

[1] Reference phrases, presented as ***Bold Italicized Text***, are followed by a corresponding reference number from the References section.

Therefore, the selected remedy for Site 1 is NFA for all media (soil, groundwater, surface water, and sediments). Because there are no hazardous substances, pollutants, or contaminants remaining onsite above the levels that allow for unrestricted use and unlimited exposure, a 5-year review will not be required.

## 1.2 Navy Authorizing Signature for the No Further Action Record of Decision for all media (soil, groundwater, surface water, and sediments) at Site 1, Landfill Near Incinerator, CAX, Williamsburg, Virginia

Tim S. Shipman LCDR

9/22/09

Lieutenant Commander Tim Shipman
Executive Officer
Naval Weapons Station Yorktown, Cheatham Annex

Date

## 1.3 USEPA Region 3 Authorizing Signature for the No Further Action Record of Decision for all media (soil, groundwater, surface water, and sediments) at Site 1, Landfill Near Incinerator, CAX, Williamsburg, Virginia

9/29/09

Henry J. Sokolowski
Director
Office of Federal Facility Remediation and Site Assessment

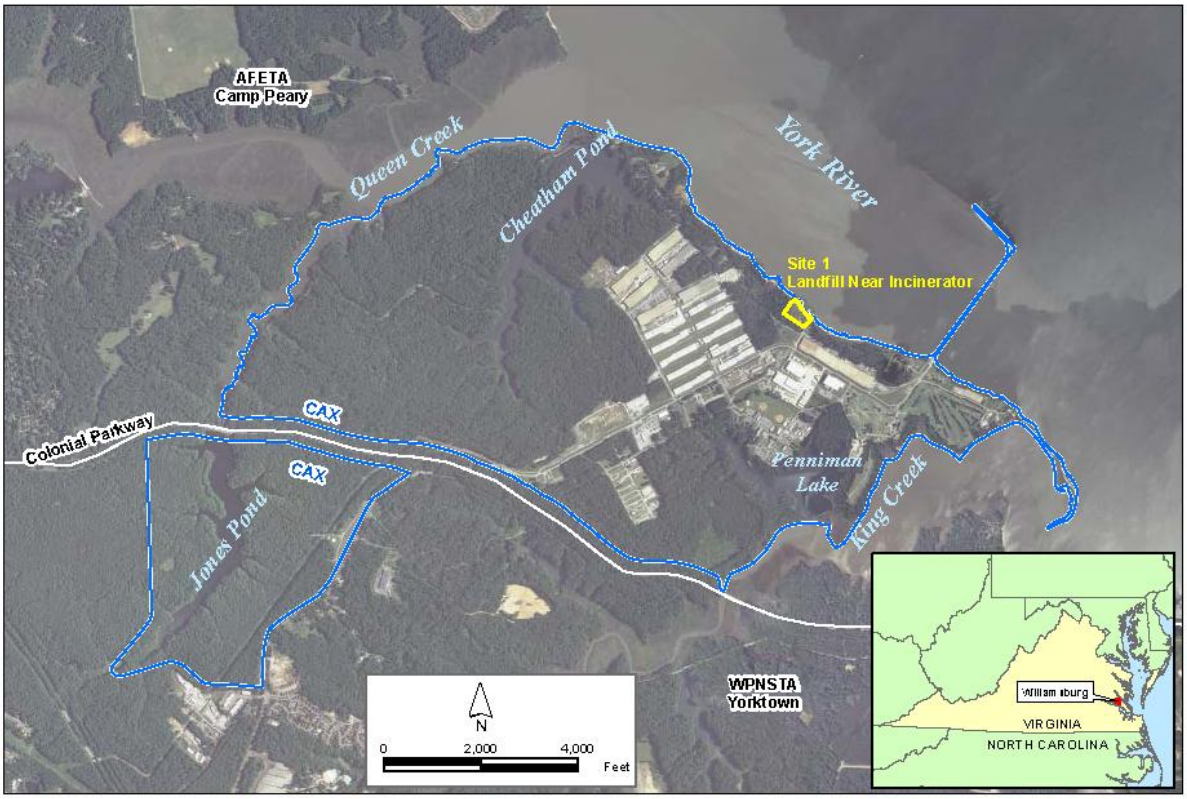
Date

# 2 Decision Summary

## 2.1 Site Description and History

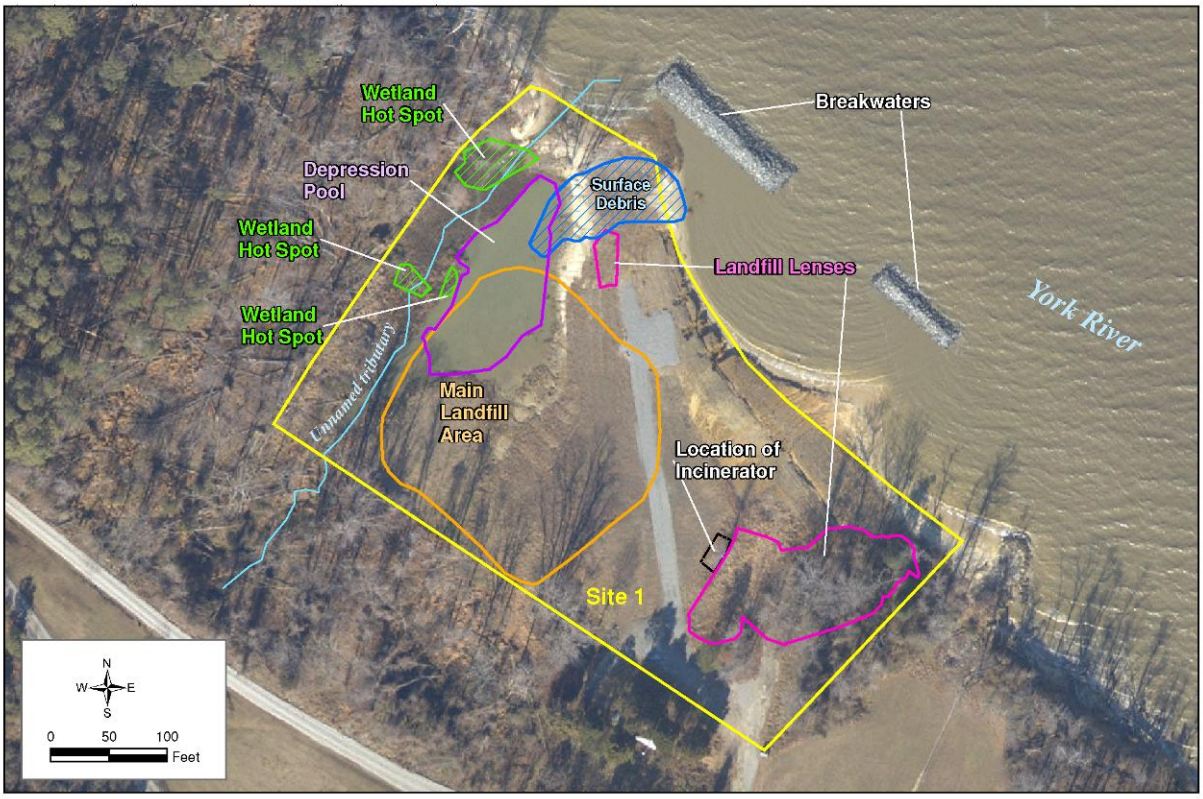
CAX is located in Williamsburg, Virginia, on the site of the former Penniman Shell Loading Plant, which was a large powder- and shell-loading facility operated during World War I (**Figure 1**). The Penniman facility closed in 1918 and was dismantled by 1923. Between 1923 and 1943, the property was used for farming or left 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. CAX is currently comprised of 2,300 acres and is divided into two separate parcels, with the larger parcel situated along the banks of the York River. The mission of CAX includes supplying Atlantic Fleet ships and providing recreational opportunities to military and civilian personnel.

**FIGURE 1**
Regional Location Map with the location of Site 1, Landfill Near Incinerator, within CAX




Site 1, Landfill Near Incinerator (**Figure 2**), is approximately 2 acres comprising five former contaminant areas: surface debris, the main landfill, a depression pool area, two small landfill lenses, and three wetland hot spots. The Site was originally used beginning in 1942 for disposing of ash from an incinerator located adjacent to the landfill. By 1951, this area was also being used as a general landfill. A variety of wastes, including empty paint and paint thinner cans, cartons of ether and other unspecified drugs, railroad ties, tar paper, sawdust, rags, concrete, lumber, glass, metal scrap, wood, and other miscellaneous debris, were burned and disposed in the landfill areas. In 1981, the main landfill was closed with a two-foot vegetated soil cover. The incinerator was dismantled between 1989 and 1992. In addition, surface debris was located in the northern corner of the site and contained cables, metal storage containers, an empty storage tank, automobiles, airplane and boat parts, and other miscellaneous items.

**FIGURE 2**
Former Site Layout – Site 1, Landfill Near Incinerator




## 2.2 Previous Investigations and Removal Actions

CAX initiated environmental investigation efforts under the NACIP program by conducting an Initial Assessment Study in 1984. Two confirmation studies were completed in 1986 and 1988. A Remedial Investigation (RI) Interim Report was completed in 1991 to summarize the results of the confirmation studies and recommended additional RI efforts for sites of concern, including Site 1. The site-specific investigations and removal actions are presented in the following subsections. The reports, as cited in the subsection headers, can be found in the administrative record.

### Site Investigation (SI) Report, Sites 1, 10, and 11 (Baker, 1994)

Six soil samples, seven groundwater samples, and six sediment samples were collected in 1992 to determine if landfill material had adversely impacted site media. Samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) (referred to as base/neutral/acids in the SI Report), total organic carbon (TOC), total inorganics, and total petroleum hydrocarbons (TPH). SVOCs, inorganics, and TPH were detected in soil samples; however, these contaminants were not detected in groundwater samples and were only detected to a limited extent in sediment samples. Based on these ***results*** (Reference [Ref.] 1), further investigation was recommended.

### Site Screening Process (SSP) Report, Sites 1, 10, and 11 (Baker, 1997)

Seven groundwater samples, analyzed for VOCs, SVOCs, pesticides, polychlorinated biphenyls (PCBs), and inorganics, were collected in 1997 and used in conjunction with soil and sediment sample ***results*** (Ref. 2) from the SI Report to conduct human health and ecological risk screenings. This risk screening also included a preliminary risk characterization.

The preliminary risk characterization determined that the contaminants at the Site presented an unacceptable risk to human receptors exposed to soil and groundwater. A potential cancer risk of $7.0 \times 10^{-4}$ and non-cancer hazard index (HI) of 20 were calculated, which exceeds the acceptable cancer risk range of $10^{-4}$ to $10^{-6}$ and non-cancer HI of 1, as established by the NCP at 40 Code of Federal Regulations (CFR) Section 300.430 (e)(2)(i)(A). In addition, potential unacceptable risks, above the target ecological index (EI) of 1, were identified for ecological receptors exposed to sediments; total calculated EIs ranged between 5.17 and 19.25. However, it was determined that no exposure pathway existed between the ecological receptors and the contaminants, which are located in the subsurface soil and groundwater, if the soil cover installed in 1981 was maintained. Therefore, the SSP report recommended that the landfill soil cover should be maintained, and the monitoring wells, which had been installed within the footprint of the landfill, should be abandoned to eliminate future potential direct pathways for contaminants within the fill material to migrate down to the water table.

### Field Investigation (FI) Report, Site 1 and AOC 2 (Baker, 1999)

A geophysical survey was conducted to delineate the ***boundaries of the landfill*** (Ref. 3). In addition, two soil samples, three surface water samples, and four sediment samples were collected and analyzed for VOCs, SVOCs, pesticides, PCBs, explosives, and inorganics. The ***analytical results*** (Ref. 4) were used to characterize the nature and extent of contamination. In addition, human health and ecological risk screenings, including a preliminary risk characterization, were conducted.

Potential unacceptable risks were identified for human and ecological receptors exposed to soil. The potential risk to human receptors was calculated to be a cancer risk of $1.9 \times 10^{-3}$ and a non-cancer HI of 11, which are above the acceptable cancer risk range of $10^{-4}$ to $10^{-6}$ and acceptable HI of 1 in accordance with the NCP at 40 CFR Section 300.430 (e)(2)(i)(A). For ecological receptors, total EIs ranging between 0.14 and 272,000 were estimated, with most EIs exceeding the target EI of 1. In addition, the FI report recommendations included implementing temporary landfill slope stabilization measures and clean-up of the landfill material that had eroded onto the York River shoreline because the toe of the landfill cover slope was unstable and eroded during storm events.

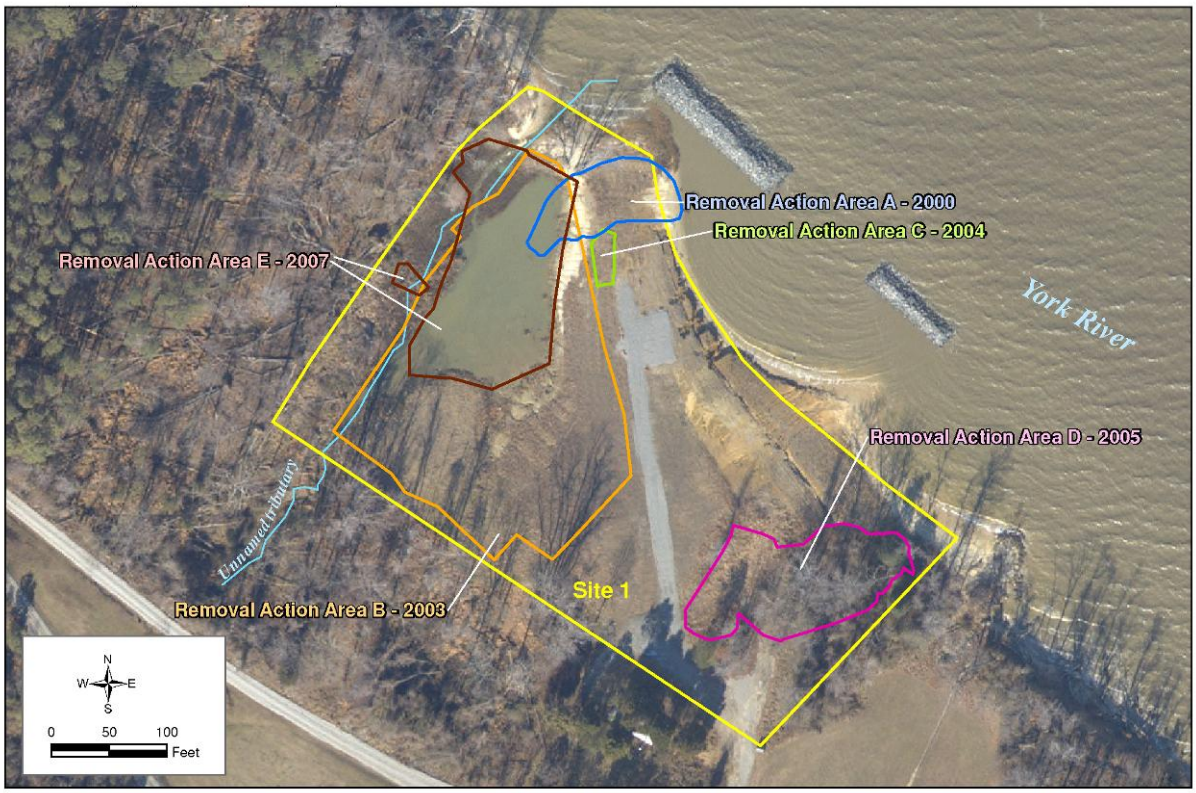
### Removal Action A and Construction Close-out Report (CCR), Time-Critical Removal Action (TCRA), Site 1 (Baker, 2000a)

Based on recommendations in the FI Report, a TCRA (Removal Action A, **Figure 3**) was completed between December 1999 and May 2000 and consisted of removing debris that had collected on the beach area of the York River and temporarily stabilizing the toe of the landfill cover slope in the eroded area. A total of five 55-gallon drums of debris were removed from the beach area and toe stabilization was accomplished by installing sand-filled geotubes. Upstream and downstream revetments were also installed to minimize erosion of the flanks of the cover slope.

### Focused Feasibility Study (FFS), Site 1 (Baker 2000b)

Based on the results of the Draft Final RI Report completed in August 2000 and completed as final in February 2004 (Round 1 Remedial Investigation, Site 1, summarized below), the Navy, with concurrence from USEPA Region 3 and VDEQ, agreed to evaluate remedial action options to address contaminants in soil within the landfill area (i.e., polyaromatic hydrocarbons [PAHs], pesticides, PCBs, and inorganics) that posed a potential risk to the current industrial user of the site. This focused evaluation considered three remedial action options to minimize contact with and off-site migration of these soils. The first option, no action, was only considered as a baseline. The second option included surface debris removal, restoration of the soil cover installed in 1981, and shoreline erosion control. The third option included surface debris removal, excavation and removal of the landfill, restoration of impacted wetland areas, and shoreline erosion control.

**FIGURE 3**
Removal Actions




## Trenching Letter Report, Site 1, Site 4, and AOC 2 (Baker, 2002)

Twenty-one (21) test pits were completed to evaluate the nature of the landfill contents and to determine the vertical and horizontal extent of buried materials. The total volume of the landfill waste, cover and soil, estimated for purposes of planning a removal, was 18,700 cubic yards (cy) of material.

## Engineering Evaluation and Cost Analysis (EE/CA) for Contaminated Soil, Site 1 (Baker, 2003)

Based on the comparison of remedial options included in the FFS, the Navy selected the third option, surface debris removal, excavation and removal of the landfill, restoration of impacted wetland areas, and shoreline erosion control to minimize contact with and off-site migration of contaminated landfill soil. ***Clean-up goals*** (Ref. 5) were established for PAHs, pesticides, PCBs, and inorganics by comparing individual human health and ecological remediation goals for each contaminant of concern and selecting either the lower of the two or the Base-specific background concentration. The initial human health and ecological remediation goals were based on regulatory screening levels.

As required by the NCP at 40 CFR Section 300.415(n)(4), a public notice of availability of the Draft EE/CA was published in the *Daily Press* on April 6, 2003, and the EE/CA was made available to the public for comment. No comments were received from the public during the comment period.

## Round 1 Remedial Investigation, Site 1 (Baker 2004)

Results from previous field investigations including soil boring information and analytical results (20 soil samples in 1999, 5 groundwater and 6 soil samples in 2000, and 10 surface soil, 5 subsurface soil, 5 surface water, and 22 sediment samples in 2001) were used to define the lateral and vertical extent of the landfill, were compared to the April 2002 USEPA Region 3 risk based

screening criteria (RBCs) to identify contaminants of potential concern (COPCs), and were used to evaluate potential human health and ecological risks and identify specific contaminants of concern (COCs).

The landfill was determined to be an approximate 1.0 acre area and impacted soil occupied approximately 0.3 acres in the northern part of the landfill. An estimated 16,400 cy of waste was determined to have been buried at varying depths ranging from the ground surface to approximately 16 feet below ground surface. Based on analytical data from the previous investigations, the following COPCs were identified for Site media:

| Medium | COPC |
|---|---|
| Soil inside the landfill area | PAHs, 4,4'-DDT, dieldrin, heptachlor epoxide, Aroclor-1248, Aroclor-1260, explosives, and inorganics |
| Soil outside and adjacent to the landfill | PAHs and inorganics |
| Sediment | PAHs, Aroclor-1254, Aroclor-1260, and inorganics |
| Groundwater | Bis(2-ethylhexyl)phthalate and inorganics |
| Surface water | Arsenic |

Contaminants detected in the native soil surrounding and beneath the landfill were found to be generally below the April 2002 USEPA Region 3 RBCs, indicating that the landfill waste did not significantly migrate to the surrounding soil.

## Human Health Risk Assessment (HHRA) Summary

As part of the RI, an HHRA was completed. Based on the ***human health conceptual site model (CSM)*** (Ref. 6 and Attachment 1), risks were quantitatively evaluated for current adult and adolescent trespassers, current adult commercial/utility workers, future adult construction workers, and future adult and child residents exposed to soil (within the waste boundary and outside/adjacent to the waste boundary), groundwater, surface water, and sediments using reasonable maximum exposure (RME) and central tendency exposure (CTE) calculations. Current receptors were evaluated for ingestion and dermal contact of surface soil, surface water, and sediments, and inhalation of surface soil. Future receptors were evaluated for ingestion and dermal contact of surface and subsurface soil, groundwater, surface water, and sediments, and inhalation of surface and subsurface soil as dust.

The RME calculation determines the highest level of human exposure that could reasonably be expected to occur, whereas the CTE level reflects a more realistic human exposure to average concentrations across the site. The potential non-cancer hazards, expressed as the hazard index (HI), and cancer risk estimates were calculated using RME concentrations. For non-cancer effects, an HI represents the ratio between the reference dose and the RME dose for a person in contact with site COPCs. An HI exceeding 1 indicates that adverse potential health effects are expected to occur. For known or suspected carcinogens, acceptable exposure levels generally are concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between $10^{-4}$ (a 1 in 10,000 chance of developing cancer) and $10^{-6}$ (a 1 in 1,000,000 chance of developing cancer), which is determined by using information on the relationship between dose and response.

***No potential unacceptable human health risks*** (Ref. 7) were identified for any receptor from exposure to sediments or surface water. ***Potential unacceptable cancer risks and non-cancer hazards*** (Ref. 8) were identified for future adult and child residents from exposure to soil (surface and subsurface) within the waste boundary. A total cancer risk of $2.4 \times 10^{-4}$ and total non-cancer HI of 1.67 was calculated for the future adult resident while a total cancer risk of $5.5 \times 10^{-4}$ and total non-cancer HI of 14.35 was calculated for the future child resident. Potential unacceptable cancer risks and non-cancer hazards were also identified for future adult and child residents from the potable use of

groundwater. A total cancer risk of $4.9 \times 10^{-4}$ and total non-cancer HI of 7.19 was calculated for the future adult resident while a total cancer risk of $2.9 \times 10^{-4}$ and total non-cancer HI of 16.89 was calculated for the future child resident. In addition, ***potential unacceptable non-cancer hazards*** (Ref. 9) were identified for future construction workers from exposure to soil within the waste boundary (total non-cancer HI of 4.64) and future child residents from exposure to soil outside/adjacent to the waste boundary (total non-cancer HI of 3.98). The potential risks and hazards from soil within the waste boundary, as summarized above, were primarily due to the presence of PAHs, pesticides, PCBs, and inorganics. The potential risks in groundwater and in soil outside/adjacent to the waste boundary, as summarized above, were primarily due to the presence of inorganics.

## Ecological Risk Assessment (ERA) Summary

As part of the RI, potential ecological risks were evaluated in an ERA, in accordance with Navy and USEPA policy and guidance. Media evaluated included surface and subsurface soil, groundwater, and surface water and sediments from the unnamed tributary. Ecological receptors evaluated included terrestrial plants and invertebrates, American robin, eastern screech owl, meadow vole, mourning dove, red fox, short-tailed shrew, white-footed mouse, aquatic plants, benthic invertebrates, great blue heron, mallard, marsh wren, mink, muskrat, and raccoon. Exposure pathways included direct contact with soil, surface water, and sediments; root uptake of soil and sediments; and ingestion of soil, surface water, sediments; and ingestion of plant and animal tissue. Potential risk to ecological receptors from groundwater was not addressed because groundwater does not present a direct exposure point for wildlife at the site. However, to be conservative, groundwater data was screened for ecological effects, assuming discharge to a surface water body with no dilution or natural attenuation.

First, the environmental setting, chemical fate and transport, ecotoxicity and potential receptors and complete exposure pathways were identified. This information was used to develop an ***ecological CSM*** (Ref. 10 and Attachment 2) and ***ecological assessment and measurement endpoints*** (Ref. 11). Both terrestrial and aquatic pathways were considered complete at Site 1. These receptor pathways were based on contaminants in surface water, soil (soil within the waste boundary and outside/adjacent to the waste boundary), and sediments.

Next, hazard quotients (HQs) were calculated to characterize the potential for contaminants to pose unacceptable ecological risk using conservative exposure assumptions. HQs represent a ratio of the exposure level to an ecological effect level, and are an estimate of potential risk. Maximum groundwater, sediments, surface water, and soil constituent concentrations were used in this step to estimate potential exposures for the ecological receptors selected to represent the assessment endpoints at Site 1. Upper trophic-level effects based on contaminants present in surface soil, sediments and surface water were determined by estimating the concentration of each ***bioaccumulating chemical*** (Ref. 12) in each relevant dietary component. Only contaminants with the potential to bioaccumulate were evaluated for exposures via food web modeling.

***Media-specific screening values*** (Ref. 13) for ecologically relevant media (i.e., soil, surface water, and sediments) were established for the assessment based on the USEPA Region 3 Biological Technical Assistance Group (BTAG) screening values. Alternate screening values were used when BTAG values were unavailable or more conservative values were available. In addition to the BTAG screening values, for lower trophic-level receptors, aluminum, antimony, barium, beryllium, cadmium, cobalt, and iron in soil were screened against Ecological Soil Screening Levels (Eco-SSLs), surface water screening values included National Ambient Water Quality (NAWQ) standards, and sediments screening values included Threshold Effects Levels (TELs) and Lowest Effects Levels (LELs). Upper trophic-level receptor evaluations were based on chronic No Observed Adverse Effect Levels (NOAELs) and chronic Lowest Observed Adverse Effect Levels (LOAELs) for ***toxicity values*** (Ref. 14) obtained from scientific literature. Chemicals with HQs greater to or equal to one, comprised of eight inorganics, two pesticides, seven PCBs, and hexachlorobenzene (a SVOCs), were identified as ***ecological COPCs*** (Ref. 15) for further evaluation in Step 3 of the ERA.

Finally, the conservative exposure assumptions employed for Step 2 were refined and risk estimates were recalculated using the mean instead of the maximum chemical concentrations of the COPCs as the basis for exposure and estimating upper trophic-level doses.

The ERA identified ***potential ecological risks*** (Ref. 16) to terrestrial habitats (specifically the Short Tailed Shrew [Shrew] and the American Robin [Robin]) from exposure to arsenic (HQ of 1.12 [Shrew]), lead (HQ of 1.35 [Robin]), zinc (HQ of 1.29 [Robin]) and Aroclor-1260 (HQ of 1.06 [Shrew]) in soil within the waste boundary and soil outside/adjacent to the waste boundary. In addition, potential ecological risks to aquatic habitats (specifically the raccoon, the marsh wren [wren], the great blue heron [heron], and the mallard) from exposure to arsenic (HQ of 2.01 [raccoon]), lead (HQ of 9.40 [wren]), mercury (HQ of 27.96 [heron] and 1.18 [mallard]), zinc (HQ of 5.64 [wren]), and Aroclor-1260 (HQ of 1.82 [heron]) were identified. The ERA recommended further evaluation of these potential risks in soil (within the waste boundary and outside and adjacent to the waste boundary), surface water, and sediments.

### 2003 Removal Actions B and C and Project Completion Report, Site 1 and Site 7 (Bhate, 2007)

Based on the EE/CA, a non-time critical removal action (NTCRA) (Removal Action B, **Figure 3**) was completed between June and December 2003 to address the potential human health and ecological risks. This action consisted of surface debris removal, excavation and offsite disposal of the majority of the main landfill (portions above the water table), and riverbank protection and stabilization through planting vegetation and installing two breakwaters in the York River. In addition, soil from 26 post-removal confirmation sampling grids were collected and analyzed for antimony, cadmium, copper, lead, mercury, nickel, silver, zinc, PCBs, PAHs, 4,4'-DDD and 4,4'-DDT. A total of 21,305 cy of landfill material and associated soil were removed. The ***results of post-removal confirmation sampling*** (Ref. 17) demonstrated that the human health and ecological clean-up goals were met. The excavated area was not backfilled to allow for future removal actions at depth and subsequently filled with water forming what was referred to in site documents as "the depression pool."

In September 2003, Hurricane Isabel made landfall in North Carolina. The resulting tidal surge and rainfall uncovered a small portion of the Site 1 landfill along the shore of the York River, located outside of the known extent of the landfill. As a result, the Navy directed the removal contractor to delineate and remove this material and associated contaminated soil. The removal of this landfill lens (Removal Action C, **Figure 3**) was conducted in February 2004 and consisted of excavation and off-site disposal of 370 cy of landfill material and associated soil and the collection of soil samples from ten landfill-delineation borings and two confirmation sampling locations. Soil samples were analyzed for antimony, cadmium, copper, lead, mercury, nickel, silver, zinc, PCBs, PAHs, 4,4'-DDD and 4,4'-DDT. The ***results of these soil sampling activities*** (Ref. 18) demonstrated that clean-up goals established in the 2003 EE/CA were met.

### 2004 Screening Ecological Risk Assessment (SERA) and Step 3a Refinement Report, Site 1 (Baker, 2005)

The ***results*** (Ref. 19) from three surface water and 30 sediment (surface and subsurface) samples, collected in 2004, were used to measure existing chemical concentrations after Removal Action B and Hurricane Isabel's landfall in September 2003. Samples were analyzed for SVOCs, PAHs, Pesticides, PCBs, and inorganics. As with the ERA (described above), potential ecological risks were evaluated, in accordance with Navy and USEPA policy and guidance.

***Potential unacceptable ecological risks*** (Ref. 20) to aquatic lower trophic-level receptors from exposure to total PAHs, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Aroclor-1260, cadmium, copper, lead, mercury, silver, and zinc detected in sediments were identified in the SERA. These contaminants were identified as risk drivers since they were detected at concentrations above the clean-up goals established for the protection of ecological receptors in the EE/CA. Further evaluation of these contaminants in sediments was recommended in the SERA.

In addition, seven sediment samples from an upgradient storm drain were collected and analyzed for PCBs to characterize the nature of upgradient influences. ***Aroclor-1260*** (Ref. 21) was detected in five

of the seven samples; however these concentrations were below the clean-up goal of 1,000 micrograms per kilogram (µg/kg), as established in the 2003 EE/CA.

### 2005 Removal Action D and Project Closeout Report Interim Removal Action D, Site 1 (Shaw, 2006)

Following discovery of another landfill lens, in the wooded area in the southeast portion of the site, near the former incinerator, the removal action was further expanded to include this area (Removal Action D, **Figure 3**). Removal Action D was completed between July and September 2005 and consisted of excavation and off-site disposal of 1,700 tons of landfill material and associated soil and shoreline stabilization through planting vegetation and replenishment of the sand behind the previously installed breakwaters in the York River. In addition, soil from eight post-removal confirmation sampling grids were collected and analyzed for antimony, cadmium, copper, lead, mercury, nickel, silver, zinc, PCBs, PAHs, 4,4'-DDD and 4,4'-DDT. The ***results of post-removal confirmation sampling*** (Ref. 22) demonstrated that clean-up goals established in the 2003 EE/CA were met.

### 2006 Technical Memorandum for the Pre-Removal Characterization of Sediments, Site 1 (Baker 2006)

Sediment sampling was completed in 2005 to characterize impacts to wetland areas adjacent to the former main landfill and to delineate contamination that remained below the water table within the depression pool area following Removal Action B. Sixty-two (62) sediment samples were collected from the wetland areas, and 46 sediment samples were collected from the depression pool area. Samples were analyzed for chemicals of concern (COCs) previously identified in the SERA (low level PAHs, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Aroclor-1260, cadmium, copper, lead, mercury, silver, and zinc). In addition, ***revised human heath and ecological clean-up goals*** (Ref. 23) for 4,4'-DDD, 4,4'-DDE, 4,4'-DDT and zinc, were established. The revised clean-up goals for 4,4'-DDD, 4,4'-DDT and zinc sediment were based on ecological risk-based values agreed upon by the Navy, USEPA Region 3, and VDEQ. A clean-up goal for 4,4'-DDE was established for the first time because it was identified as a risk driver in the SERA and no clean-up goal had been established in the EE/CA.

Based on the ***wetland area sampling results*** (Ref. 24), approximately 37 cy of sediments were identified for removal from three area "hot spots" (**Figure 2**). In addition, based on the ***depression pool sampling results*** (Ref. 25), approximately 1,800 cy of sediment were identified for removal from the depression pool area.

Three whole-body fish tissue samples were also collected to determine whether PCBs detected in the wetland area have been taken up by resident fish species and have the potential to impact upper trophic-level fish-eating receptors. The maximum estimated ***fish tissue concentration***, (Ref. 26) an estimated value of 3.3 micrograms per gram (µg/g), did not exceed literature-based tissue residue screening values (minimum screening value of 6.1) nor do the dietary intakes derived for the great blue heron exceed NOAEL-based ingestion screening values. No further action was recommended.

### 2007 Removal Action E and Final Completion Report Removal Action E Hot Spot Removal and Pond Recovery, Site 1 (Shaw, 2008)

Based on recommendations in the 2006 Pre-Removal Characterization of Sediments Technical Memorandum, the removal action was further expanded, with the revised clean-up goals and included an evaluation of the three wetland area hot spots, landfill waste, and associated sediment contamination within the depression pool area (Removal Action E, **Figure 3**). Removal Action E was completed between February and November 2007 and consisted of the excavation and off-site disposal of 3,070 cy of landfill material and associated sediment and the collection of 14 post-removal confirmation sediment samples from the wetland area hot spots. These sediment samples were analyzed for antimony, cadmium, copper, lead, mercury, nickel, silver, zinc, PCBs, PAHs, 4,4'-DDD, and 4,4'-DDT. (Samples were not analyzed for 4,4'-DDE because it was not detected in the pre-removal characterization sediment samples.) In addition, even though results of the pre-removal characterization sediment sampling from the depression pool area indicated that post-removal

confirmation samples were not required, four additional sediment samples were collected from this area following excavation activities. These samples were collected as a conservative, proactive measure and were analyzed for antimony, cadmium, copper, lead, mercury, nickel, silver, zinc, PCBs, PAHs, 4,4'-DDD, and 4,4'-DDT. ***Results of the post-removal sampling activities*** (Ref. 27) demonstrated that clean-up goals presented in the 2006 technical memorandum were met. As part of the restoration efforts, a man-made tidal flat was constructed within the footprint of the former depression pool area.

### Cheatham Annex Site 1 Groundwater Data Review and Risk Management Consideration Technical Memorandum (CH2M HILL, 2008a)

During the RI, unacceptable human health risks were identified from potable use of groundwater by a potential future resident from exposure to arsenic, iron, and manganese based on both RME and CTE calculations. These calculations included groundwater data collected from former monitoring well 1-GW07, once located within the former waste landfill. However, following the removal of all waste and former monitoring well 1-GW07, no further action for groundwater was recommended since the maximum and mean concentrations of arsenic, iron, and manganese in all monitoring wells immediately downgradient, side-gradient, and upgradient of the former landfill are below background levels. In addition, as discussed below in Section 2.5.3, the maximum arsenic, iron, and manganese concentrations in groundwater, calculated without samples from former monitoring well 1-GW07, were detected at concentrations that ***do not pose unacceptable potable groundwater-use risk*** (Ref. 28); therefore, the potential potable groundwater-use risks identified in the RI were determined to be acceptable.

### Documentation for No Further Action [NFA] Regarding Site Waste, Soil, and Sediment Technical Memorandum (CH2M HILL, 2008b)

All waste material had been removed from the site by the five removal actions. The ***results of all removal action confirmation sampling*** (Ref. 29) (as described above) demonstrated that remaining concentrations of chemicals in soil and sediments did not pose an unacceptable risk to human health or the environment. Thus site conditions were determined to allow for unlimited use and unrestricted exposure, and no further action was required.

## 2.3 Scope and Role of Operable Unit

Site 1 is one of 18 ERP sites and AOCs being addressed under CERCLA at CAX. The following sites are currently in the Site Investigation stage of the CERCLA process:

- Site 4 – Outdated Medical Supply Area
- Site 7 – Old DuPont Disposal Area
- Site 9 – Transformer Storage Area
- AOC 1 – Scrap Metal Dump
- AOC 2 – Dextrose Dump
- AOC 3 – CAD 11/12 Pond Bank
- AOC 6 – Penniman AOC
- AOC 7 – Drum and Can Disposal Area
- AOC 8 – Area South of Site 7

In addition, Site 11, the Bone Yard, is currently in the RI/FS stage of the CERCLA process. No other site at CAX has a final ROD in place; however, no further remedial action plans (NFRAPs) have been signed for the following sites:

- Site 2 – Signed August 2003 for all media
- Site 3 – Signed August 2004 for all media
- Site 5 – Signed August 2003 for all media
- Site 6 – Signed August 2003 for all media
- Site 8 – Signed August 2003 for all media

- Site 10 – Signed August 2003 for all media
- Site 12 – Signed August 2004 for all media

Information on the status of all ERP sites at CAX can be found in the current version of the SMP in the Administrative Record. The NFA determination documented in this ROD for Site 1 does not include or affect any other site at CAX.

## 2.4 Site Characteristics

All landfill material, surface debris, and contaminated soil and sediments were removed during the removal actions (**Figure 3**). The site consists of a man-made tidal flat that was created as part of site restoration following Removal Action E. The site is surrounded by wooded, grassy, wetland, and beach areas that support a diverse wildlife community (**Figure 4**).

**FIGURE 4**
Wetlands Monitoring/Viewing Station at CAX Site 1

The Site 1 removal actions were engineered to direct surface water runoff to the tidal flat (**Figure 5**). This runoff then flows through a meandering floor path towards the York River.

Groundwater in the vicinity of CAX occurs at approximately 10 feet below ground surface in the Yorktown-Eastover aquifer. This aquifer varies in thickness and is underlain by the Saint Mary's confining unit. The Saint Mary's confining unit can be up to 500 feet thick and prevents migration of contaminants to deeper aquifers. Groundwater flow direction mimics topography flowing toward and discharging into the unnamed creek and tidal flat to the northwest and the York River to the northeast.

**FIGURE 5**
Current Site Layout

## 2.5 Current and Potential Future Land and Resource Uses

The current use of Site 1 is a wetland with a wildlife viewing station. A wooden boardwalk and an observation deck have been constructed to allow viewing access. Potential future use of Site 1 is expected to remain the same.

Groundwater at CAX is not currently used for drinking water as drinking water is supplied to CAX by the City of Newport News Waterworks. In addition, drinking water is publically available, through the City of Newport News Waterworks, to those domestic homes located within the vicinity of CAX.

In the past, groundwater from the Yorktown-Eastover aquifer was the drinking water source for older individual homes within the vicinity of CAX and was used as a backup water supply for CAX itself.

Based on the results of risk assessments and the removal actions conducted, there are no contaminants remaining in groundwater that would pose unacceptable risks to human health if used as a drinking water supply. However, if risks did exist, impact to the former domestic water supply wells is not likely since they are located greater than one mile upgradient of Site 1 and because groundwater from Site 1 discharges directly to the York River.

## 2.6 Summary of Site Risks

Potential human health and ecological risks were evaluated in the RI prior to the removal actions conducted at Site 1 and SERA and Step 3 Refinement Report. In summary, prior to the five removal actions, potential human health risks were associated with exposure to soil within the waste boundary, soil outside and adjacent to the waste boundary, and groundwater (Attachment 3, Tables 3-1 and 3-2).

Subsequent to the five removal actions, potential risks were re-evaluated in a groundwater risk management technical memorandum, and a waste, soil, and sediments NFA technical memorandum, which document that all risks attributable to Site 1 soil, groundwater, and sediments were mitigated. In addition, based on previous investigations, there are no unacceptable human health or ecological risks from exposure to surface water.

### 2.6.1 Waste and Soil within the Waste Boundary

All waste and contaminated soil within the waste boundary were removed during the five removal actions. In addition, after completion of the removals, maximum detected concentrations of identified COCs did not exceed the clean-up goals (as established for the protection of human health and the environment in the Technical Memorandum for the Pre-Removal Characterization of Sediments) (**Table 1**). As a result, all potential unacceptable cancer risks and non-cancer hazards to adult and child residents, non-cancer hazards to future construction workers, and ecological risks to terrestrial habitats from exposure to waste and soil within the waste boundary have been mitigated.

Based on the results of the HHRA, which was undertaken before the removal actions, ***potential unacceptable cancer risks and/or non-cancer hazards*** (Ref. 30) associated with exposure to select SVOCs, pesticides, PCBs, and inorganics in waste and comingled soil within the waste boundary were identified for future construction workers (non-cancer HI of 4.64) and future adult (cancer risk of $2.4 \times 10^{-4}$, non-cancer HI of 1.67) and child (cancer risk of $5.5 \times 10^{-4}$ and non-cancer HI of 14.35) residents. In addition, based on the results of the ERA, ***potential ecological risks*** (Ref. 31) were identified to receptors in terrestrial habitats (specifically the shrew and the robin) from exposure to arsenic (HQ of 1.12 [shrew]), lead (HQ of 1.35 [robin]), zinc (HQ of 1.29 [robin]), and Aroclor-1260 (HQ of 1.06 [shrew]) in soil within the waste boundary. The clean-up goals for the removals were calculated to reduce risk presented by COCs to acceptable levels

**TABLE 1**
Maximum Concentrations of COCs in Soil following Removal Actions

| Contaminant (mg/kg) | Total PAHs | 4,4-DDD | 4,4-DDE | 4,4-DDT | Aroclor-1260 | Antimony | Cadmium | Copper | Lead | Mercury | Nickel | Silver | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Remediation Goal | 20.5 | 0.1 | 0.1 | 0.1 | 0.1 | 11 | 4 | 50 | 50 | 0.24 | 30 | 2 | 50 |
| Maximum Concentration | 1.524 | 0.0237 | NA | 0.0173 | 0.01 | 10.9 | 3.3 | 17.3 | 38.6 | 0.098 | 8.8 | 1.8 | 47.1 |

mg/kg – milligrams per kilogram
NA - Not Analyzed, analytical results from pre-removal characterization sampling indicated that this constituent was below the remediation goal.

### 2.6.2 Soil Outside and Adjacent to the Waste Boundary

Following completion of the five removal actions, the maximum detected concentrations of identified COCs did not exceed the clean-up goals for soil (as established for the protection of human health and the environment in the Technical Memorandum for the Pre-Removal Characterization of Sediments) (**Table 1**). Therefore, ecological risks to terrestrial habitats from exposure to any soil at Site 1 have been mitigated

Based on the results of the HHRA, ***potential unacceptable non-cancer hazards*** (Ref. 32) were identified for child residents from cumulative exposure (by ingestion) to inorganics in soil outside and adjacent to the waste boundary (total non-cancer HI of 3.98). In addition, based on the results of the ERA, ***potential ecological risks*** (Ref. 33) were posed to terrestrial habitats (specifically the shrew and the robin) from exposure to arsenic (HQ = 1.12 [shrew]), lead (HQ = 1.35 [robin]), zinc (HQ = 1.29 [robin]), and Aroclor-1260 (HQ = 1.06 [shrew]) in soil outside and adjacent to the waste boundary. The identified potential non-cancer hazards calculated for the child resident were associated with the ingestion of antimony, arsenic, chromium, copper, iron, manganese, nickel, and

thallium and are considered acceptable for numerous reasons: (1) no individual contaminants exceeded the acceptable RME risk threshold (HQ of 1); (2) these inorganics target different organs in the human body (for example, antimony targets the whole body; arsenic targets the skin; copper targets the gastrointestinal system; and iron targets the liver); (3) contaminant concentrations are consistent with background; and (4) there is no potential unacceptable risk based on more realistic CTE assumptions (**Table 2**). No risks were identified due to the presence of organics in the soil outside and adjacent to the waste boundary.

**TABLE 2**
Summary of Risk to Child Resident from Ingestion of Inorganics

| Media | Chemical of Concern | EPC (mg/kg) | RME Cancer Risk | RME Non-Cancer Hazard (HQ) | CTE Cancer Risk | CTE Non-Cancer Hazard (HQ) | CSF (mg/kg-day-1) | RfD (mg/kg-day) |
|---|---|---|---|---|---|---|---|---|
| Surface Soil | Arsenic | 6.93 | $1.1x10^{-5}$ | 0.3 | $3.8x10^{-6}$ | 0.099 | 1.5 | 0.0003 |
| | Chromium | 18.4 | Non carcinogenic | 0.078 | Non carcinogenic | 0.026 | NA | 0.003 |
| | Copper | 140 | Non carcinogenic | 0.045 | Non carcinogenic | 0.015 | NA | 0.04 |
| | Iron | 20,735 | Non carcinogenic | 0.88 | Non carcinogenic | 0.3 | NA | 0.3 |
| | Manganese | 109 | Non carcinogenic | 0.069 | Non carcinogenic | 0.023 | NA | 0.02 |
| | Thallium | 0.474 | Non carcinogenic | 0.087 | Non carcinogenic | 0.029 | NA | 0.00007 |
| | Total | -- | -- | 1.5 | -- | 0.49 | -- | -- |
| Subsurface Soil | Antimony | 2.39 | Non carcinogenic | 0.077 | Non carcinogenic | 0.026 | NA | 0.0004 |
| | Arsenic | 5.27 | $8.7x10^{-6}$ | 0.22 | $2.9x10^{-6}$ | 0.075 | 1.5 | 0.0003 |
| | Chromium | 27.2 | Non carcinogenic | 0.12 | Non carcinogenic | 0.039 | NA | 0.003 |
| | Iron | 12,879 | Non carcinogenic | 0.55 | Non carcinogenic | 0.18 | NA | 0.3* |
| | Nickel | 354 | Non carcinogenic | 0.23 | Non carcinogenic | 0.076 | NA | 0.02 |
| | Thallium | 0.672 | Non carcinogenic | 0.12 | Non carcinogenic | 0.041 | NA | 0.00007 |
| | Total | -- | -- | 1.3 | -- | 0.44 | -- | -- |

EPC – EPA - Exposure-Point Concentration; the concentration of COC detected by sampling and analysis either before or after the removal actions
mg/kg – milligrams per kilogram
RME – Reasonable Maximum Exposure
HQ – Hazard Quotient
CTE – Central Tendency Exposure
CSF – Cancer Slope Factor
RfD – Non-Cancer Toxicity Factor

### 2.6.3 Groundwater

Based on the HHRA in the RI, ***potential unacceptable cancer risks and non-cancer hazards*** (Ref. 34) were identified, based on RME concentrations, for future adult (total cancer risk of $4.9x10^{-4}$ and total non-cancer HI of 7.19) and child (total cancer risk of $2.9x10^{-4}$ and total non-cancer HI of 16.89) residents from the potable use of groundwater. The potential risks were primarily associated with arsenic, iron, and manganese detected in former monitoring well 1-GW07, which was screened within the former landfill area. No unacceptable risks were identified for organic contaminants including VOCs, SVOCs, pesticides, or PCBs. The groundwater risk assessment was re-evaluated following the five removal actions using data from the existing monitoring wells. Risk was determined to be ***acceptable*** (Ref. 35) because the maximum arsenic, iron, and manganese concentrations are below background concentrations (**Table 3**), and therefore, are considered naturally occurring. In addition, no potential unacceptable risk exists based on more realistic CTE calculations (**Table 3**).

**TABLE 3**
Summary of Potential Unacceptable Human Health Risks due to Exposure to Groundwater

| Receptor | Pathway | Chemical of Concern | EPC (µg/L) | Background Concentration (µg/L) | RME Cancer Risk | RME Non-Cancer (HI) | CTE Cancer Risk | CTE Non-Cancer Hazard (HI) | CSF (mg/kg-day-1) | RfD (mg/kg-day) |
|---|---|---|---|---|---|---|---|---|---|---|
| Future Child Resident (Prior to Removal Action) | Ingestion | Arsenic | 34.7 | 12.6 | $2.9 \times 10^{-4}$ | 7.4 | $6.4 \times 10^{-5}$ | 4.9 | 1.5 | 0.0003** |
| | | Iron | 29,800 | 11,400 | Non carcinogenic | 6.4 | Non carcinogenic | 4.2 | N/A | 0.3* |
| | | Manganese | 505 | 760 | Non carcinogenic | 1.6 | Non carcinogenic | 1.1 | N/A | 0.02* |
| | Dermal | Arsenic | 34.7 | 12.6 | $1.1 \times 10^{-6}$ | 0.029 | $8.3 \times 10^{-8}$ | $6.5 \times 10^{-3}$ | 1.5 | 0.0003** |
| | | Iron | 29,800 | 11,400 | Non carcinogenic | 0.032 | Non carcinogenic | $7.1 \times 10^{-3}$ | N/A | 0.3* |
| | | Manganese | 505 | 760 | Non carcinogenic | 0.21 | Non carcinogenic | $4.6 \times 10^{-2}$ | N/A | 0.02* |
| Future Child Resident (Following Removal Action) | Ingestion | Arsenic | 3.6 | 12.6 | $3.0 \times 10^{-5}$ | 0.77 | $6.6 \times 10^{-6}$ | 0.51 | 1.5 | 0.0003** |
| | | Iron | 720 | 11,400 | Non carcinogenic | 0.066 | Non carcinogenic | 0.044 | N/A | 0.3* |
| | | Manganese | 110 | 760 | Non carcinogenic | 0.35 | Non carcinogenic | 0.24 | N/A | 0.02* |
| | Dermal | Arsenic | 3.6 | 12.6 | $2.3 \times 10^{-6}$ | 0.0051 | $1.4 \times 10^{-8}$ | $1.1 \times 10^{-3}$ | 1.5 | 0.0003** |
| | | Iron | 720 | 11,400 | Non carcinogenic | 0.00043 | Non carcinogenic | $9.5 \times 10^{-5}$ | N/A | 0.3* |
| | | Manganese | 110 | 760 | Non carcinogenic | 0.059 | Non carcinogenic | $1.3 \times 10^{-2}$ | N/A | 0.02* |

EPC – EPA - Exposure-Point Concentration; the concentration of COC detected by sampling and analysis either before or after the removal actions.
µg/L – micrograms per liter
mg/kg – milligrams per kilogram
RME – Reasonable Maximum Exposure
HI – Hazard Index
CTE – Central Tendency Exposure
CSF – Cancer Slope Factor
RfD – Non-Cancer Toxicity Factor
* - Source: National Center for Environmental Assessment (NCEA)
** - Source: Integrated Risk Information System (IRIS)

Groundwater was not used to determine potential risk to ecological receptors since it does not present a direct exposure point for wildlife at the site.

### 2.6.4 Surface Water

Based on the HHRA, ***no unacceptable human health risks*** (Ref. 36) were identified from exposure to surface water. Cancer risks to future child residents under RME assumptions were calculated at $4.0 \times 10^{-7}$, within the USEPA's acceptable levels, and non-cancer hazards to future child residents under RME assumptions were calculated at below USEPA's acceptable threshold. Limited ecological risks associated with exposure to aluminum, cobalt, iron, and manganese in surface water were identified in the ERA. However, following removal of the landfill source area, a SERA was conducted in which surface water samples were re-collected to re-evaluate potential risk to ecological receptors. No potential risks were identified upon re-evaluation after the removal actions because the contaminant concentrations were determined to be equivalent to background concentrations.

### 2.6.5 Sediments

Based on the HHRA, ***no unacceptable human health risks*** (Ref. 37) were identified from exposure to sediment. Cancer risks to future child residents under RME assumptions were calculated to be

$3.9 \times 10^{-6}$, within the USEPA's acceptable levels, and non-cancer hazards to future child residents under RME assumptions were calculated at 0.39, below USEPA's threshold for consideration of action.

No unacceptable risk to ecological receptors is present by site sediments since completion of the removal actions (**Table 4**). Based on the results of the SERA, undertaken before the removal actions, ***potential unacceptable ecological risks*** (Ref. 38) to aquatic lower trophic-level receptors from exposure to total PAHs, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Aroclor-1260, cadmium, copper, lead, mercury, silver, and zinc detected in sediments were identified. These contaminants were identified as risk drivers since they were detected at concentrations above the clean-up goals established for the protection of ecological receptors in the EE/CA.

These potential risks, however, were addressed upon completion of Removal Action E, after which the maximum detected concentrations of identified COCs did not exceed the clean-up goals (as established for the protection of human health and the environment in the Technical Memorandum for the Pre-Removal Characterization of Sediments) (**Table 4**). As a result, ecological risks to aquatic lower trophic-level receptors from exposure sediments have been mitigated.

**TABLE 4**
Maximum Concentrations of COCs in Sediments, following Removal Actions

| Contaminant (mg/kg) | Total PAHs | 4,4-DDD | 4,4-DDE | 4,4-DDT | Aroclor-1260 | Antimony | Cadmium | Copper | Lead | Mercury | Nickel | Silver | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Remediation Goal | 4 | 0.11 | 0.11 | 0.34 | 1 | 11 | 1.2 | 34 | 136 | 0.24 | 20.9 | 1 | 202 |
| Maximum Concentration | 2.989 | 0.107 | NA | 0.135 | 0.0905 | 5.5 | 1.2 | 29.3 | 69.1 | 0.18 | 10.6 | 0.44 | 197 |

NA = Not Analyzed, analytical results from pre-removal characterization sampling indicated that this constituent was below the remediation goal.

## 2.7 No Further Action Determination

Site 1 poses no unacceptable risk to human health or the environment. The Navy in partnership with the USEPA Region 3 and VDEQ agreed NFA is required under CERCLA for Site 1. Site conditions allow for unlimited use and unrestricted exposure. No remedial response action and no restrictions on any land use are necessary at Site 1.

## 2.8 Community Participation

Community participation at CAX includes a Restoration Advisory Board (RAB), public meetings, public information repositories, newsletters, fact sheets, public notices, and an ERP web site. The Community Involvement Plan for CAX (and Naval Weapons Station Yorktown) provides detailed information on community participation for the ERP. The RAB was formed in 1994 and consists of community members, and representatives of the USEPA Region 3, the VDEQ, and the Navy. RAB meetings are held twice a year (May and November) and are open to the public to provide opportunity for public comment and input.

The investigations conducted at Site 1, the findings, and the Proposed Plan (PP) that forms the basis for this NFA ROD have been presented and discussed with the RAB. In addition, in accordance with Section 117(a) of CERCLA, the Navy provided a public comment period between November 24, 2008 and December 23, 2008, for the Site 1 NFA PP. In accordance with 40 CFR 300.430(f)(3)(1)(A), a notice of availability was published in the *Daily Press* and *The Virginia Gazette* on November 22 and 23, 2008. The PP was available for review during the public comment period at the Virgil I. Grissom Public Library (366 DeShazor Drive, Newport News, VA 23608, 757-369-3190). The public comment period included a public meeting to present the PP, which was held on December 2, 2008 at the York County Public Library. No comments were received during the public comment period for the Site 1 NFA PP.

This ROD, the PP, and all other information that supports this NFA determination are available in the AR. The AR is accessible to the public at:

Public Affairs Office
NAVFAC Atlantic
6506 Hampton Blvd
Norfolk, VA 23508-1278
757-322-8005

# 3 Responsiveness Summary

The participants in the public meeting included RAB members and representatives of the Navy, and VDEQ. One member of the public attended the meeting. The only question asked by the public was regarding getting the information on the problems and solutions at Site 1 out to others within the environmental community since the activities at this site can be used in other areas. The Navy informed the public that once the ROD is signed, there are plans to conduct a media event in which members of the press and environmental community will be invited. Further discussion on this topic is documented in the ***meeting transcript*** (Ref. #39). No additional written comments, concerns, or questions were received by the Navy, USEPA, or VDEQ during the public comment period.

# References

| Item | Reference Phrase in ROD | Location in ROD | Identification of Referenced Document Available in the Administrative Record |
|---|---|---|---|
| **Ref. 1** | **Results** | Section 2.2 | Baker. 1994. *Site Investigation for Sites 1, 10, and 11*, Naval Supply Center, Cheatham Annex, Williamsburg, Virginia. November. Figure 4-1 and Tables 4-4, 4-5, and 4-6. AR N0. 00140C. |
| **Ref. 2** | **Results** | Section 2.2 | Baker. 1997. *Site Screening Process Report Sites 1, 10, and 11*, Fleet and Industrial Supply Center, Cheatham Annex, Williamsburg, Virginia. November. Figures 5-1, 5-2, and 5-3. AR No. 00131C. |
| **Ref. 3** | **boundaries of the landfill** | Section 2.2 | Baker. 1999. *Field Investigation Report, Site 1 and AOC 2*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. September. Figure 3-1. AR No. 01217. |
| **Ref. 4** | **Results** | Section 2.2 | Baker. 1999. *Field Investigation Report, Site 1 and AOC 2*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. September. Figures 4-1 through 4-7. AR No. 01217. |
| **Ref. 5** | **clean-up goals** | Section 2.2 | Baker. 2003. *Engineering Evaluation and Cost Analysis for Contaminated Soil, Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. June. Tables 3-7 and 3-8. AR No. 01563. |
| **Ref. 6** | **human health conceptual site model (CSM)** | Section 2.2 | Baker. 2004. *Round 1 Remedial Investigation Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. February. Figure 7-1. AR No. 01475. |
| **Ref. 7** | **No potential unacceptable human health risks** | Section 2.2 | Baker. 2004. *Round 1 Remedial Investigation Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. February. Tables 7-11 through 7-14 and Appendix L; Tables 9.1 through 9.6. AR No. 01475. |
| **Ref. 8** | **Potential unacceptable cancer risks and non-cancer hazards** | Section 2.2 | Baker. 2004. *Round 1 Remedial Investigation Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. February. Tables 7-13, 7-14, A-4, and A-9 and Appendix L; Tables 9.4 and 9.5. AR No. 01475. |
| **Ref. 9** | **potential unacceptable non-cancer hazards** | Section 2.2 | Baker. 2004. *Round 1 Remedial Investigation Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. February. Tables 7-13 and 7-15 and Appendix L; Tables 9.4 and 9.6. AR No. 01475. |

| Item | Reference Phrase in ROD | Location in ROD | Identification of Referenced Document Available in the Administrative Record |
|---|---|---|---|
| **Ref. 10** | **ecological CSM** | Section 2.2 | Baker. 2004. *Round 1 Remedial Investigation Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. February. Figure 8-2. AR No. 01475. |
| **Ref. 11** | **ecological assessment and measurement endpoints** | Section 2.2 | Baker. 2004. *Round 1 Remedial Investigation Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. February. Table 8-3. AR No. 01475. |
| **Ref. 12** | **bioaccumulating chemicals** | Section 2.2 | Baker. 2004. *Round 1 Remedial Investigation Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. February. Tables 8-7 and 8-8. AR No. 01475. |
| **Ref. 13** | **media specific screening values** | Section 2.2 | Baker. 2004. *Round 1 Remedial Investigation Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. February. Table 8-4. AR No. 01475. |
| **Ref. 14** | **toxicity values** | Section 2.2 | Baker. 2004. *Round 1 Remedial Investigation Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. February. Tables 8-5 and 8-6. AR No. 01475. |
| **Ref. 15** | **ecological COPCs** | Section 2.2 | Baker. 2004. *Round 1 Remedial Investigation Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. February. Table 8-45. AR No. 01475. |
| **Ref. 16** | **potential ecological risks** | Section 2.2 | Baker. 2004. *Round 1 Remedial Investigation Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. February. Tables 8-43 and 8-44. AR No. 01475. |
| **Ref. 17** | **results of post-removal confirmation sampling** | Section 2.2 | Bhate, 2006. *Project Completion Report, Site 1 – Landfill Near Incinerator and Site 7 0 Old DuPont Disposal Area, Naval Weapons Station Yorktown, Cheatham Annex, Yorktown, Virginia.* December. Table 2-2 and Figure 2-2. AR Nos.: 02195, 02196, 02197, and 02198. |
| **Ref. 18** | **results of these soil sampling activities** | Section 2.2 | Bhate, 2006. *Project Completion Report, Site 1 – Landfill Near Incinerator and Site 7 0 Old DuPont Disposal Area, Naval Weapons Station Yorktown, Cheatham Annex, Yorktown, Virginia.* December. Table 2-2 and Figure 2-5. AR Nos.: 02195, 02196, 02197, and 02198. |
| **Ref. 19** | **Results** | Section 2.2 | Baker, 2005. *Screening Level Ecological Risk Assessment and Step 3A Refinement Report, Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Cheatham Annex, Williamsburg, Virginia. April. Figures 5-2 and 5-3. AR No. 01565. |
| **Ref. 20** | **potential unacceptable ecological risks** | Section 2.2 | Baker, 2005. *Screening Level Ecological Risk Assessment and Step 3A Refinement Report, Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Cheatham Annex, Williamsburg, Virginia. April. Table 6-12. AR No. 01565. |
| **Ref. 21** | **Aroclor-1260** | Section 2.2 | Baker, 2005. *Screening Level Ecological Risk Assessment and Step 3A Refinement Report, Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Cheatham Annex, Williamsburg, Virginia. April. Part of Section 3.2.2 and Figure 3-6. AR No. 01565. |

| Item | Reference Phrase in ROD | Location in ROD | Identification of Referenced Document Available in the Administrative Record |
|---|---|---|---|
| **Ref. 22** | **results of post-removal confirmation sampling** | Section 2.2 | Shaw, 2006. *Final Project Closeout Report, Interim Removal Action D, Site 1 – Southeast Wooded Area,* Cheatham Annex, Naval Weapons Station Yorktown, Virginia. August. Tables 7 and 8. AR No. 01922. |
| **Ref. 23** | **revised human health and ecological clean-up goals** | Section 2.2 | Baker. 2006. *Technical Memorandum, Pre-Removal Characterization of Sediments, Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Cheatham Annex. December. Table 2-2. AR No. 02014. |
| **Ref. 24** | **wetland area sampling results** | Section 2.2 | Baker. 2006. *Technical Memorandum, Pre-Removal Characterization of Sediments, Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Cheatham Annex. December. Figures 4-2 through 4-14 and parts of Appendix D. AR No. 02014. |
| **Ref. 25** | **depression pool sampling results** | Section 2.2 | Baker. 2006. *Technical Memorandum, Pre-Removal Characterization of Sediments, Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Cheatham Annex. December. Figures 4-2 through 4-14 and parts of Appendix D. AR No. 02014. |
| **Ref. 26** | **Fish tissue concentrations** | Section 2.2 | Baker. 2006. *Technical Memorandum, Pre-Removal Characterization of Sediments, Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Cheatham Annex. December. Section 5.3 and last Page of Appendix D. AR No. 02014. |
| **Ref. 27** | **Results of the post-removal confirmation sampling** | Section 2.2 | Shaw Environmental. 2008. *Final Construction Completion Report, Removal Action E, Hotspot Removal and Pond Recovery at Site 1,* Cheatham Annex, Naval Weapons Station, Williamsburg, Virginia. July. Appendix C.2 thorough C.5. AR No. 02279. |
| **Ref. 28** | **do not pose unacceptable potable groundwater-use risk** | Section 2.2 | CH2M HILL, 2008a. *Final Cheatham Annex Site 1 Groundwater Data Review and Risk Management Consideration.* February. Revised Risk Assessment Section. AR No. 02199. |
| **Ref. 29** | **results of all removal action confirmation sampling** | Section 2.2 | CH2M HILL. 2008b. *Documentation for No Further Action (NFA) Regarding Site Waste, Soil, and Sediment Cheatham Annex Site 1, Landfill Near Incinerator*. May. Tables 1 and 2 and Figures 1 and 2. AR No. 02215. |
| **Ref. 30** | **potential unacceptable cancer risks and non-cancer hazards** | Section 2.5.1 | Baker. 2004. *Round 1 Remedial Investigation Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. February. Tables 7-13 through 7-15 and Appendix L, Tables 9.4 through 9.6. AR No. 02014. |
| **Ref. 31** | **potential ecological risks** | Section 2.5.2 | Baker. 2004. *Round 1 Remedial Investigation Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. February. Tables 8-43 and 8-44. AR No. 02014. |
| **Ref. 32** | **potential unacceptable non-cancer hazards** | Section 2.5.2 | Baker. 2004. *Round 1 Remedial Investigation Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. February. Tables 7-13 through 7-14 and Appendix L, Tables 9.4. AR No. 02014. |

| Item | Reference Phrase in ROD | Location in ROD | Identification of Referenced Document Available in the Administrative Record |
|---|---|---|---|
| **Ref. 33** | **potential ecological risks** | Section 2.5.3 | Baker. 2004. *Round 1 Remedial Investigation Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. February. Table 8-43 and 8-44. AR No. 02014. |
| **Ref. 34** | **potential unacceptable cancer risks and non-cancer hazards** | Section 2.5.3 | Baker. 2004. *Round 1 Remedial Investigation Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. February. Appendix A, Tables A4 thorough A9. AR No. 02014. |
| **Ref. 35** | **acceptable** | Section 2.5.3 | CH2M HILL, 2008. *Final Cheatham Annex Site 1 Groundwater Data Review and Risk Management Consideration.* February. AR No. 02199. |
| **Ref. 36** | **no unacceptable human health risks** | Section 2.5.4 | Baker. 2004. *Round 1 Remedial Investigation Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. February. Tables 7-11 through 7-14 and Appendix L; Tables 9.1 through 9.6. AR No. 02014. |
| **Ref. 37** | **no unacceptable human health risks** | Section 2.5.5 | Baker. 2004. *Round 1 Remedial Investigation Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Yorktown Virginia, Cheatham Annex Site. February. Tables 7-11 through 7-14 and Appendix L; Tables 9.1 through 9.6. AR No. 02014. |
| **Ref. 38** | **potential unacceptable ecological risks** | Section 2.5.5 | Baker, 2005. *Screening Level Ecological Risk Assessment and Step 3A Refinement Report, Site 1 – Landfill Near Incinerator*, Naval Weapons Station Yorktown, Cheatham Annex, Williamsburg, Virginia. April. Table 6-12. AR No. 01565. |
| **Ref. 39** | **meeting transcript** | Section 3 | CH2M HILL. 2009. *Proposed Plan*, Site 1: Landfill Near Incinerator, Naval Weapons Station Yorktown, Cheatham Annex. January. AR No. Pending. |

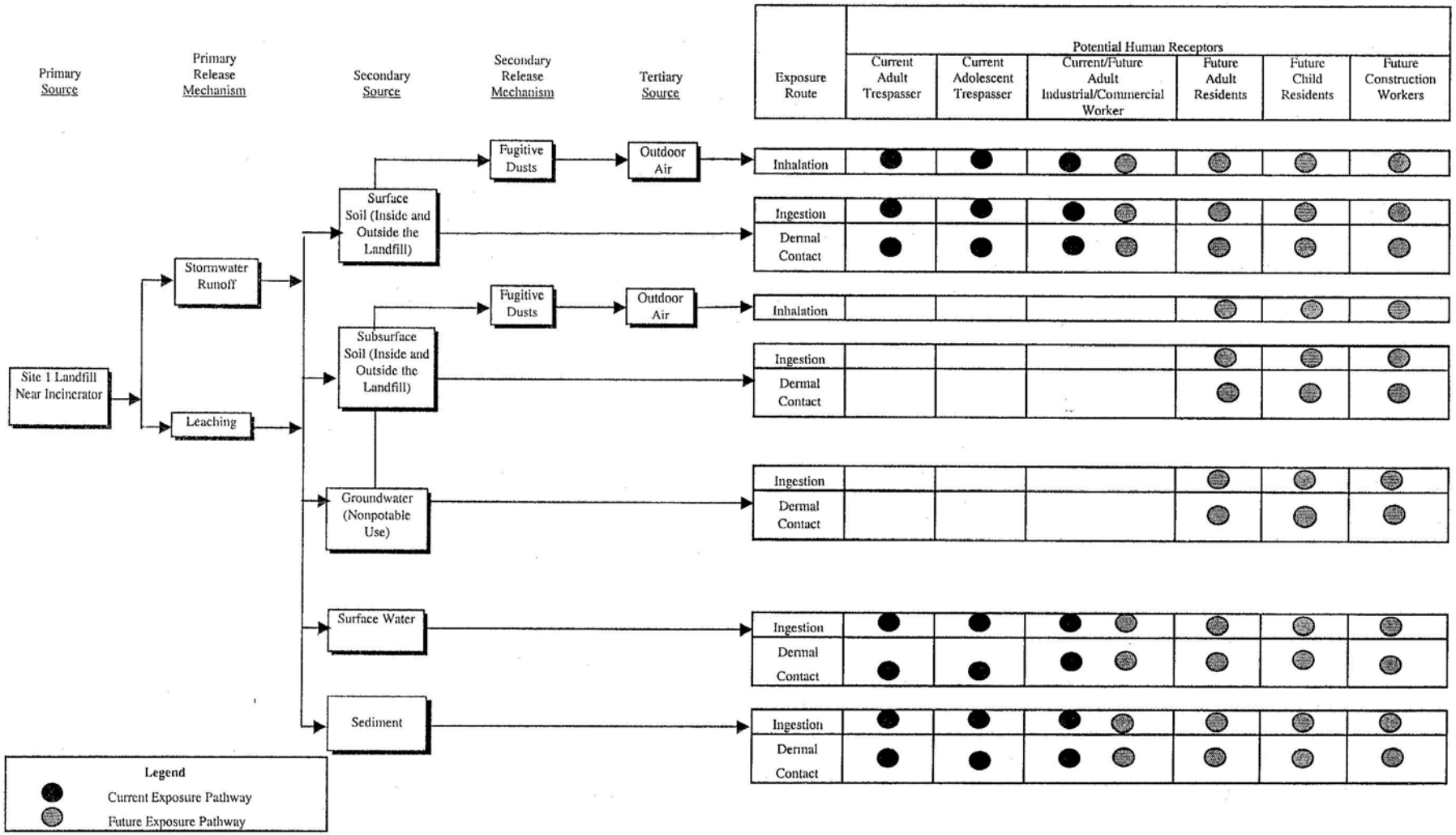
Detailed site information reference in this ROD in bold blue text is contained in the AR.

For access to information contained in the AR for CAX please contact:

Public Affairs Office, NAVFAC Atlantic
6506 Hampton Blvd
Norfolk, Virginia 23508-1278
Phone: (757) 322-8005

# Attachment 1

FIGURE 7-1
FLOWCHART OF POTENTIAL EXPOSURE PATHWAYS AND RECEPTORS
SITE 1 - LANDFILL NEAR INCINERATOR
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA
CHEATHAM ANNEX SITE



# Attachment 2

# FIGURE 8-2
# ECOLOGICAL CONCEPTUAL MODEL
# SITE 1 - LANDFILL NEAR INCINERATOR
# NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA
# CHEATHAM ANNEX SITE

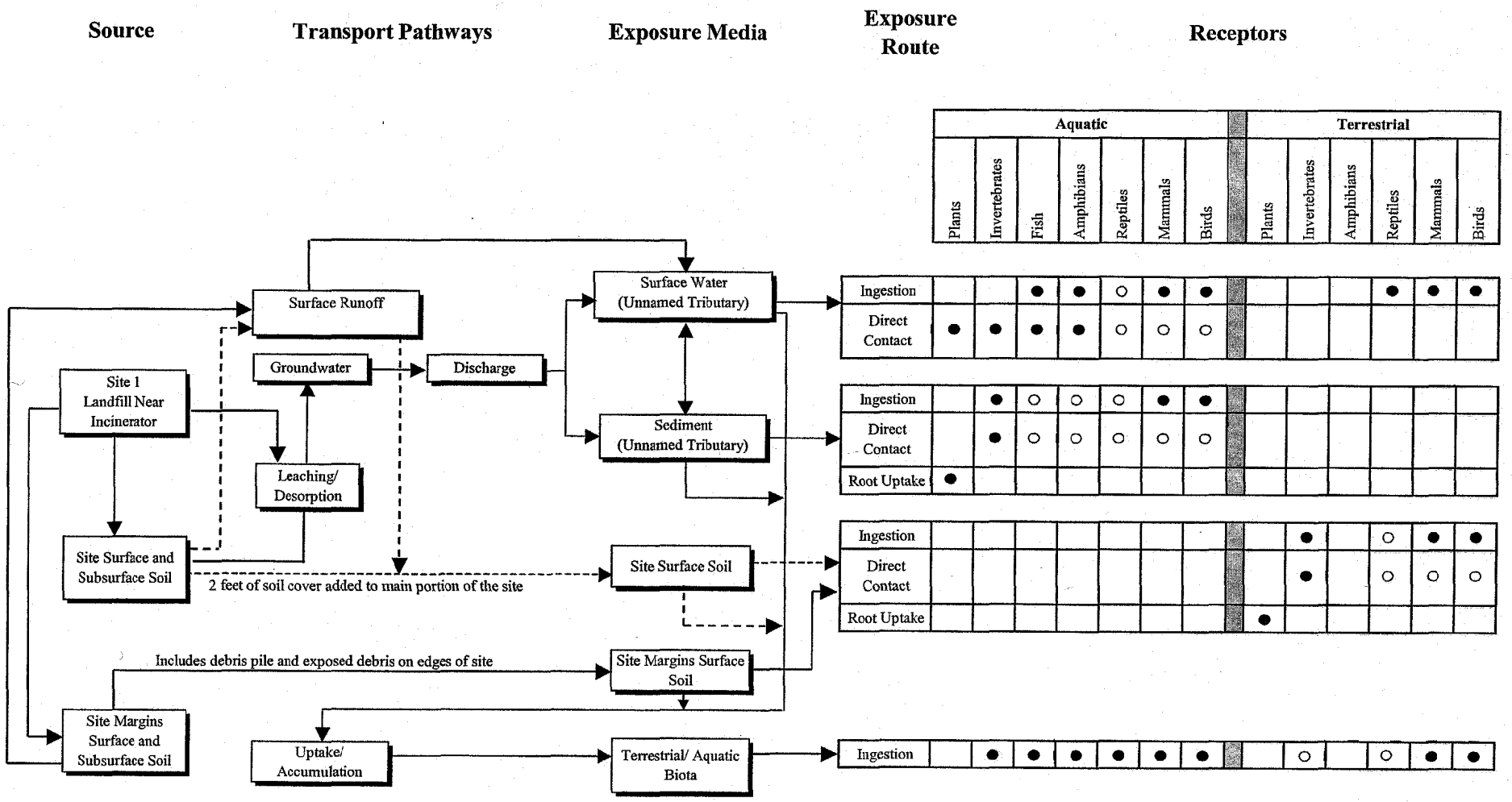



figure 8-2 conceptual model.xls
1/7/2004

# Attachment 3

TABLE 3-1
Summary of RME Cancer Risks and Hazard Indices based on 2004 HHRA
*Site 1, Cheatham Annex, Williamsburg, Virginia*

| Receptor | Media | Exposure Route | Cancer Risk | COPCs with Cancer Risk >$10^{-4}$ | Hazard Index | COPCs with HI >1 |
|---|---|---|---|---|---|---|
| Current Adolescent Trespassers | Surface Soil Inside Landfill | Ingestion | $1.4x10^{-5}$ | | 0.12 | |
| | | Inhalation | $6.8x10^{-9}$ | | 0.00073 | |
| | | Dermal Contact | $6.7x10^{-7}$ | | 0.099 | |
| | | Total | $1.4x10^{-5}$ | | 0.22 | |
| | Surface Soil Outside Landfill | Ingestion | $5.1x10^{-7}$ | | 0.036 | |
| | | Inhalation | $2.6x10^{-9}$ | | 0.0002 | |
| | | Dermal Contact | $1.4x10^{-7}$ | | 0.025 | |
| | | Total | $6.6x10^{-7}$ | | 0.061 | |
| | Surface Water | Ingestion | $2.4x10^{-7}$ | | 0.0042 | |
| | | Dermal Contact | $2.7x10^{-8}$ | | 0.00047 | |
| | | Total | $2.7x10^{-7}$ | | 0.0047 | |
| | Sediment | Ingestion | $1.2x10^{-6}$ | | 0.07 | |
| | | Dermal Contact | $3.4x10^{-7}$ | | 0.056 | |
| | | Total | $1.5x10^{-6}$ | | 0.13 | |
| Current Adult Trespassers | Surface Soil Inside Landfill | Ingestion | $2.3x10^{-5}$ | | 0.075 | |
| | | Inhalation | $1.2x10^{-8}$ | | 0.00047 | |
| | | Dermal Contact | $4.4x10^{-7}$ | | 0.024 | |
| | | Total | $2.4x10^{-5}$ | | 0.099 | |
| | Surface Soil Outside Landfill | Ingestion | $8.8x10^{-7}$ | | 0.023 | |
| | | Inhalation | $4.5x10^{-9}$ | | 0.00013 | |
| | | Dermal Contact | $9.1x10^{-8}$ | | 0.006 | |
| | | Total | $9.8x10^{-7}$ | | 0.029 | |
| | Surface Water | Ingestion | $4.2x10^{-7}$ | | 0.0027 | |
| | | Dermal Contact | $5.0x10^{-8}$ | | 0.00033 | |
| | | Total | $4.7x10^{-7}$ | | 0.003 | |
| | Sediment | Ingestion | $2.0x10^{-6}$ | | 0.045 | |
| | | Dermal Contact | $2.2x10^{-7}$ | | 0.014 | |
| | | Total | $2.2x10^{-6}$ | | 0.058 | |
| Current/Future Industrial/Commercial Workers | Surface Soil Inside Landfill | Ingestion | $5.9x10^{-5}$ | | 0.18 | |
| | | Inhalation | $3.9x10^{-8}$ | | 0.0015 | |
| | | Dermal Contact | $3.6x10^{-6}$ | | 0.19 | |
| | | Total | $6.2x10^{-5}$ | | 0.37 | |
| | Surface Soil Outside Landfill | Ingestion | $2.2x10^{-6}$ | | 0.056 | |
| | | Inhalation | $1.5x10^{-8}$ | | 0.0004 | |
| | | Dermal Contact | $7.6x10^{-7}$ | | 0.048 | |
| | | Total | $3.0x10^{-6}$ | | 0.1 | |
| | Surface Water | Ingestion | $2.1x10^{-6}$ | | 0.013 | |
| | | Dermal Contact | $1.5x10^{-7}$ | | 0.00091 | |
| | | Total | $2.2x10^{-6}$ | | 0.014 | |
| | Sediment | Ingestion | $5.0x10^{-6}$ | | 0.11 | |
| | | Dermal Contact | $1.8x10^{-6}$ | | 0.11 | |
| | | Total | $6.8x10^{-6}$ | | 0.22 | |

TABLE 3-1
Summary of RME Cancer Risks and Hazard Indices based on 2004 HHRA
*Site 1, Cheatham Annex, Williamsburg, Virginia*

| Receptor | Media | Exposure Route | Cancer Risk | COPCs with Cancer Risk >$10^{-4}$ | Hazard Index | COPCs with HI >1 |
|---|---|---|---|---|---|---|
| Future Child Residents | Surface Soil Inside Landfill | Ingestion | **3.7x10-4** | benzo(a)pyrene ($2.2x10^{-4}$) | **4.7** | Antimony (1.2) Iron (1.3) |
| | | Inhalation | $1.8x10^{-7}$ | | 0.029 | |
| | | Dermal Contact | $4.8x10^{-6}$ | | 1.1 | |
| | | Total | **$3.7x10^{-4}$** | | **5.8** | |
| | Surface Soil Outside Landfill | Ingestion | $1.4x10^{-5}$ | | **1.5** | |
| | | Inhalation | $7.1x10^{-8}$ | | 0.0079 | |
| | | Dermal Contact | $1.0x10^{-6}$ | | 0.26 | |
| | | Total | $1.5x10^{-5}$ | | **1.7** | |
| | Subsurface Soil Inside Landfill | Ingestion | $1.7x10^{-4}$ | | **6.8** | Antimony (1.1) Copper (1.2) Iron (2.1) |
| | | Inhalation | $1.9x10^{-7}$ | | 0.045 | |
| | | Dermal Contact | $4.3x10^{-6}$ | | **1.3** | |
| | | Total | $1.7x10^{-4}$ | | **8.1** | |
| | Subsurface Soil Outside Landfill | Ingestion | $1.1x10^{-5}$ | | **1.3** | |
| | | Inhalation | $9.9x10^{-8}$ | | 0.00088 | |
| | | Dermal Contact | $7.7x10^{-7}$ | | 0.44 | |
| | | Total | $1.2x10^{-5}$ | | **1.8** | |
| | Groundwater (potable use) | Ingestion | **$2.9x10^{-4}$** | Arsenic ($2.9x10^{-4}$) | **16.34** | Arsenic (7.4) Iron (6.4) Manganese (1.6) |
| | | Dermal Contact | $1.3x10^{-6}$ | | 0.55 | |
| | | Total | **$2.9x10^{-4}$** | | **16.89** | |
| | Surface Water | Ingestion | $3.8x10^{-7}$ | | 0.0097 | |
| | | Dermal Contact | $2.2x10^{-8}$ | | 0.00057 | |
| | | Total | $4.0x10^{-7}$ | | 0.01 | |
| | Sediment | Ingestion | $3.6x10^{-6}$ | | 0.32 | |
| | | Dermal Contact | $2.8x10^{-7}$ | | 0.068 | |
| | | Total | $3.9x10^{-6}$ | | 0.39 | |
| Future Adult Residents | Surface Soil Inside Landfill | Ingestion | $1.6x10^{-4}$ | | 0.5 | |
| | | Inhalation | $1.6x10^{-7}$ | | 0.0063 | |
| | | Dermal Contact | $2.9x10^{-6}$ | | 0.16 | |
| | | Total | $1.6x10^{-4}$ | | 0.67 | |
| | Surface Soil Outside Landfill | Ingestion | $5.9x10^{-6}$ | | 0.16 | |
| | | Inhalation | $6.1x10^{-8}$ | | 0.0017 | |
| | | Dermal Contact | $6.2x10^{-7}$ | | 0.04 | |
| | | Total | $6.6x10^{-6}$ | | 0.2 | |
| | Subsurface Soil Inside Landfill | Ingestion | $7.1x10^{-5}$ | | 0.73 | |
| | | Inhalation | $1.7x10^{-7}$ | | 0.0097 | |
| | | Dermal Contact | $2.6x10^{-6}$ | | 0.19 | |
| | | Total | $7.4x10^{-5}$ | | 0.93 | |

TABLE 3-1
Summary of RME Cancer Risks and Hazard Indices based on 2004 HHRA
*Site 1, Cheatham Annex, Williamsburg, Virginia*

| Receptor | Media | Exposure Route | Cancer Risk | COPCs with Cancer Risk >$10^{-4}$ | Hazard Index | COPCs with HI >1 |
|---|---|---|---|---|---|---|
| Future Adult Residents (cont.) | Subsurface Soil Outside Landfill | Ingestion | $4.8x10^{-6}$ | | 0.14 | |
| | | Inhalation | $8.5x10^{-8}$ | | 0.00019 | |
| | | Dermal Contact | $4.7x10^{-7}$ | | 0.067 | |
| | | Total | $5.3x10^{-6}$ | | 0.21 | |
| | Groundwater (potable use) | Ingestion | **$4.9x10^{-4}$** | Arsenic ($4.9x10^{-4}$) | **7.00** | Arsenic (3.2) Iron (2.7) |
| | | Dermal Contact | $1.8x10^{-6}$ | | 0.19 | |
| | | Total | **$4.9x10^{-4}$** | | **7.19** | |
| | Surface Water | Ingestion | $3.2x10^{-7}$ | | 0.0021 | |
| | | Dermal Contact | $3.9x10^{-8}$ | | 0.00025 | |
| | | Total | $3.6x10^{-7}$ | | 0.0023 | |
| | Sediment | Ingestion | $1.5x10^{-6}$ | | 0.034 | |
| | | Dermal Contact | $1.7x10^{-7}$ | | 0.01 | |
| | | Total | $1.7x10^{-6}$ | | 0.045 | |
| Future Adult Construction Workers | Surface Soil Inside Landfill | Ingestion | $2.3x10^{-5}$ | | **1.7** | |
| | | Inhalation | $1.6x10^{-9}$ | | 0.0015 | |
| | | Dermal Contact | $1.4x10^{-7}$ | | 0.19 | |
| | | Total | $2.3x10^{-5}$ | | **1.9** | |
| | Surface Soil Outside Landfill | Ingestion | $8.5x10^{-7}$ | | 0.54 | |
| | | Inhalation | $6.0x10^{-10}$ | | 0.0004 | |
| | | Dermal Contact | $3.0x10^{-8}$ | | 0.048 | |
| | | Total | $8.8x10^{-7}$ | | 0.58 | |
| | Subsurface Soil Inside Landfill | Ingestion | $1.0x10^{-5}$ | | **2.5** | |
| | | Inhalation | $1.7x10^{-9}$ | | 0.0023 | |
| | | Dermal Contact | $1.3x10^{-7}$ | | 0.23 | |
| | | Total | $1.0x10^{-5}$ | | **2.7** | |
| | Subsurface Soil Outside Landfill | Ingestion | $6.8x10^{-7}$ | | 0.48 | |
| | | Inhalation | $8.4x10^{-10}$ | | 0.000045 | |
| | | Dermal Contact | $2.3x10^{-8}$ | | 0.08 | |
| | | Total | $7.1x10^{-7}$ | | 0.56 | |
| | Groundwater | Ingestion | $3.7x10^{-7}$ | | 0.12 | |
| | | Dermal Contact | $2.3x10^{-7}$ | | 0.058 | |
| | | Total | $6.0x10^{-7}$ | | 0.18 | |

TABLE 3-2
Summary of CTE Cancer Risks and Hazard Indices based on 2004HHRA
*Site 1, Cheatham Annex, Williamsburg, Virginia*

| Receptor | Media | Exposure Route | Cancer Risk | COPCs with Cancer Risk >$10^{-4}$ | Hazard Index | COPCs with HI >1 |
|---|---|---|---|---|---|---|
| Future Child Residents | Surface Soil Inside Landfill | Ingestion | $1.2x10^{-4}$ | | 1.6 | |
| | | Inhalation | $1.2x10^{-7}$ | | 0.02 | |
| | | Dermal Contact | $2.3x10^{-6}$ | | 0.51 | |
| | | Total | $1.3x10^{-4}$ | | 2.1 | |
| | Surface Soil Outside Landfill | Ingestion | $4.6x10^{-6}$ | | 0.49 | |
| | | Inhalation | $4.8x10^{-8}$ | | 0.0052 | |
| | | Dermal Contact | $4.8x10^{-7}$ | | 0.13 | |
| | | Total | $5.2x10^{-6}$ | | 0.62 | |
| | Subsurface Soil Inside Landfill | Ingestion | $5.5x10^{-5}$ | | 2.3 | |
| | | Inhalation | $1.3x10^{-7}$ | | 0.03 | |
| | | Dermal Contact | $2.0x10^{-6}$ | | 0.6 | |
| | | Total | $5.8x10^{-5}$ | | 2.9 | |
| | Subsurface Soil Outside Landfill | Ingestion | $3.7x10^{-6}$ | | 0.44 | |
| | | Inhalation | $6.6x10^{-8}$ | | 0.00059 | |
| | | Dermal Contact | $3.7x10^{-7}$ | | 0.21 | |
| | | Total | $4.2x10^{-6}$ | | 0.65 | |
| | Groundwater (potable use) | Ingestion | $6.4x10^{-5}$ | | **10.92** | Arsenic (4.9) Iron (4.2) Manganese (1.1) |
| | | Dermal Contact | $9.6x10^{-8}$ | | 0.12 | |
| | | Total | $6.4x10^{-5}$ | | **11.05** | |
| | Surface Water | Ingestion | $3.8x10^{-7}$ | | 0.0097 | |
| | | Dermal Contact | $1.6x10^{-8}$ | | 0.00041 | |
| | | Total | $3.9x10^{-7}$ | | 0.01 | |
| | Sediment | Ingestion | $1.8x10^{-6}$ | | 0.16 | |
| | | Dermal Contact | $2.0x10^{-7}$ | | 0.049 | |
| | | Total | $2.0x10^{-6}$ | | 0.21 | |

TABLE 3-2
Summary of CTE Cancer Risks and Hazard Indices based on 2004HHRA
*Site 1, Cheatham Annex, Williamsburg, Virginia*

| Receptor | Media | Exposure Route | Cancer Risk | COPCs with Cancer Risk >$10^{-4}$ | Hazard Index | COPCs with HI >1 |
|---|---|---|---|---|---|---|
| Future Adult Residents | Surface Soil Inside Landfill | Ingestion | $2.0x10^{-5}$ | | 0.17 | |
| | | Inhalation | $4.0x10^{-8}$ | | 0.0042 | |
| | | Dermal Contact | $6.4x10^{-7}$ | | 0.095 | |
| | | Total | $2.0x10^{-5}$ | | 0.27 | |
| | Surface Soil Outside Landfill | Ingestion | $7.4x10^{-7}$ | | 0.052 | |
| | | Inhalation | $1.5x10^{-8}$ | | 0.0011 | |
| | | Dermal Contact | $1.4x10^{-7}$ | | 0.024 | |
| | | Total | $8.9x10^{-7}$ | | 0.077 | |
| | Subsurface Soil Inside Landfill | Ingestion | $8.9x10^{-6}$ | | 0.24 | |
| | | Inhalation | $4.2x10^{-8}$ | | 0.0065 | |
| | | Dermal Contact | $5.7x10^{-7}$ | | 0.11 | |
| | | Total | $9.5x10^{-6}$ | | 0.36 | |
| | Subsurface Soil Outside Landfill | Ingestion | $6.0x10^{-7}$ | | 0.047 | |
| | | Inhalation | $2.1x10^{-8}$ | | 0.00013 | |
| | | Dermal Contact | $1.0x10^{-7}$ | | 0.039 | |
| | | Total | $7.2x10^{-7}$ | | 0.087 | |
| | Groundwater (potable use) | Ingestion | $6.7x10^{-5}$ | | **3.28** | Arsenic (1.5) Iron (1.3) |
| | | Dermal Contact | $1.5x10^{-7}$ | | 0.05 | |
| | | Total | $6.7x10^{-5}$ | | **3.33** | |
| | Surface Water | Ingestion | $1.2x10^{-7}$ | | 0.0021 | |
| | | Dermal Contact | $1.3x10^{-8}$ | | 0.00022 | |
| | | Total | $1.3x10^{-7}$ | | 0.0023 | |
| | Sediment | Ingestion | $2.9x10^{-7}$ | | 0.017 | |
| | | Dermal Contact | $5.5x10^{-8}$ | | 0.0092 | |
| | | Total | $3.4x10^{-7}$ | | 0.026 | |

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CH2MHILL

September 21, 2009

358549.RP.FR

Ms. Sue Haug
Remedial Project Manager
NPL/BRAC Federal Facilities Branch
USEPA, Region III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Subject: Response to USEPA Comments on *Draft Final Record of Decision, Site 1: Landfill Near Incinerator*; Naval Weapons Station Yorktown; Cheatham Annex; Williamsburg, Virginia

Dear Ms. Haug:

On behalf of the U.S. Department of the Navy's Naval Facilities Engineering Command (NAVFAC), CH2M HILL has prepared this letter in response to your September 9, 2009 emails, which provide EPA Legal's comments regarding the subject document via e-mail and track changes in the Word file; your September 9, 2009 email, which provided your comments; and your email dated September 21, 2009, which provided final editorial comments.

**Comments from Suzanne Parent (EPA Legal):**

**1. Comment:** "***Managing review of this ROD has been a real problem because of the size of the Word file.*** *This ROD is many orders of magnitude larger than any ROD I have ever reviewed. Technical problems due to the enormity of the file resulted in delay in making comments and more work because I had to review the ROD in hardcopy and then transfer the changes while at the only workstation that would not crash whenever I opened the file.* ***Most RODs from Federal NPL sites that I have reviewed have been 250 to 500 KB. This ROD was 20MB--or 20000 KB.*** *I recommend strongly to the Navy that,* ***to save government time and costs****, they investigate with their contractor how to draft a ROD using Microsoft Word so the size is manageable by the parties that must review it. I have a reviewed RODs at the Norfolk Naval Shipyard that were also produced, I believe, by the same contractor, which are contained in files that are the more typical, under 500KB, size, so it seems this company has made manageably sized RODs in the past.*"

**Response:** Comment noted. No changes were made to the ROD.

**2. Comment:** "***This ROD requires a section for Scope and Role*** *of the action being decided, in accordance with EPA's July 1999 ROD guidance. In the previous set of comments, I recommended that this section be drafted and incorporated into the ROD. According to the response to comments that you received from the Navy's contractor (not the Navy itself), the section was not incorporated because, the contractor argued, the information is incorporated into the Declaration. Although a brief description of the site as a whole, which would be included in a Scope and Role section, is*

*included in the Declaration, EPA should not concur with deletion of entire sections of the ROD format for purposes of saving space or whatever reason the Navy and/or its contractor may have for deleting the Scope and Role section that is required by the guidance. The Federal Facility Agreement between EPA and the Navy that addresses CERCLA compliance for the Cheatham Annex NPL Site requires compliance with EPA CERCLA guidance. If there is a good reason to vary from EPA's ROD guidance for a site-specific purpose that the Navy (not its contractor) would like to present to EPA, then I think EPA would be open to hearing the rationale for such a variance and may agree to it. But until such time when the Navy makes such a presentation, in my opinion, EPA must insist that its guidances addressing CERCLA activities, including the July 1999 ROD guidance, is adhered to.* ***I do not recommend concurrence on or execution of this ROD by EPA until that section is reinstated in the ROD or the Navy*** *(not its contractor because the contractor is not a party to our agreement)* ***presents a compelling reason for variance from the ROD guidance."***

**Response:** A Scope and Roles section (Section 2.3) was added to the ROD as recommended.

**3. Comment:** *Section 1.1; "An acronym [UU/UE] must be used three times in a document to make it worthwhile to introduce it."*

**Response:** The ROD was revised as recommended and an acronym was only used if it appeared within the document three or more times.

**4. Comment:** *Section 1.2; "Header must be on same page with signature."*

**Response:** The ROD was revised as recommended.

**5. Comment:** *Section 2.2, Engineering Evaluation and Cost Analysis (EE/CA) for Contaminated Soil, Site 1 (Baker, 2003); "As meant [base established background concentrations]? The background concentration established for the Base (the installation)?"*

**Response:** The base established background concentrations are the background concentrations established specifically for CAX. "base established" was revised to "Base-specific" to clarify this information.

**6. Comment:** *Section 2.2, Engineering Evaluation and Cost Analysis (EE/CA) for Contaminated Soil, Site 1 (Baker, 2003); "Please add the date of the Public Notice for the EE/CA"*

**Response:** The date the Public Notice was placed in the *Daily Press* was added to the ROD.

**7. Comment:** *Section 2.2, Engineering Evaluation and Cost Analysis (EE/CA) for Contaminated Soil, Site 1 (Baker, 2003); "The EE/CA was made available to the public, not merely the notice, correct?"*

**Response:** This is correct; the sentence was revised to include information that the EE/CA was also made available to the public.

**8. Comment:** *Section 2.2, Round 1 Remedial Investigation, Site 1 (Baker 2004); "An in-text table is far easier to read than a run-on list with five series with up to five elements each. I don't care about the formatting, but please present this information [select PAHs, pesticides, PCBs, explosives, and inorganics were identified as COPCs in soil inside the landfill area, select PAHs and inorganics were identified as COPCs in soil outside and adjacent to the landfill, select PAHs, PCBs, and inorganics were identified as COPCs in sediment, bis(2-ethylhexyl)phthalate and select inorganics were identified as COPCs in groundwater, and arsenic was identified as a COPC in surface water.] in a table, like this edit, or in a list that looks generally like this"*

| Medium | COPC |
|---|---|

| | |
|---|---|
| Soil inside the landfill area | Select PAHs, pesticides, PCBs, explosives, and inorganics |
| Soil outside and adjacent to the landfill | Select PAHs and inorganics |
| Sediment | Select PAHs, PCBs, and inorganics |
| Groundwater | Bis(2-ethylhexyl)phthalate and select inorganics |
| Surface water | Arsenic |

**Response:** The information was revised to be presented in a table.

**9. Comment:** *Section 2.2, Round 1 Remedial Investigation, Site 1 (Baker 2004); "If it's [select PAHs] three or fewer, please list them."*

**Response:** Constituents in this section were listed individually if less than three were detected in a contaminant group (i.e., PAHs, PCBs, inorganics).

**10. Comment:** *"Is it significantly fewer metals than for the other media? Begs the question: What's the difference between "inorganics" and "select inorganics?" If it's three or less, please list them."*

**Response:** The word "select" was removed from this section and in accordance with Comment 9, above, constituents in this section were listed individually if less than three were detected in a contaminant group.

**11. Comment:** *"The parentheses I put in here [(i.e., soil, surface water, and sediments)] in the last review were taken out. Why? Isn't "soil, surface water and sediments" intended to illustrate for the reader what the ecologically relevant media are? I added "i.e.," in this review, even though it isn't completely necessary, to clarify. Please leave those parentheses in or explain the grammatical rationale for deleting them. If they are deleted, then "soil, surface water, and sediments" are in addition to "ecologically relevant media," as if those media are NOT ecologically relevant. The meaning would be the opposite of the intended meaning, I believe."*

**Response:** The parentheses were added as recommended.

**12. Comment:** *"My change in the last review to move punctuation to the interior of quotation marks was not accepted ["Removal Action B", Figure 3]. First, quotation marks are NOT needed around the names of the Removal Actions; it would be obvious to the reader that the parentheses holds the name of the removal. BUT if quotation marks are going to be used, the comma must go within the marks. Rule 8.141 of the United State Printing Office Government Style Manual commands that federal publications place commas and periods within quotation marks. If another style manual is being used as the reference guide for this federal goverment document, please tell us what it is."*

**Response:** The quotation marks were removed from all removal action references.

**13. Comment:** *[Removal Action C, Figure 3] "Please make consistent with the names of the other removal actions. Quotation marks or not??"*

**Response:** The quotation marks were removed from all removal action references.

**14. Comment:** *Section 2.3; "Second request: please add the Scope and Role section, drafted in accordance with EPA's July 1999 ROD guidance, to this ROD. The FFA between the Navy and*

*EPA regarding this site requires compliance with EPA's guidance for CERCLA activities. I understand that EPA recently made a similar request for a ROD at Little Creek and the section was re-instated without a problem. Please put the section in this ROD or I, the staff attorney, will not concur on the final ROD package and I will raise the issue to EPA management for resolution among the parties to the FFA."*

**Response:** A Scope and Roles section (Section 2.3) was added to the ROD as recommended.

**15. Comment:** *"Comment on table 1—please decide whether to use a hyphen or an equals sign in the footnotes of this table, and then make that use consistent for all tables in this document."*

**Response:** All equal signs were replaced with hyphens in the document tables.

**16. Comment:** *"Comment on Table 3. Please put a hyphen between "Exposure" and "Point" in the legend. The EPC is the concentration at the exposure point. Thus, exposure point is a unit modifier of concentration. Also, please edit that line to read as follows: EPA - Exposure-Point Concentration; the concentration of COC detected by sampling and analysis either before or after the removal actions."*

**Response:** This revision was made as recommended.

All other editorial and formatting comments, including comments made on September 21, 2009 were made as indicated. If you have any questions or comments regarding the above response to comments, please feel free to contact me at 757-671-6266.

Sincerely,

CH2M HILL

Stephanie Sawyer
Project Manager

cc: Mr. Chris Murray/NAVFAC Mid-Atlantic
Mr. Wade Smith/VDEQ
Ms. Marlene Ivester/CH2M HILL
Ms. Stephanie Sawyer/CH2M HILL

CH2M HILL
5700 Cleveland Street, Suite 101
Virginia Beach, VA 23462
Tel 757.518.9666

August 21, 2009

358549.RP.DF

Ms. Sue Haug
Remedial Project Manager
NPL/BRAC Federal Facilities Branch
USEPA, Region III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Subject: Response to USEPA Comments on *Draft Record of Decision, Site 1: Landfill near Incinerator*; Naval Weapons Station Yorktown; Cheatham Annex; Williamsburg, Virginia

Dear Ms. Haug:

On behalf of the U.S. Department of the Navy's Naval Facilities Engineering Command (NAVFAC), CH2M HILL has prepared this letter in response to your July 30, 2009 email, which provide EPA Legal's comments regarding the subject document via track changes in the Word file; your July 30, 2009 email, which provided your comments; and your email dated August 4, 2009, which clarified EPA Legal's comment S47 (note: it is comment S47 in the Word file and Comment 40 below, as some of the comments were strictly editorial).

**Comments from Suzanne Parent (EPA Legal):**

**1. Comment:** *CERCLA has been amended again (Brownfields Amendments 2002), and we can't list all the amendments.*

**Response:** All references to the SARA Amendment will be removed from the ROD.

**2. Comment:** *See deleted text immediately below [Step 1A (Verification)]. I don't know what this means. If technical people want to keep it in, then a sentence or clause must be added explaining what it is and it's (sic) significance.*

**Response:** Step 1A (Verification) has been deleted from the text.

**3. Comment:** *Ref #1: I'm deleting the pound signs ( ). Symbols should generally be avoided in narrative unless necessary, such as a dollar sign. How is "Ref. 1" more understandable than "Ref. 1"??*

**Response:** The # symbols have been removed from all references in the document.

**4. Comment:** *Ref. 2: A problem with this new citation procedure is that all documents cited in brief in the text are not cited in full in the list of references, which is required.*

**Response:** All references to specific reports, within the ROD, are now cited within the Section 2.2 subsection headers. There reports can be found in the Administrative Record

and the ROD was revised to reflect this information. Since the references are cited as subsection headers, they are not included as an additional reference section. They are listed in the last column of the References table, as well, but this section is meant to reference specific information regarding the bold italicized text and not just be a document list.

**5. Comment:** *Second paragraph under the Site Screening Process (SSP) Report, Sites, 1, 10, and 11 section: This is so dense that it is impossible to read. These four lines are just one clause . . . not even an entire sentence! Please break down into a few sentences and please start with a topic sentence, not a bunch of numbers.*

**Response:** This sentence has been broken up into several sentences as recommended.

**6. Comment:** *On "existing soil cover": Correct? If not, then what soil cover is "existing." Change to "...soil cover installed in 1981 is maintained"*

**Response:** The soil cover was removed during the removal actions, therefore the reference to the existing soil cover has been revised as recommended.

**7. Comment:** *As an example, I've edited this one bulky unreadable sentence [second paragraph under the Field Investigation (FI) Report, Site 1 and AOC 2] to be three clear sentences. [The paragraph should read as follows:]*

> *Potential unacceptable risks were identified for human receptors and ecological receptors exposed to soil. The potential risk to human receptors was calculated to be a cancer risk of $1.9x10^{-3}$ and a non-cancer HI of 11, which are above the acceptable cancer risk range of $10^{-4}$ to $10^{-6}$ and acceptable HI of 1 in accordance with the NCP at 40 CFR Section 300.430 (e)(2)(i)(A). For ecological receptors, total EIs ranging between 0.14 and 272,000 were estimated, exceeding the target EI of 1. In addition, the FI report recommendations included implementing temporary landfill slope stabilization measures and clean-up of the landfill material that had eroded onto the York River shoreline because the toe of the landfill cover slope was unstable and eroding during storm events.*

**Response:** This sentence was revised as recommended.

**8. Comment:** *Regarding the first paragraph, last sentence of the Engineering Evaluation and Cost Analysis (EE/CA) for Contaminated Soil, Site 1 section: Please add another sentence or two about how the RGs were determined. The remedial decision in this ROD is based on the removals achieving these goals and the determination that the goals are protective of HH and the E.*

**Response:** Information regarding how the clean-up goals were established was added to this section.

**9. Comment:** *Regarding "the Daily Press": Correct name? The Daily Press is the publication of general circulation located near the facility?*

**Response:** The official title of the newspaper in which the EE/CA was published is "Daily Press"; therefore, no changes will be made.

**10. Comment:** *Regarding the Round 1 Remedial Investigation, Site 1 section: Add a paragraph in this description of the RI that identifies the COCs for the site and generally describes how COCs are identified. Table 2 lists COCs but there's no where in the ROD where it is explained how the COCs were determined and what they are.*

**Response:** COPCs have been added by media along with an explanation of how the COPCs were identified. In addition, identification of COCs is provided in the Summary of

Site Risks section. No other changes to the summary of the RI were made since the RI Summary already includes a general description of the contaminants identified as posing potential risk to human health or the environment (i.e., COCs).

**11. Comment:** *Regarding the vertical extent of the landfill in the last sentence of the first paragraph under the Round 1 Remedial Investigation, Site 1 section: How deep was it? Please include in the next paragraph with the other dimensions of the landfill.*

**Response:** Information regarding the vertical extent of waste was added.

**12. Comment:** *Regarding the last sentence of the last paragraph under the Round 1 Remedial Investigation, Site 1 section: What evidence was there in the RI to support this [In addition, limited impact to groundwater and sediments was identified] conclusion. Please write a few plain-speaking sentences to explain what was sampled, the outcome of the analysis and what the numbers really mean. (below MCLs? Below action levels? Etc.)*

**Response:** This sentence was removed during the rewording of this section as part of addressing Comment 10.

**13. Comment:** *Why is there more detail in this ROD about the ERA than the HHRA?*

**Response:** Each summary explains how the risks were calculated. The eco risks were calculated using three separate steps (Steps 1 through 3A), while the HH risks were calculated using one step (RME and CTE calcs), thus, there is more ERA information to report. However, both risk summaries fully explain how potential risks were calculated.

**14. Comment:** *Ramming the numbers into parentheticals is just not the way. It's really very difficult to read. I've made multiple sentences, which is better, but still bulky. Best would be to simply present these numbers in a table. Then the ROD would only need a few sentences to make the conclusions.*

**Response:** This paragraph has been revised to use fewer parenthetical references, thus easier to read.

**15. Comment:** *["Potential risks from soil within the waste boundary were due to the presence of PAHs, pesticides, PCBs, and inorganics. Potential risks in groundwater and in soil outside/adjacent to the waste boundary were due to the presence of inorganics" is] not enough information. Start a new paragraph using these sentences and explain how the risk drivers were determined and the reason, if it is possible to draw a conclusion, why they are different in the different media. It's logical that the waste material would migrate, but it looks like that's not what happened here. Why?*

**Response:** This sentence, as well as the whole paragraph, has been revised to clarify that these contaminants were identified as COCs that contributed to the identified cancer risks and non-cancer hazards of the proceeding paragraphs. In addition, more information regarding the specific COCs contributing to risk and conclusions made by the HHRA are included in Section 2.5, Summary of Site Risks.

**16. Comment:** *I've deleted the steps [Steps 1 through 3A]. If you want to put them back, you must explain the whole process too.*

**Response:** References to the specific steps of the ERA evaluation have been removed from the document.

**17. Comment:** *Citation [USEPA, 1995d] needs to be in the references in full.*

**Response:** In accordance with the revisions made as a result of Comment 4, this reference has been removed from the document.

**18. Comment:** *All these references [USEPA, 2003] need to be cited in full in the reference section.*

**Response:** In accordance with the revisions made as a result of Comment 4, this reference has been removed from the document.

**19. Comment:** *How will people find these references [Buchman, 1999]?*

**Response:** In accordance with the revisions made as a result of Comment 4, this reference has been removed from the document.

**20. Comment:** *Citation [Persaud et al., 1993] in full in back.*

**Response:** In accordance with the revisions made as a result of Comment 4, this reference has been removed from the document.

**21. Comment:** *Regarding the last sentence of the last paragraph under the ERA Summary section: Why would the ERA recommend further evaluation of risks presented by groundwater if there is no pathway from groundwater to biota?*

**Response:** The ERA was reviewed and the further evaluation for groundwater was not made; therefore the reference to groundwater in this sentence was removed from the ROD.

**22. Comment:** *[(Baker, 2003)] Citation? The only reference for the EE/CA are the cleanup goals as Ref. 5. The amendment discussed here must be documented on other pages of the EE/CA, right?*

**Response:** In reviewing the EE/CA to respond to this comment, it was discovered there wasn't an amendment to the EE/CA to deal with the "landfill lens" uncovered by Hurricane Isabel. The removal contractor was already on-site conducting the main removal, so the Navy added this area to their scope of work. The sentence in the ROD has been revised to this:

"As a result, the Navy directed the removal contractor to delineate and remove this material and associated contaminated soils."

There were two other references to "expanding the EE/CA" that have been corrected as well.

**23. Comment:** *[(Baker, 2003)] Citation? This new system with page-specific citations means a very long reference section at the back with repeating different pages of the same documents.*

**Response:** In accordance with the revisions made as a result of Comment 4, this reference has been removed from the document.

**24. Comment:** *What previously installed breakwaters? Were they installed pursuant to a CERCLA action? When?*

**Response:** As mentioned in the summary of the 2003 Removal Actions B and C and Project Completion Report, Site 1, and Site 7, the breakwaters were installed as part of river bank protection activities conducted during Removal Action B. No changes were made.

**25. Comment:** *The "J" in the estimate means nothing to most people. Need to explain it or change wording to be accurate.*

**Response:** The "J" qualifier has been removed and replaced with "estimated".

**26. Comment:** *In which of the summarized studies were the post-removal groundwater samples taken and analyzed? Also, for writing, this is a wicked run-on sentence that is just unreadable. Please add citation and narrative to support the conclusion stated here. And please use more than one sentence to do that.*

**Response:** Post-removal groundwater samples were not collected and analyzed. Unacceptable human health risks were only identified when utilizing groundwater data collected from monitoring well 1-GW07. Once all landfill waste and monitoring well 1-GW07 were removed from the site, the source of contamination was eliminated and human health risks were recalculated. The recalculated risks utilized groundwater data collected during the RI. This paragraph was revised to clarify this information.

**27. Comment:** *Section 2.3: This ROD is missing a Scope and Role section. See pp. 6-8 and 8-7 of the ROD guidance. Please add the section.*

**Response:** The Scope and Role information is included in the last paragraph of Section 1. Therefore, no changes were made.

**28. Comment:** *Section 2.4: This section is very unclear. The point is to state what the current land use is, the expected future land use, and the potential future land use. It should be written clearly and simply. The next two paragraphs, mostly about groundwater, are especially unclear. Just state the proximity of residences to the site and if people are drinking well water. If there's a state law or local ordinance requiring residences to hook up to public water, this is the place to state that (include a citation for that).*

**Response:** This section was rewritten to more clearly represent the intention of the section.

**29. Comment:** *What does this mean? [has historically been identified as a source of domestic (older individual homes) water supplies in some parts of Charles City, New Kent, James City, and York Counties] Are their homes on well water for drinking water or not? The use of well water as drinking water is "historic"? Or the identification is "historic"? Point unclear.*

**Response:** In accordance with the revisions made as a result of Comment 28, this section has been rewritten and more clear.

**30. Comment:** *Is that [the main gate] near Site 1? The ROD does not state or show where Site 1 is compared to the main gate.*

**Response:** In accordance with the revisions made as a result of Comment 28, this section has been rewritten and includes the distance between Site 1 and the domestic water supply wells.

**31. Comment:** *Section 2.4: These reasons are not good ones for failing to cleanup the groundwater. If groundwater is classified as a potential sources of drinking water, and it is not safe for drinking because of site-related contamination, then the NCP expects that the gw will be remediated to it's beneficial reuse—regardless of whether anyone has access to that water now.*

**Response:** No risks were identified due to the exposure to groundwater; therefore, no remedial action is necessary. This sentience was intended to provide information that the former domestic potable wells would not be impacted by Site 1 activities if risk were identified and has been revised to clarify that information.

**32. Comment:** *Is not considered what? [.....however, beneficial groundwater use as a potable supply is not considered because impact to these wells from historical activities at CAX Site 1.....]*

**Response:** In accordance with the revisions made as a result of Comment 28, this section has been deleted.

**33. Comment:** *Point [Since potential unacceptable risks to soil within the waste boundary were identified, it was assumed that there were potential unacceptable risks from exposure to waste buried at Site 1.] unclear. Isn't the waste the source of the contamination in the soil?*

**Response:** This sentence has been deleted from the ROD.

**34. Comment:** *Section 2.5.1: VOCs???? None of the summaries of site investigations presented in this draft RD indicate the presence of VOCs—only that samples were analyzed for VOCs. Summary of the ERA lists no VOC as presenting a risk w/ an HQ>1. This sentence seems clearly irrelevant and/or misleading. Are there VOCs or a threat of release of VOCs at this site?*

**Response:** No, there are not VOCs or a threat of VOC release at the site. This sentence has been deleted from the ROD.

**35. Comment:** *Section 2.5.2: Move the third paragraph to be the first paragraph, as I did for section 2.5.1. Lead with the conclusion. Also edit that paragraph to present the evidence that contamination in soil outside the waste boundary has been reduced to cleanup levels. Or include other substantive evidence that the soil no longer (or perhaps never did?) present an unacceptable risk to human health or the environment.*

**Response:** This section has been revised to lead with the conclusions. In addition, Table 1 presents soil cleanup levels and the maximum soil concentrations detected throughout Site 1 following removal actions, thus providing evidence that contamination outside and adjacent to the waste boundary has been reduced to below cleanup levels and no longer present an unacceptable risk to human health or the environment.

**36. Comment:** *Section 2.5.2: VOCs???? None of the summaries of site investigations presented in this draft RD indicate the presence of VOCs—only that samples were analyzed for VOCs. Summary of the ERA lists no VOC as presenting a risk w/ an HQ>1. This sentence seems clearly irrelevant and/or misleading. Are there VOCs or a threat of release of VOCs at this site?*

**Response:** As with the response to Comment 34, this sentence has been deleted from the ROD.

**37. Comment:** *Regarding Table 2: What does CSF stand for? And in the legend, you can delete acronyms that have been defined in the text if you wish (like CTE and RME).*

**Response:** CSF means cancer slope factor and has been defined in Table 2.

**38. Comment:** *Table 1 is about soil WITHIN the boundary, not outside it. This paragraph [Following completion of the five removal actions, the maximum detected concentrations of identified COCs did not exceed the clean-up goals for soil (as established for the protection of human health and the environment in the Technical Memorandum for the Pre-Removal Characterization of Sediments) (**Table 1**). Therefore, ecological risks to terrestrial habitats from exposure to soil outside/adjacent to the waste boundary have been mitigated] should be deleted and a new paragraph should be written that includes evidence that soil outside the boundary does not pose an unacceptable risk to ecologic receptors.*

**Response:** Table 1 presents soil clean up levels and the maximum soil concentrations detected throughout Site 1 following removal actions, not just within the boundary. The title of Table 1 has been revised to reflect this information. No other changes were made.

**39. Comment:** *1. Is the argument presented here [was re-evaluated following the five removal actions and determined to be* ***acceptable*** *(Ref. 35) because these contaminants are consistent with background concentrations and no potential unacceptable risk exists based on more realistic CTE calculations (****Table*** *3).] that the metals in the water are naturally occurring? If so, please state that plainly and present some background data versus data from the gw sampling at the site. 2. If risk from CTE is being used as the rationale for no action, what is the rationale for using CTE versus RME?*

**Response:** 1). The argument here is that following the removal actions the risk was re-evaluated using data from existing monitoring wells and is acceptable since the maximum arsenic, iron, and manganese concentrations are below background levels. This paragraph was revised to clarify this information. In addition, Table 3 presents the maximum concentrations (EPC) and background values. 2). The rationale for no action was that concentrations are below background levels. Discussion of CTE was added just as another line of evidence to prove that the future risks to adult and child residents is acceptable. RME was not considered and is unnecessary because we are below background.

**40. Comment:** *Regarding table 3—for EPA's tox—isn't calculated cancer risk cumulative? (not based on pathway)??*

**Comment clarity** (provided by EPA): *Cancer risks are cumulative within and across exposure pathways. Additionally, under a residential exposure scenario cancer risks should be summed for child and adult receptors. Although the conclusions may not change, for the sake of accuracy, groundwater risks at this site should be summed to reflect total exposure (child + adult and ingestion + dermal contact).*

**Response:** The calculated risks are cumulative. Adding this information to the existing table would cause too much confusion, so an attachment (Attachment C) has been added to the ROD to identify the cumulative risk to receptors.

**41. Comment:** *Add a sentence here [Section 2.5.4] identifying the receptor with the highest calculated risk and the risk associated with that receptor to serve as a demonstration that there are no unacceptable risks from surface water.*

**Response:** Information regarding the calculated risk to future child residents, under RME assumptions, was added. This calculated risk was added since it is the most conservative exposure scenario.

**42. Comment:** *Section 2.5.4: Did completion of the removals result in lower levels of COCs in surface water? If so, please present the evidence. If not, clarify rationale.*

**Response:** Following completion of Removal Action B, ecological risks were re-calculated utilizing new surface water results. This section has been revised to reflect this information.

**43. Comment:** *Add a sentence here [Section 2.5.5] identifying the receptor with the highest calculated risk and the risk associated with that receptor to serve as a demonstration that there are no unacceptable risks from sediments to humans.*

**Response:** Information regarding the calculated risk to future child residents, under RME assumptions, was added. This calculated risk was added since it is the most conservative exposure scenario.

**44. Comment:** *Section 2.6: See deleted text. Is deletion correct? Management of site risks usually means implementation of institutional controls. Here, the removals were undertaken and there is no current risk anymore, right?*

**Response:** This comment is correct; there is no risk anymore. The entire sentence has been deleted.

**45. Comment:** *40 CFR 300.430(f)(3)(1)(A) requires that a notice of availability of the PRAP and a brief analysis is published in a major local newspaper of general circulation. Was it? If so, write a sentence here to document that.*

**Response:** Information regarding the public notice that the PP (or PRAP) was available for public review and comment was added.

**46. Comment:** *Section 3: EPA did not attend [the public meeting]?*

**Response:** No. There was no EPA representative present at the public meeting for the Site 1 Proposed Plan.

**47. Comment:** *It is necessary to summarize all comments and respond in substance in the Responsiveness Summary. Add at least one more sentence about the nature of the questions asked at the public meeting and the responses. If there was criticism of the NFA proposed plan, explain what the criticism was and respond in substance here.*

**Response:** A summary of the one question raised during the public meeting was added.

**<u>Comments from EPA RPM (Sue Haug):</u>**

**1. Comment:** *Please also refer to the Site as OU 1 on the cover and the header on page 1-1 (this page is mis-labeled as 2-1). Please change the first sentence in the Declaration to:*

> *This Record of Decision (ROD) presents the No Further Action (NFA) determination for all media (soil, groundwater, surface water, and sediments) at Operable Unit 1 (OU 1), also known as Environmental Restoration Program (ERP) Site 1, Former Landfill Near Incinerator...*

**Response:** Although "Operable Unit 1" is an EPA designation and not a Navy or Partnering Team one, it has been added to ease EPA review. The cover and first sentence in the Declaration have been changed, as recommended.

**2. Comment:** *I didn't give you the correct signature block. It should be:*

> *Hank Sokolowski*
> *Associate Division Director, Office of Federal Facility*
> *Remediation and Site Assessment*

**Response:** The signature block has been revised to reflect the correct information

All other editorial and formatting comments were made as indicated. If you have any questions or comments regarding the above response to comments, please feel free to contact me at 757-671-6266.

Sincerely,

CH2M HILL

Stephanie Sawyer
Project Manager

cc: Mr. Chris Murray/NAVFAC Mid-Atlantic
Mr. Wade Smith/VDEQ
Ms. Bonnie Capito/NAVFAC Atlantic
Ms. Marlene Ivester/CH2M HILL

CH2M HILL
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August 21, 2009

358549.RP.DF

Mr. Wade Smith
Remedial Project Manager
Office of Remediation Programs
Virginia Department of Environmental Quality (VDEQ)
P.O. Box 1105
Richmond, Virginia 23218

Subject: Response to VDEQ Comments on *Draft Record of Decision, Site 1: Landfill near Incinerator;* Naval Weapons Station Yorktown; Cheatham Annex; Williamsburg, Virginia

Dear Mr. Smith,

On behalf of the U.S. Department of the Navy's Naval Facilities Engineering Command (NAVFAC), this letter is in response to your June 12, 2009 email, providing comments for the subject document via track changes in the Word file. Comments are presented, shown in italics, followed by Navy's responses.

**Comment #1:** *Recommend consistently referring to Site 1 as Landfill Near Incinerator instead of periodically referring to Site 1 as Former Landfill Near Incinerator.*

**Response:** All references to Site 1 as the Former Landfill Near Incinerator have been revised to reference Site 1 as the Landfill Near Incinerator.

**Comment #2:** *The report cover and CD contain NAB Little Creek's EPA ID#. Please revise.*

**Response:** The report cover and CD have been revised to show the correct EPA ID Number.

**Comment #3:** *Please move Figure 3 to this section or place all figures at the end of section.*

**Response:** Figure 3 was moved to Section 2.2, as indicated.

**Comment #4:** *The hardcopy and the CD version do not contain Attachment 1. Please include.*

**Response:** All future hardcopies and CD versions of this ROD will include Attachment 1.

**Comment #5:** *The hardcopy and the CD version do not contain Attachment 2. Please include.*

**Response:** All future hardcopies and CD versions of this ROD will include Attachment 2.

**Comment #6:** *Cannot locate reference [USEPA, 1995d].*

**Response:** Based on changes made as a result of EPA comments, this reference has been removed from the ROD.

**Comment #7:** *Cannot locate reference [USEPA, 2003].*

**Response:** Based on changes made as a result of EPA comments, this reference has been removed from the ROD.

**Comment #8:** *Cannot locate reference [Buchman, 1999].*

**Response:** Based on changes made as a result of EPA comments, this reference has been removed from the ROD.

**Comment #9:** *Cannot locate reference [Persaud et al., 1993].*

**Response:** Based on changes made as a result of EPA comments, this reference has been removed from the ROD.

**Comment #10:** *Please define [µg/kg].*

**Response:** µg/kg has been defined.

**Comment #11:** *Please include reference [2006 Technical Memorandum].*

**Response:** Based on changes made as a result of EPA comments, this reference will not be made in the ROD.

**Comment #12:** *Please include a description of "Meandering Floor Path".*

**Response:** The Meandering Floor Path directs surface water runoff to the York River, This information has been added to the ROD.

**Comment #13:** *? [Groundwater in the vicinity of CAX occurs in at approximately.....]*

**Response:** The word "in" has been removed from this sentence so it now reads as: "Groundwater in the vicinity of CAX occurs at approximately 10 ft bgs in the Yorktown-Eastover aquifer."

**Comment #14:** *According to CAX's IRP Web Site (http://public.lantops-ir.org/sites/public/yorktown/Site%20Files/AdminRecords.aspx) – The AR does not contain this ROD, the Proposed Plan, and all other information that supports an NFA determination. Please update the AR.*

**Response:** Due to the transition from the Enterprise system to NIRIS and the public website being temporarily unavailable, the references to the website where the Administrative Record can be found have been removed from the ROD. The official AR for CAX, maintained by the NAVFAC Librarian, will contain the Proposed Plan and all other information that supports an NFA determination.

In addition, all formatting and editorial revisions were made, as indicated.

Sincerely,

CH2M HILL

Stephanie Sawyer
Project Manager

cc: Mr. Chris Murray/NAVFAC Mid-Atlantic
Ms. Sue Haug/USEPA
Ms. Bonnie Capito/NAVFAC Atlantic
Ms. Marlene Ivester/CH2M HILL

# COMMONWEALTH of VIRGINIA

*DEPARTMENT OF ENVIRONMENTAL QUALITY*
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Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
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September 23, 2009

Mr. Henry J. Sokolowski, Associate Director
Hazardous Site Cleanup Division (3HS00)
U.S. Environmental Protection Agency, Region 3
1650 Arch Street
Philadelphia, PA 19103-2029

**RE: Final Record of Decision**
**Site 1 – Landfill Near Incinerator**
**Naval Weapons Station Yorktown**
**Cheatham Annex**
**Williamsburg, Virginia**

Dear Mr. Sokolowski:

The Virginia Department of Environmental Quality (DEQ) staff has reviewed the *Final Record of Decision* (Final ROD) for Site 1 – Landfill Near Incinerator located at Naval Weapons Station Yorktown, Cheatham Annex (CAX), Williamsburg, Virginia. The DEQ concurs with the No Further Action decision, as described in the September 2009 Final ROD, which was signed by Tim S. Shipman (Lieutenant Commander, U.S. Navy, Executive Officer) on September 22, 2009.

Please contact Wade Smith at (804) 698-4125 or wade.smith@deq.virginia.gov with any questions.

Sincerely,

Durwood H. Willis

Durwood H. Willis
Director, Office of Remediation Programs

cc: Chris Murray, CAX
Milt Johnston, DEQ, TRO
Wade Smith, DEQ, CO
Susanne Haug, EPA