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FINAL PROPOSED PLAN SITES 6, 12, 15 AND 17 OPERABLE UNIT 9 (OU9) WITH TRANSMITTAL NWS EARLE NJ
9/21/2004
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PHIL-18337

Project Number 2128

September 21, 2004

Engineering Field Activity Northeast
Naval Facilities Engineering Command
10 Industrial Highway Mail Stop No. 82
Lester, Pennsylvania 19113-2090

Attn: Ms. M. DiGeambeardino, Code EV21/MD

Reference: Contract No. N62467-94-D-0888
Contract Task Order (CTO) No. 843

Subject: Submission of Final Proposed Plan for Sites 6, 12, 15, and 17 (OU 9)
NWS Earle - Colts Neck, New Jersey

Dear Ms. DiGeambeardino:

Tetra Tech NUS, Incorporated (TtNUS) is pleased to provide copies of the subject document. Three copies have been sent to Jessica Mollin at EPA, Region 2, three copies have been sent to Bob Marcolina at NJDEP, one copy has been sent to Alicia Hartmann at NWS Earle and three copies are enclosed for your use. One copy has been sent to Mary Jane Kehoe at the Monmouth County Library, Eastern Branch for the Administrative Record file.

Thank you for this opportunity to submit the documents. Do not hesitate to contact me if you have any questions or require revisions.

Sincerely,

Russell E. Turner
Project Manager

RET/vh

Enclosures

c: Alicia Hartmann (NWS Earle)
Jessica Mollin (EPA, Region II)
Bob Marcolina (NJDEP)
Mary Jane Kehoe (Monmouth County Library, Eastern Branch)
Garth Glenn (TtNUS) (without enclosures)
File

FINAL PROPOSED PLAN
for
SITES 6, 12, 15 and 17 (OU 9)

NAVAL WEAPONS STATION EARLE
Colts Neck, New Jersey

Engineering Field Activity Northeast
Naval Facilities Engineering Command
Contract No. N62467-94-D-0888
Contract Task Order 843

September 2004

TETRA TECH NUS, INC.

Department of the Navy

Proposed Remedial Action Plan for OU 9

Naval Weapons Station (NWS) Earle
Colts Neck, New Jersey

SEPTEMBER 2004

NAVY ANNOUNCES PROPOSED REMEDIAL ACTION PLAN

The Department of the Navy (Navy) has completed a **feasibility study (FS)** for Operable Unit 9 (OU 9) to address contamination associated with Site 6 (Landfill West of Normandy Road), Site 12 (Battery Storage Area), Site 15 (Sludge Disposal Area), and Site 17 (Landfill) at Naval Weapons Station (NWS) Earle in Colts Neck, New Jersey. All of the OU 9 sites are located within the Waterfront area of NWS Earle (See Figures 1 and 2).

The FS was prepared as part of the Navy's Installation Restoration Program (IRP) and the Superfund Remedial Program [Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)]. IRP sites at NWS Earle have been grouped into operable units comprising sites with similar site characteristics. The Navy is then able to save time and money by processing similar sites simultaneously. OU 9 consists of Sites 6, 12, 15, and 17. The purpose of the FS was to evaluate the clean-up alternatives available for Sites 6, 12, 15, and 17.

Site 6 is a former landfill used from 1943 to 1965 for the disposal of refuse from the Waterfront area. The disposed refuse consisted of dunnage lumber, glass, paper, packing material, and small amounts of paint and solvent. Site 12 is a paved battery storage area next to a loading dock located east of Building R-10 formerly used as a temporary staging area for forklift batteries sent off site for recycling. The Site 15 sludge disposal area was used in the early 1970s for the disposal of an unknown amount of oily bilge sludge from Navy ships. Site 17 is a former landfill of approximately three acres, used as early as the mid 1940's for the disposal of wood, heavy equipment, empty paint cans, and construction debris.

Before the FS was completed, the Navy performed a **remedial investigation (RI)** and a human health and ecological risk assessment.

This Proposed Plan summarizes the findings of the OU 9 FS report, identifies the cleanup alternative preferred by the Navy and U.S. Environmental Protection Agency (EPA), and explains the reasons for this preference. In addition, this Proposed Plan explains how the public can participate in the decision-making process and provides addresses for the appropriate Navy contacts.

PUBLIC PARTICIPATION IS ENCOURAGED

This Proposed Plan is issued by the Navy, the lead agency for the IRP and Superfund activities at the NWS Earle facility, and by EPA, the support agency for Superfund activities. The purpose of the Proposed Plan is to outline the alternatives

PUBLIC MEETING

A public meeting to discuss this Proposed Plan will be held on Tuesday, October 5, 2004 at 7:30 PM at the Howell Township Municipal Building, Howell Township, New Jersey. The meeting date will also be published in the Asbury Park Press.

detailed in the FS and state the rationale for the preferred alternative for cleanup of OU 9.

The public is encouraged to comment on this Proposed Plan. Procedures for public comment are discussed at the end of this Plan. After the public comment period has ended and after any comments have been reviewed and considered, the Navy and EPA will select the final remedies for Sites 6, 12, 15, and 17.

NOTE: A glossary of relevant technical and regulatory terms is provided at the end of this Proposed Plan. Terms included in the Glossary are initially indicated in **boldface** within the Proposed Plan.

NAVY'S RESPONSIBILITY

The Navy is issuing this Proposed Plan as part of its public participation responsibilities under the Superfund law and, in particular, Sections 113(k), 117(a), and 121(f) of CERCLA, (commonly referred to as Superfund) as amended by the Superfund Amendments and Reauthorization Act (SARA).

This document presents the preferred alternative for cleanup of OU 9, based on the FS. The Proposed Plan also summarizes information that can be found in greater detail in the RI report for the OU 9 sites at NWS Earle and in other site documents contained in the **Administrative Record** file for this site. The Administrative Record file is available at the Monmouth County Library, Eastern Branch, Route 35, Shrewsbury, New Jersey. The Navy invites the public to review the available materials and to comment on this Proposed Plan during the public comment period.

The Navy, with EPA, may modify the selected remedy presented in this Proposed Plan for OU 9 based on new information from the public comments. **The public is encouraged to review and comment on the recommendations identified here.**

SITE BACKGROUND

NWS Earle is located in Monmouth County, New Jersey, approximately 47 miles south of New York City. The station consists of two areas, the 10,248-acre Main Base (Mainside area), located inland, and the 706-acre Waterfront area. The two areas are connected by a Navy-controlled right-of-way. Figure 2 shows the Waterfront area and highlights where the four OU 9 sites are located.

Commissioned in 1943, the facility's primary mission is to supply ammunition to the naval fleet. An estimated 1,500 people either work or live at the NWS Earle station.

The Mainside area is located in Colts Neck Township, which has a population of approximately 12,300 people. The surrounding area includes agricultural land, vacant land, and low-density housing. The Mainside area consists of a large, relatively undeveloped portion associated with ordnance operations, production, and storage; this portion is encumbered by **explosive safety quantity distance (ESQD) arcs.** The NWS Earle Master Plan contains maps showing the ESQD arcs around weapons handling, maintenance and storage facilities. Land use within the ESQD is typically limited to

transient activities only (e.g., transit or entry for ordnance inspection and maintenance activities). The result of the ESQD policy implementation is that most of the approximately 10,000 acres at the Mainside area (with the exception of the more densely developed Administration area near the main gate) is open land in its natural wooded state. Other land use in the Mainside area consists of residences, offices, workshops, warehouses, recreational space, open space, and undeveloped land.

The Waterfront area, which is located approximately 10 miles north of the Mainside area, is located in Middletown Township. Land use at the Waterfront facility includes residences, office buildings, recreational areas, open space, and undeveloped land. Approximately 20 percent of the Waterfront area is considered marshland. The area around the Waterfront includes commercial and single-family residential land. The Mainside and Waterfront areas are connected by a 10-mile railroad and road right-of-way. Munitions and other supplies destined for U.S. Navy ships, pass from the Mainside area along the railroad right-of-way to the Waterfront area and to waiting ships at piers located in the Lower Hudson River Bay near Sandy Hook, New Jersey.

Sites 6, 12, 15, and 17 are located in the Waterfront Administration area (Figure 2). The Waterfront Administration area is not encumbered by ESQD arcs. Future land use is not expected to vary significantly from current land use unless a major base realignment were to occur. A brief description of each site follows.

Site 6 - Landfill West of Normandy Road

Site 6 is a 4-acre area used between 1943 and 1965 to dispose of refuse consisting of dunnage lumber, glass, paper, packing material, and small amounts of paint and solvent from the Waterfront area (Figure 3). It was reported that the wastes were burned before they were covered, and an estimated 2,500 tons of waste were deposited annually at the landfill. The landfill area may have been part of a salt marsh before disposal began. Currently, the majority of the landfill surface is paved or covered with buildings. The landfill surface is 3 to 10 feet higher than the adjacent marsh and wetland areas, and the toe of the landfill is covered with vegetation.

A Navy contractor performed landfill surface stabilization work at Site 6 in 1999. The work included delineation of adjacent wetlands to determine boundaries for the stabilization, clearing and removal of brush and trees, placement of additional soil cover, and grading and seeding of the area to stabilize the northern slope of the site.

Site 12 - Battery Storage Area

Site 12 was a paved area next to the loading dock east of Building R-10 located in the Waterfront Area (Figure 3). The site was used as a temporary staging area for forklift batteries being sent off site to be reclaimed. The storage area occupied various portions of the paved area at different times but was generally limited to approximately 7,500 to 10,000 square feet at the northern end of the paved area adjacent to Building R-10.

Site 15 - Sludge Disposal Site

The Site 15 sludge disposal area reportedly occupied a small area (approximately one acre) along the former railroad tracks near the main entrance to the Waterfront area (Figure 3). In the early 1970s, the site was used for disposal of an unknown amount of oily bilge sludge. It is estimated that over 5,000 gallons of sludge, which may have ranged from 1 percent to 25 percent oil, may have been disposed at the site. The exact location of the sludge disposal activities was not apparent during site inspections. The site is near

an elevated railroad bed built approximately 6 feet above the surrounding ground surface.

Site 17 - Landfill

The Site 17 former landfill occupies 3 acres in the Waterfront area, adjacent to a tidal marsh in the Ware Creek drainage basin (Figure 3). The site was reportedly used for the disposal of wood, heavy equipment, empty paint cans, and construction debris. The former landfill surface is covered with gravel and pavement for use as a parking area for Navy personnel working at the Waterfront area.

REGULATORY STATUS

In 1990, NWS Earle was placed on the **National Priorities List (NPL),** a list of sites where uncontrolled hazardous substance releases may potentially present serious threats to human health and the environment.

STUDIES AND RESULTS

Potential hazardous substance releases at NWS Earle were addressed in the **Initial Assessment Study (IAS)** in 1983, a **Site Inspection Study (SI)** in 1986, and a Phase I RI in 1993. These were preliminary investigations to determine the number of sources, compile histories of waste-handling and disposal practices at the sites, and acquire data on the types of contaminants present and potential human health and/or environmental receptors.

Potential sites at NWS Earle were investigated during Phase II RI activities to further define the nature and extent of contamination at these sites. Phase II activities included installation and sampling of groundwater monitoring wells, surface water and sediment sampling, surface and subsurface soil sampling and test pit excavation. The Phase II RI was initiated in 1995 and completed in July 1996, when the final RI report was released.

The RI reports include a comparison of the site-specific investigation results to **Applicable or Relevant and Appropriate Requirements (ARARs)** and other guidance to be considered (TBCs) as well as to site background conditions. ARARS include federal and/or state standards such as federal **Maximum Contaminant Levels (MCLs)** for drinking water, New Jersey Department of Environmental Protection (NJDEP) Groundwater Quality Standards (GWQS), NJDEP soil cleanup criteria or other published list of reference values. Site background conditions were established by a significant sampling and analysis program and statistical analysis described in the RI report.

In the case of OU 9 sites, compounds of concern (and eventually remediation goals) were selected based on comparison to GWQS. For these sites, the GWQS reference value was more stringent than the MCL for the compounds of potential concern encountered.

Designated "background" samples were collected in areas adjacent to the areas of concern but demonstrably not affected by site activities. The procedure for determining background concentrations is summarized in the February 1997 RI Addendum Report. Background results can be found in the Tables section following the main body and the Figures section of this Proposed Plan document. Tables 1 through 6 pertain to Site 6, Tables 10 through 13 pertains to Site 15, and Tables 14 through 20 pertains to Site 17.

Summaries of OU 9 site investigations are discussed below.

Site 6

Initial Assessment and Confirmation Study

The 1983 IAS, consisting of records review, interviews and on-site observations, did not recommend Site 6 for a confirmation study of environmental sampling and laboratory analysis.

Site 6 was not recommended for a confirmation study due to the materials disposed at the site, which are discussed on page 3. The IAS report concluded that the bulk of wastes disposed of at Site 6 were inert and their presence would not produce health effects or significant environmental impacts. However, the Navy did not agree with this conclusion and the IAS was followed by further remedial investigations summarized as follows.

Phase I RI/FS Results

During the 1993 Phase I RI, 4 soil borings were drilled and completed as monitoring wells. Two soil samples were analyzed for **volatile organic compounds (VOCs)**, **semivolatile organic compounds (SVOCs)**, pesticides, **polychlorinated biphenyls (PCBs)**, and metals. Low levels of VOCs (2-butanone), several SVOCs and two pesticides (4,4-DDE and 4,4-DDT) were detected in soils collected from three of the well borings at concentrations well below NJDEP soil cleanup criteria standards. Low levels of metals were also detected below the NJDEP soil cleanup criteria standards. Four sediment samples were collected from the marsh area downgradient of the site. Some elevated levels of metals (cadmium, lead, and silver), all pesticides, most SVOCs, and PCBs were detected at levels above the sediment ecological toxicity threshold values. Groundwater samples were collected from the four monitoring wells and analyzed for metals, organics, and landfill parameters. Elevated levels of metals (iron, manganese, and sodium) and one miscellaneous parameters (ammonia as nitrogen) were detected above applicable NJDEP groundwater guidance cleanup levels. Concentrations of landfill related parameters (a set of analytical tests including biological oxygen demand and chemical oxygen demand used to evaluate impact of municipal type landfills on groundwater or surface water) were relatively low compared to typical groundwater concentrations found beneath active solid waste landfills.

Due to laboratory data quality problems relating to the Phase I data, only data collected during the Phase II RI were used to calculate potential human health or ecological risks.

Phase II Remedial Investigation

Between June and October 1995, the Navy conducted the following field investigation activities:

- Sampling and analysis of surface water.
- Sampling and analysis of sediment.
- Sampling and analysis of groundwater from the four existing monitoring wells.
- Measurement of static-water levels in the four monitoring wells.

Based on previous investigations including the 1995 RI, it was determined that further data were required to assess the ecological impacts on the adjacent wetlands. On October 29, 1996 and November 1, 1996, the Navy conducted additional surface water and sediment sampling and analysis at Site 6.

Based on regional geological mapping, Site 6 is part of the outcrop area of the Englishtown Formation. The Englishtown Formation ranges from 35 and 150 feet in thickness, and the soil borings are no more than 23 feet deep. The

lithology of the sediments encountered in the on-site borings generally agrees with the published description of the Englishtown Formation. In general, the borings encountered fill material, yellowish-brown clay, yellowish-brown, olive, and gray sand and silty sand, and gray silt. Based upon the boring log descriptions, the wells at Site 6 penetrated fill material and the Englishtown Formation.

Tables 1 through 5 present the occurrence and distribution of compounds found in RI samples collected at Site 6. Figures 4 and 5 show sample locations and concentrations of compounds that exceed screening levels. Surface water and sediment sample analysis results were compared to NWS Earle site-wide background samples. Groundwater at Site 6, found in the fill and Englishtown Formation, was compared to samples taken from the fill and Englishtown Formation grouping of background groundwater samples taken at NWS Earle.

Sediment

Four site-related sediment samples were collected at Site 6 during the 1995 RI and six additional sediment samples (06SD05 through 06SD10) were collected during the 1996 RI Addendum field activities (see Figure 6). Tables 1 and 2 present the occurrence and distribution of inorganic and organic chemicals, respectively, detected in Site 6 sediment samples and compare them to background concentrations. The background samples for sediment were BGSD01, BGSD02, and BGSD04 through BGSD07.

Higher concentrations of metals in comparison to background were seen in site-related samples, particularly at sample locations 06SD01 and 06SD04 and, to a lesser extent, at sample locations 06SD02 and 06SD07. Samples contained aluminum (up to 14,500 mg/kg at 06SD07), arsenic (up to 36.3 mg/kg at 06SD04), barium (up to 138 mg/kg at 06SD02), cadmium (up to 1.8 mg/kg at 06SD04), cobalt (up to 8.2 mg/kg at 06SD01), copper (up to 228 mg/kg at 06SD04), iron (up to 52,200 mg/kg at 06SD01), lead (up to 445 mg/kg at 06SD04), magnesium (up to 2,460 mg/kg at 06SD01), manganese (up to 451 mg/kg at 06SD04), mercury (up to 0.63 mg/kg at 06SD04), nickel (up to 43.8 mg/kg at 06SD04), selenium (up to 3.4 mg/kg at 06SD04), vanadium (up to 104 mg/kg at 06SD07), and zinc (up to 1,720 mg/kg at 06SD04). Antimony and thallium were detected at two locations at levels up to 12.4 mg/kg and 2.1 mg/kg, respectively.

Polycyclic aromatic hydrocarbons (PAHs) including benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, indeno(1,2,3-cd)pyrene, fluoranthene, fluorene, and pyrene were detected in background sediment samples at levels ranging from 110 to 1,900 ug/kg with some concentrations exceeding the sediment ecological toxicity threshold values. The maximum concentrations of individual PAHs detected in the Site 6 sediment samples occurred in sample 06SD04 and ranged from one to 10 times higher than the concentrations in background sediment. Pesticides are found throughout the facility in areas where pesticides were used to control vegetation or insects. Background samples contained the pesticide DDT and its analogs at the following concentrations: 19 ug/kg 4,4'-DDT, 1.7 ug/kg 4,4'-DDE and 21 ug/kg 4,4'-DDD. These pesticides were detected in the sediment samples at Site 6 with 4,4'-DDT concentrations ranging from 9.3 to 110 ug/kg, 4,4'-DDE concentrations ranging from 3.6 to 66 ug/kg, and 4,4'-DDD concentrations ranging from 2.4 to 230 ug/kg. Several additional pesticides detected in Site 6 sediment samples were not present in background sediments or were present at much lower levels. The highest levels of pesticides were at sample locations 06SD01, 06SD02, and 06SD04. Trace levels of xylene (3 ug/kg) and 4-methyl-2-pentanone (2 ug/kg) were each detected in one sediment sample, 06SD01, but were not found in background sediments.

Bis(2-ethylhexyl) phthalate was present in two sediment samples at concentrations up to 880 ug/kg. Butylbenzyl phthalate was detected in one sample, 06SD08, at 300 ug/kg but was not detected in background samples. Toluene was detected in one sediment sample at a level (31 ug/kg).

The Site 6 sediment samples were also analyzed for pH and total organic carbon (TOC). TOC levels in sediment did not exceed background.

Groundwater

Four groundwater samples (06GW01 through 06GW04) were collected at Site 6. Tables 3 and 4 present the occurrence and distribution of inorganic and organic chemicals detected in site-related groundwater samples compared to background.

Concentrations of most metals in Site 6 groundwater were similar to the ranges detected in background samples. The following metals exhibited concentrations greater than background: cadmium (1.2 to 7.0 ug/L) and iron (13,400 to 95,200 ug/L) in samples 06GW01, 06GW02, 06GW03, and 06GW04 and manganese (1820 ug/L) in sample 06GW01.

Endosulfan I and gamma-BHC were each detected in one groundwater sample collected at Site 6 at concentrations of 0.0021 and 0.0008 ug/L, respectively. Explosives and related degradation products were analyzed for but not detected in any of the groundwater samples.

Miscellaneous parameter analyses of four groundwater samples consisted of ammonia, biological oxygen demand (BOD), chemical oxygen demand (COD), chlorides, nitrates, sulfates, TOC, phosphates, and turbidity. Most indicator parameters revealed lower concentrations in all downgradient wells than in upgradient well 06MW01. Downgradient concentrations were slightly greater than upgradient levels and greater than background ranges for ammonia and TOC in 06MW04 and for sulfate in 06MW03. Upgradient well 06MW01 had chloride, BOD, COD, and TOC at concentrations greater than background. The wells containing maximum detected concentrations of miscellaneous parameters were generally consistent with the results of the previous 1993 investigation. None of the landfill indicator parameters in upgradient or downgradient wells were high enough to be within a range typically associated with a municipal landfill nearby.

Surface Water

Two surface water samples were collected at Site 6 in 1995 (06SW01 and 06SW02), and three surface water samples (06SW05 through 06SW07) were collected in 1996. Table 5 presents the occurrence and distribution of inorganic chemicals in Site 6 surface water samples and compares them to background. No organic compounds were detected in Site 6 surface water samples.

The highest levels of metals were primarily at locations 06SW01 and 06SW06. Metals exceeding two times the background concentrations included aluminum (up to 15,100 ug/L), arsenic (up to 42.4 ug/L), barium (up to 468 ug/L), cadmium (2.7 ug/L at 06SW01), cobalt (up to 6.6 ug/L), copper (up to 102 ug/L), iron (up to 349,000 ug/L), lead (up to 506 ug/L), mercury (up to 0.29 ug/L), nickel (up to 27.2 ug/L), vanadium (up to 40.5 ug/L), and zinc (up to 323 ug/L). Antimony was also detected at location 06SW06 (3.3 ug/L).

Miscellaneous parameter analyses of the five surface water samples taken at Site 6 consisted of alkalinity, ammonia, BOD, COD, chlorides, total dissolved solids (TDS), total suspended solids (TSS), total water hardness (hardness), TOC,

phosphate, and turbidity. Although several surface water indicator parameters were detected at levels greater than background (chloride, phosphate, nitrate, and ammonia), only ammonia nitrogen was detected at an estimated value above the NJDEP freshwater guidance cleanup standard.

Site 12

Initial Assessment and Confirmation Study

The 1983 IAS, consisting of interviews, records review and on-site inspection, did not recommend Site 12 for a confirmation study of environmental sampling and analysis based on the belief that any acids spilled would have been buffered when they drained into the salt marsh.

Phase I Remedial Investigation

During the 1993 SI, one surface water sample and one sediment sample were collected from the downstream side of the storm water culvert outflow in the salt marsh. No surface water or sediment was present at the upgradient portion of the drainage culvert at the time these samples were taken. The sediment sample was analyzed for VOCs, SVOCs, pesticides, PCBs, metals, and cyanide. The surface water sample was analyzed for VOCs, metals, and cyanide. Sample analysis indicated that SVOCs, VOCs, and pesticides were present in the sediment sample taken at the site. Metals were detected in the surface water and sediment sample. Cyanide was not detected in either sample.

An underground storage tank (UST) installed at the northeast corner of building R-10 and located approximately adjacent to the former battery storage area was removed in 1994. Visual contamination of the soil was not observed during the tank removal. Upon removal, the tank and associated piping were examined and found in good condition, free of holes, and with minor rust and pitting. Four confirmation soil samples were obtained from the excavation sidewalls, and two samples were taken from the excavated soils. The excavation sidewall samples were analyzed for total petroleum hydrocarbons (TPH), and all had concentrations less than the method detection limits (MDL) or actual sample detection limit (DL) of 56 to 61 mg/kg. The two soil pile samples had TPH concentrations of 460 mg/kg and 520 mg/kg, indicating moderate TPH contamination that could be properly disposed in a regulated solid waste landfill. The soil was disposed as non-hazardous.

Phase II Remedial Investigation

In August 1995, B&R Environmental conducted sampling and analysis of surface soil and sediment and surveyed to establish the horizontal locations and vertical elevations of the surface soil and sediment sample locations.

No samples were obtained from the area labeled "Battery Storage Area" because the asphalt would have been a barrier to infiltration of the spilled battery electrolyte solution. The RI attempted to obtain the "worst case" sediment samples in known low-lying areas of likely sedimentation.

On October 29, 1996, B&R Environmental conducted surface and subsurface soil sampling at Site 12 and surveyed to establish the horizontal locations and vertical elevations of the sample locations. The RI Addendum field investigation was designed to provide further data on the aerial and vertical extent of metals contamination in soils at Site 12. This sampling was part of a larger sampling event performed at the time to investigate potential impacts from Waterfront sites on the salt marsh. Since there were no true sediments or surface water at Site 12, surface soil and subsurface soil were sampled to further delineate soil contamination in advance of the soil removal action carried out by the Navy later.

Infiltration is limited by an asphalt parking lot that covers the site. Surface runoff is directed to a storm water collection basin that discharges through a concrete culvert to a drainage swale and eventually to a marsh north of the site. A UST was located in this general area, but it has been removed.

Regional geological mapping indicates that Site 12 is within the outcrop area of the Englishtown Formation. The Englishtown Formation ranges from 35 and 150 feet in thickness and consists of tan and gray, fine- to medium-grained quartz sand with local clay beds. The presence of the Englishtown Formation beneath Site 12 cannot be confirmed because no soil borings were drilled at the site. However, the lithology of the sediments encountered in borings at Sites 6, 15, and 17 generally agreed with the published description of the Englishtown Formation. Site 6 is located about 600 feet northeast, Site 15 is located about 1,000 feet south-southeast, and Site 17 is located about 700 feet south-southwest of Site 12. In general, the borings at these sites encountered fill material and sand, silty sand, and clayey sand.

Groundwater

Groundwater beneath the site consists of the Englishtown aquifer, the same as beneath Sites 6, 15, and 17. The direction of shallow groundwater flow in the aquifer beneath Site 12 is generally north/northwest.

Soil Removal Action

A remedial action consisting of excavation and removal of surface and subsurface soils in the vicinity of Site 12 was conducted by the Navy in 1999. The objectives of the remedial action included minimizing the potential migration and mobilization of the contaminants to surface water, groundwater, and soils at the site. Approximately 262 tons of excavated soil was shipped offsite for disposal and recycling. Three rounds of confirmatory sampling were conducted to demonstrate compliance with NJDEP Residential Direct Contact Soil Cleanup Criteria. The excavation of contaminated soils achieved the remedial action objective for protection of human health and the environment, including prevention of human exposure to contaminated surface and subsurface soils, and prevention of migration of contaminants to the adjacent marsh.

Based on EPA and NJDEP approval, Site 12 met all applicable requirements for closure.

Site 15

Although there are no known records available to document the area involved in the former oily waste disposal or of specific conditions of disposal, the site is estimated to have been approximately 1 acre based on the best records and findings available.

Initial Assessment and Confirmation Study

The 1983 IAS consisted of file review, interviews and visual inspection. Site 15 was not selected for an environmental sampling and analysis confirmation study because the exact location of disposal could not be determined and typical bilge water contained a low percentage of oil.

Phase I Remedial Investigation

During the 1993 SI, two subsurface soil samples, four sediment samples, and one groundwater (hydropunch) sample were collected and two soil borings were drilled at the site. The subsurface soil samples were collected at 8 feet and 7 feet below ground surface. Each sample was analyzed for SVOCs. Four SVOCs (phenol, di-n-butylphthalate, butylbenzylphthalate, and bis(2-ethylhexyl) phthalate were detected at concentrations well below the NJDEP cleanup criteria. The sediment samples were collected from 0 to 0.5 feet bgs from a drainage swale

located northeast of the site. The sediment samples were analyzed for SVOCs; several SVOCs were detected at concentrations well below the sediment ecological toxicity threshold values. One groundwater sample was collected from a hydropunch location between the two soil borings. The groundwater sample was analyzed for TAL metals and TCL VOCs, SVOCs, pesticides, and PCBs. Analysis indicated that no organic compounds were encountered at a level of concern for MCL's or GWQS, but that levels of metals (aluminum, barium, beryllium, cadmium, calcium, cobalt, iron, lead, magnesium, manganese, mercury, nickel, potassium, and silver) were present in groundwater above applicable groundwater guidance cleanup levels.

Phase II Remedial Investigation

Between June and July 1995, the Navy conducted sampling and analysis of surface water, sediment, surface soil and subsurface soil at Site 15 and conducted a survey to establish the horizontal locations and vertical elevations of the sample locations.

A small drainage swale runs parallel to the railroad bed on the north side of the Site 15, and surface water from the site and the adjacent paved parking area flows toward this swale. This swale contains water only after precipitation events. Wetlands are present north and south of the site.

Regional geological mapping indicates that Site 15 lies within the outcrop area of the Englishtown Formation. The Englishtown Formation ranges between 35 and 150 feet in thickness. The lithology of the sediments encountered in the on-site borings generally agrees with the published description of the Englishtown Formation and the Woodbury Clay. Assuming a portion of the Englishtown Formation was removed by erosion, it is possible that at least one of the soil borings penetrated the underlying Woodbury Clay. In general, the borings encountered fill material, yellowish-brown and brown silty sand and clayey sand (probably representative of the Englishtown Formation), and black silt (possibly representative of the Woodbury Clay). Based on the boring log descriptions from the SI fieldwork performed in May 1992, boring HP15-2 penetrated fill material and the Englishtown Formation, boring BH15-1 penetrated fill material, the Englishtown Formation, and the Woodbury Clay, and boring HP15-1 penetrated the Englishtown Formation and the Woodbury Clay.

No wells were installed at the site to determine groundwater conditions. However, groundwater in the Englishtown aquifer beneath Sites 6 and 17; and presumably Site 15, occurs under unconfined conditions. The direction of shallow groundwater flow beneath Site 15, based upon investigations conducted at Sites 6 and 17, is thought to be north to northwest. Site 6 is located about 1,400 feet south, and Site 17 is located 600 feet northwest of Site 15.

Surface Soil

Two surface soil samples were collected at Site 15. Tables 6 and 7 present the occurrence and distribution of inorganic and organic compounds detected in site-related surface soil samples and compare them to background concentrations. Figure 6 shows sample locations and concentrations of compounds in Site 15 surface and subsurface soils that exceed screening levels.

Concentrations slightly greater than background were observed for cadmium in sample 15SS02 and lead in sample 15SS01. Antimony was detected in 15SS01 at a low level, near the instrument detection limit

Site 15 surface soil samples exhibited low levels of PAHs including benz(a)anthracene (71 ug/kg), benzo(a)pyrene (58 to 69 ug/kg), benzo(b)fluoranthene (120 to 160 ug/kg),

fluoranthene (130 to 180 ug/kg), phenanthrene (69 to 100 ug/kg), and pyrene (140 to 210 ug/kg). 4,4'-DDE (13 to 43 ug/kg) and 4,4'-DDT (12 ug/kg) were detected in Site 15 surface soils. Alpha-BHC was detected in one Site 15 surface soil sample at a concentration of 0.13 ug/kg.

The two Site 15 surface soil samples were also analyzed for moisture, pH, and TPH. TPH was detected at concentrations ranging from 120 to 200 mg/kg.

Subsurface Soil

Four subsurface soil samples were collected at Site 15. Tables 8 and 9 present the occurrence and distribution of inorganic and organic chemicals in Site 15 subsurface soil samples and compare them to background. Figure 6 shows sample locations and concentrations of compounds in Site 15 surface and subsurface soils that exceed screening levels. Cadmium was present at a level (average concentration 2.8J mg/kg) greater than background in one sample (15SB04-02).

Bis(2-ethylhexyl) pthalate (59 to 260 ug/kg) was detected in all four subsurface soil samples.

The four subsurface soil samples were also analyzed for moisture, pH, and TPH. TPH was detected at concentrations ranging from 20 to 110 mg/kg. .

Sediment

Three sediment samples were collected at Site 15. Tables 10 and 11 present the occurrence and distribution of inorganic and organic compounds in the Site 15 sediment samples and compare them to background concentrations. Figure 7 shows sample locations and concentrations of compounds in Site 15 sediment and surface water samples that exceed screening levels. Arsenic, barium, copper, iron, lead, mercury, nickel, selenium, silver, and zinc were detected at levels greater than background samples. The highest concentrations of arsenic (25.5 mg/kg), iron (84,000 mg/kg), and lead (187 mg/kg) were seen in sample 15SD01. The highest concentration of copper (269 mg/kg) was in sample 15SD02, and zinc exhibited a maximum concentration (464 mg/kg) in sample 15SD03.

PAHs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, indeno(1,2,3-cd)pyrene, fluoranthene, fluorene, phenanthrene, and pyrene were detected in background sediment samples from 110 to 1,900 ug/kg. Similar PAHs were detected in sediment samples collected at Site 15. PAH levels in sample 15SD01 were generally two to five times higher than background ranges. Samples 15SD02 and 15SD03 exhibited concentrations within a range similar to background samples. Butylbenzyl phthalate (910 ug/kg) and di-n-butyl phthalate (160 ug/kg) were detected in one Site 15 sediment sample but were not detected in background sediment samples.

Pesticides detected in Site 15 sediment samples included 4,4'-DDT (7.2 to 46 ug/kg), 4,4'-DDD (13 to 45 ug/kg) and 4,4'-DDE (2.1 to 59 ug/kg). Gamma-Chlordane (5.1 to 29 ug/kg) was detected at levels greater than background ranges. Alpha-Chlordane (3.8 to 31 ug/kg), endrin (10 ug/kg), and heptachlor epoxide (0.47 to 3.2 ug/kg) were also detected in sediment samples collected at Site 15. Site 15 sediment samples also contained Aroclor 1260 (16 ug/kg in 15SD02 and 100 ug/kg in 15SD01), styrene 911 ug/kg), and 2-butanone (86 ug/kg) were each detected in one sediment sample (15SD03).

The three sediment samples collected at Site 15 were also analyzed for moisture, pH, and TPH. TPH was detected at concentrations ranging from 370 to 3100 mg/kg.

Surface Water

Two surface water samples 15SW01 and 15SW02 were collected at Site 15. Tables 12 and 13 present the occurrence and distribution of inorganic and organic compounds detected in Site 15 surface water samples and compare them to background. Figure 7 shows sample locations and concentrations of compounds in Site 15 sediment and surface water samples that exceed screening levels. TPH was analyzed for but not detected in surface water samples.

4,4'-DDD was detected in one surface water sample from Site 15 at a concentration of 0.0018 ug/L (15SW01).

Site 17

Initial Assessment and Confirmation Study

The IAS in 1983, consisting of file review, interviews and visual observations concluded minimal impact. Site 17 was not selected for a confirmation study of environmental sampling and analysis because of the presence of largely inert and immobile materials.

Phase I Remedial Investigation

During the 1993 SI, soil samples were collected from three soil borings and two of the four monitoring well borings. Soil borings were completed to the water table, and subsurface soil samples were collected from between 5 and 11 feet bgs. Four monitoring wells were installed and screened in the upper water-bearing zone. In addition, four sediment samples were collected from the marsh area downgradient of the site. Soil samples were analyzed for metals and cyanide. Analytical results indicated that no significant concentrations of metals or cyanide were present. Elevated levels of pesticides above sediment ecological toxicity threshold values were detected in sediment samples. SVOCs and VOCs were detected in sediment but below the ecological toxicity threshold values. Groundwater samples were analyzed for TAL metals, TCL VOCs, SVOCs, pesticides, PCBs, and landfill parameters. Elevated levels of metals (aluminum, arsenic, beryllium, chromium, iron, lead, manganese, and sodium) and landfill indicator parameters were present in groundwater above applicable groundwater cleanup guidance levels. Tabulated data was included in the Phase II – Site Inspection Study Draft Report (1993, Roy F. Weston, Inc.).

Phase II Remedial Investigation

Between June and October 1995, the Navy conducted the following field investigation activities at Site 17:

- Sampling and analysis of surface water
- Sampling and analysis of sediment
- Drilling and installation of one shallow permanent monitoring well
- Sampling and analysis of groundwater from the newly installed well and existing wells
- Measurement of static-water levels in the monitoring wells
- Sampling and analysis of surface soil

On October 28 and 30, 1996, the Navy conducted additional surface water and sediment sampling at Site 17. Analytical results from the 1995 and 1996 investigations are discussed in the following subsections.

The landfill surface at Site 17 is paved or is covered with hard packed gravel and is currently utilized as a parking area for Waterfront personnel. The face of the landfill is 10 to 15 feet

higher in elevation than the marsh area and is heavily vegetated. Infiltration is limited to some degree by the nature of the surface cover, and overland flow drains toward the salt marsh north and west of the site. The groundwater flow direction is north-northwest toward the marsh, based on measured groundwater elevations. Geo-rectified digital imagery was used to interpret the probable extent of disposal areas with respect to the placement of fill material during the early 1940's, on which the Waterfront facilities were originally constructed. Results of the RI revealed slightly elevated levels of PAHs and pesticides in drainage pathway sediments and elevated levels of metals, possibly due to suspended sediment, in drainage pathway surface water samples.

No slope stabilization work was performed at Site 17. However, grading, topsoil cover placement, and seeding was conducted on the flat portion of the site. In addition, the Navy installed a wooden barricade to prevent any future deposition of soils or debris on the sloped area of Site 17.

Regional geological mapping indicates that Site 17 lies within the outcrop area of the Englishtown Formation. The Englishtown Formation ranges between 35 and 150 feet in thickness, and the soil borings installed as part of RI activities are no more than 20 feet deep. The lithology of the sediments encountered in the on-site borings generally agrees with the published description of the Englishtown Formation. In general, the borings encountered fill material and yellowish-brown, olive brown, and gray silty sand, clayey sand and sand, olive brown silt, and gray clay. Based on the boring log descriptions, the wells and borings at Site 17 penetrated fill material and the Englishtown Formation. Groundwater in the fill material and the Englishtown aquifer beneath the site occurs under unconfined conditions, and the fill material and formation are interpreted to be hydraulically interconnected. The direction of shallow groundwater flow in the aquifer is northwest.

Surface Soil

One surface soil sample (17SS01) was collected at Site 17 in August 1995. Tables 14 and 15 present the occurrence and distribution of inorganic compounds and the organic compound detected in this sample and compare results to facility-wide background results. Concentrations of metals in 17SS01 were within the ranges found in background samples. 4.4'-DDT was detected in the surface soil sample at Site 17 at a concentration of 1.2 ug/kg.

Sediment

Four site-related sediment samples (17SD01 through 17SD04) were collected during the 1995 RI, and an additional six sediment samples (17SD05 through 17SD10) were collected during the 1996 RI Addendum fieldwork. Tables 16 and 17 present the occurrence and distribution of inorganic and organic chemicals in Site 17 samples and compare them to facility-wide background results. Figure 8 shows Site 17 sample locations and concentrations of compounds that exceed screening levels.

Elevated levels of metals were detected in several site samples, notably sample locations 17SD02 and 17SD07. Metals detected included aluminum (up to 19,300 mg/kg), arsenic (up to 41.9 mg/kg), barium (up to 71.9 mg/kg), beryllium (up to 1.9 mg/kg), cadmium (up to 3.1 mg/kg), cobalt (up to 21.1 mg/kg), copper (up to 99.1 mg/kg), iron (up to 66,400 mg/kg), lead (up to 236 mg/kg), magnesium (up to 4,800 mg/kg), manganese (up to 218 mg/kg), mercury (0.32 mg/kg), nickel (up to 29.3 mg/kg), vanadium (up to 101 mg/kg), and zinc (up to 242 mg/kg). Sample 17SD03 also contained elevated levels or arsenic, cobalt, iron, lead, and mercury but at levels below 17SD01 and 17SD07.

The PAH compounds deibenz(a,h)anthracene, acenaphthene, acenaphthylene, napthalene, and

anthracene (concentration range 4 to 1,000 ug/kg) were found in at least one Site 17 sediment sample. The maximum concentrations of PAHs were observed in sample 17SD03.

Bis(2-Ethylhexyl)phthalate, di-n-butyl phthalate, diethyl phthalate, and butylbenzyl phthalate were detected in Site 17 sediment samples. Bis(2-Ethylhexyl) phthalate was present at the highest concentrations (9,400 ug/kg in sample 17SD03 and 4,400 ug/kg in 17SD02). Aroclor 1260 was detected in 17SD02 at 80 ug/kg and in 17SD03 at 31 ug/kg. Aroclor 1248 was detected in 17SD10 at 57 ug/kg. Aroclor 1254 was also detected at 17SD10 at a concentration of 120 ug/kg. The Aroclor 1260 result for 17SD03 was qualified rejected (R) based on data validation and was not used for risk assessment. 4-Methylphenol (420 to 820 ug/kg), isophorone (75 ug/kg), endosulfan II (0.21 ug/kg), alpha-chlordane (4.5 ug/kg to 14 ug/kg), and methoxychlor (1.6 to 3.9 ug/kg) were detected in at least one Site 17 sediment sample.

The following pesticide compounds were detected at concentrations greater than the ranges of background samples in one or more Site 17 sediment samples: 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, and gamma-chlordane. The highest levels of pesticides were found primarily at sample locations 17SD01 through 17SD03 and 17SD07.

The 1995 RI sediment samples collected at Site 17 were also analyzed for moisture, pH, and total organic carbon (TOC). Two sediment samples (17SD01 and 17SD04) contained pH levels exceeding maximum sediment background levels. The 1996 RI Addendum samples were also analyzed for TOC and percent solids.

Groundwater

Four groundwater samples (17GW01, 17GW03, 17GW04, and 17GW05) were collected at Site 17 in 1995. Table 18 presents the occurrence and distribution of inorganic chemicals detected in Site 17 groundwater samples and compares them to background. No organic compounds were detected. Arsenic, barium, cadmium, and iron were detected in sample 17GW04 at levels greater than the ranges of background samples. This sample had a very high sodium level (1.6 percent) indicating a possible salt water tidal impact.

Miscellaneous parameter analyses of four groundwater samples at Site 17 consisted of ammonia, BOD, COD, chlorides, sulfates, TOC, phosphates, and turbidity. Chloride concentrations in 17MW04 were very high (31,000 mg/L). Site 17 is adjacent to a tidally influenced estuary and elevated chloride concentrations in site media may be a result of tidal influence. With the exception of very high chloride concentrations in 17MW04, none of the other indicator parameters were high enough to be within a range typically associated with a municipal type landfill nearby.

Surface Water

Three surface water samples (17SW02 through 17SW04) were collected at Site 17 in 1995, and three surface water samples (17SW05 through 17SW07) were collected in 1996. Tables 19 and 20 present the occurrence and distribution of inorganic and organic chemicals detected in Site 17 surface water samples and compare them to facility-wide background. Figure 8 shows Site 17 sample locations and concentrations of compounds that exceed screening levels.

The presence of elevated levels of aluminum in 17SW02 and 17SW03 suggested that a significant portion of the metals in these samples may have been present in a suspended rather than dissolved form. No elevated levels of metals were detected in the 1996 RI Addendum surface water samples.

The only organic compound detected in surface water samples was bis(2-ethylhexyl) phthalate at

a concentration of 1 ug/L at sample location 17SW06.

Miscellaneous parameter analyses for three surface water samples collected at Site 17 in 1995 consisted of ammonia, BOD, COD, chlorides, nitrates, hardness, TOC, phosphates, and turbidity. None of the indicator parameters detected in the surface water samples were high enough to be within a range typically associated with a municipal type landfill nearby.

SUMMARY OF SITE RISKS

As part of the Phase II RI, a human health risk assessment and an ecological risk assessment were performed for Sites 6, 12, 15, and 17. The exact procedures used for human health risk assessment and ecological risk screening are presented in the RI Report (July 1996) and RI Addendum Report (January 1998). Laboratory analytical results from remedial activities in the SI and Phase I RI were used to direct the sampling activities in the Phase II RI. Only data from The Phase II RI was used to calculate human health or ecological risks as presented in the RI and RI Addendum reports. At the request of EPA, since the RI human health risk assessment was performed several years ago, the Navy performed a review of the human health risks based on current EPA risk assessment guidelines and risk factors. This review concluded the there would be minor additions and deletions of chemicals of potential concern (COPCs) for individual sites, but no major change, sufficient to redirect the findings of the November 2003 FS would result if the risk assessments were recalculated using current guidelines and factors.

Human Health Risks

The objectives of the risk assessment were to estimate the actual or potential risks to human health resulting from the presence of contamination in surface soil, subsurface soil, sediment, groundwater, and surface water at the sites and to provide the basis for determining the need for remedial measures for these media in the FS. To assess these risks, the exposure scenarios listed below were assumed:

- Ingestion of groundwater as a drinking water source.
- Inhalation of contaminants in groundwater (i.e., volatile compounds emitted during showering).
- Dermal exposure to contaminants in groundwater (i.e., showering, hand washing, bathing).
- Dermal contact from contaminated soils.
- Inhalation of contaminants in soil (i.e, fugitive dusts).
- Incidental ingestion of surface water and sediment.
- Dermal contact with contaminated surface water and sediment.

These scenarios were applied to various site use categories, including future industrial, residential, and recreational receptors. Potential human health risks were categorized as **carcinogenic** or **noncarcinogenic**. A hypothetical carcinogenic risk increase from exposure should ideally fall below a risk range of 1 x 10E-6 (an increase in one case of cancer for one million people exposed) to 1 x 10E-4 (an increase of one case of cancer per 10,000 people exposed).

Noncarcinogenic risks were estimated using **Hazard Indices (HI)**, where an HI exceeding one is considered an unacceptable health risk.

A baseline human health risk assessment was conducted for the OU 9 sites. Results of this assessment are discussed for each site.

Site 6

Currently the majority of the landfill is covered by buildings or pavement, limiting the surface/subsurface contaminant transport and exposure pathway. Sediment, groundwater, and surface water were sampled at Site 6. The potential receptors considered were future industrial, residential, and recreational receptors.

The results of the Site 6 baseline human health risk assessment concluded that **reasonable maximum exposure (RME)** cancer risks associated with future residential groundwater exposure (6.1E-04) exceeded the upper end of EPA's target acceptable risk range (1E-04 to 1E-06). The RME cancer risks associated with future industrial groundwater exposure (1.4E-04) were at the upper bound of EPA's target risk range. Arsenic (via ingestion of and dermal contact with groundwater) is the principal COPC that contributed to the cancer risks for these exposure scenarios.

RME estimates for non-carcinogenic hazard indices (HIs) associated with future residential groundwater exposure (5.7) scenario exceeded 1.0, the cutoff point below which adverse non-carcinogenic effects are not expected to occur. Arsenic was the COPC that exceeded 1.0 for this exposure scenario. In addition, **central tendency exposure (CTE)** risk estimates for future residential exposure to groundwater yielded an HI greater than 1.0; the affected target organ is the skin. The HI associated with future industrial groundwater exposure (8.7E-01) scenario was below 1.0.

The estimated RME cancer risk for the future industrial employee and the future residential receptor exceeded 1E-04, based mainly on ingestion of groundwater. The estimated CTE cancer risk for the future residential receptor exceeded 1E-04, based mainly on ingestion of groundwater. The estimated RME non-cancer HI for the future residential receptor exceeds 1.0, based mainly on ingestion of groundwater. The estimated CTE cancer risk for the future residential receptor exceeds 1.0, based mainly on ingestion of groundwater.

Only the maximum concentration of arsenic found in one groundwater sample, 26.8 ug/l, would result in calculated human health risk greater than the EPA acceptable risk range under the RME or CTE future residential exposure scenarios. Detected arsenic concentrations in the other Site 6 groundwater wells were 5.1 ug/l and 8.8 ug/l. These relatively low concentrations, as well as the average concentration in the four background groundwater samples, 10.6 ug/l, would also result in calculated risk levels within (at the upper end of) EPA's acceptable risk range.

Lead was found at concentrations exceeding the EPA action level (15 ug/L) in groundwater samples taken in previous investigations but not in groundwater samples collected using low-flow techniques during the 1995 RI/FS. Lead was not found at levels exceeding 400 mg/kg in subsurface soil samples.

Site 12

Based on the RI conclusion that Site 12 soils posed a potential risk to the future residential child (for antimony and lead) the Navy, in agreement with EPA and the NJDEP, decided to perform a soils removal action at Site 12. The remedial action, consisting of excavation and removal of surface and subsurface soils in the vicinity of Site 12, was conducted by the Navy in 1999. Approximately 262 tons of excavated soil was shipped off site for disposal and recycling. Three rounds of confirmatory sampling were conducted to demonstrate compliance with NJDEP

Residential Direct Contact Soil Cleanup Criteria. Attachment 1 contains confirmation sampling summary tables. Restoration of the site after excavation included backfill using certified clean select fill.

The excavation of contaminated soils achieved the remedial action objective for protection of human health and the environment, including prevention of migration of contaminants to the adjacent marsh.

The average lead concentration remaining in site related soils after remediation was 14.1 mg/kg. Lead was not found at levels exceeding 400 mg/kg in any samples collected from soil or sediment remaining at Site 12. IEUBK lead model results indicate that less than five percent of the modeled population (resident child) would be expected to develop a blood lead concentration greater than 10 ug/dl.

Based on EPA and NJDEP approval, Site 12 met all the applicable requirements for closure, and the remediation for which Foster Wheeler Environmental Corporation was contracted by the Navy was complete as documented in the Remedial Action Report for Soil Excavation at Site 12 prepared by Foster Wheeler (December 1999).

Site 15

Surface soil, subsurface soil, sediment, and surface water were sampled at Site 15. The potential receptors considered for this site were current industrial and future industrial, residential, and recreational receptors. The cancer risks associated with surface and subsurface soil exposure for all exposure scenarios, including the future residential exposure scenario (8.6E-05) were within the 1E-04 to 1E-06 target risk range. Arsenic (via ingestion and dermal contact with surface and subsurface soil) was the major COPC that contributed to the cancer risks for these exposure scenarios.

Only the future residential (surface soil and subsurface soil) exposure scenario yielded total RME HIs (1.4) (sum of HIs for ingestion, dermal, and inhalation of dusts) greater than 1.0, the cutoff point below which adverse effects are not expected to occur. Central tendency generates a lower risk estimate than RME because it assumes typical rather than upper range receptor behavior patterns related to the ingested dose. CTE analysis provides additional information, but RME scenario guideline assessments are used for determining remedial action.

Lead soil and surface water representative concentrations (110 mg/kg and 2 ug/l, respectively) at the site were below the EPA guidelines for soil and for surface water. The soil was less than the most stringent guideline for NJDEP residential soil direct contact cleanup criteria and surface water was below the most stringent guideline for AWQC freshwater chronic aquatic life. These concentrations are not expected to be associated with a significant increase in blood-lead levels. IEUBK lead model results indicate that less than five percent of the modeled population (resident child) would be expected to develop a blood lead concentration greater than 10 ug/dl.

Site 17

Surface soil, groundwater, sediment, and surface water were sampled at Site 17. The potential receptors considered for this site were current industrial and future industrial, residential, and recreational receptors.

The RME cancer risks associated with a future residential exposure scenario were 4.5E-04, mainly from potential exposure to groundwater. The CTE cancer risks for the future residential receptor (2.6E-05) were below the target acceptable risk range of 1E-04 to 1E-06. Arsenic (via ingestion) is the principal COPC that contributed to the cancer risks for this exposure

scenario. The RME cancer risks associated with future industrial employee exposure were 1.0E-04, at the upper end of the target acceptable risk range of 1E-04 to 1E-06. The CTE cancer risks for the future industrial employee (4.7E-06) were below the target acceptable risk range of 1E-04 to 1E-06. Arsenic (via ingestion) is the principal COPC that contributed to the cancer risks for this exposure scenario.

RME estimates for non-carcinogenic HIs associated with a future residential (groundwater ingestion) exposure scenario was 4.2, exceeding 1.0, the cutoff point below which adverse non-carcinogenic effects are not expected to occur. Arsenic is the COPC that exceeded 1.0 for this exposure scenario. In addition, CTE risk estimates for future residential exposure to groundwater also yielded an HI greater than 1.0; the affected target organ was skin. The RME non-cancer risks associated with future industrial employee exposure were 7.4E-01, below 1.0.

Arsenic was detected in three of four Site 17 groundwater samples at concentrations of 4.2 ug/l, 7.0 ug/l, and 19.7 ug/l. Arsenic was detected in one of three background groundwater samples at a concentration of 5.1 ug/l. The other two concentrations are similar to the background concentration.

Lead concentrations in soils/sediments, detected at the site during the RI ranging from 5.2 mg/kg to 236 mg/kg, were all below the EPA guideline (400 mg/kg).

Ecological Risks

Ecological risk assessment (ERA) was performed by performing risk screening-level assessments as tier 1 of the three-tiered approach in accordance with guidance from EPA. Ecological risks were estimated using **Hazard Quotients (HQ)**, where an HQ exceeding 1 is considered a indicator of potential concern.

Site 6

Significantly elevated contaminant concentrations and exceedances of threshold values from the 1995 RI samples and 1996 RI were not prevalent in surface water and sediment samples collected farther into the marsh adjacent to Site 6. Therefore, impacts of contaminants from Site 6 on the marsh were considered to be minimal. Elevated concentrations of some inorganics were present but were confined primarily to ubiquitous metals in only a few samples collected relatively far from the landfill. This indicated that these elevated concentrations were most likely stemming from contaminant sources that were not related to the landfill. Additive impacts on the watershed and cumulative effects from contaminants from the site on marsh receptors are unlikely. Concentrations of contaminants that bioaccumulate and biomagnify were also relatively low. Thus, potential risks to organisms from exposure via the foodchain (e.g., wading birds) appeared to be highly unlikely. Concentrations of contaminants in surface water and sediments in the two samples collected upstream from the marsh were low and, as a result, impacts to the marsh from upstream sources appeared to be negligible.

The data collected from Site 6 and the salt marsh indicates that the assessment endpoint chosen, the maintenance of receptor populations in the salt marsh, does not appear to be compromised from Site 6 or upstream contaminants; therefore, ecological risks to the marsh from Navy-related areas appear to be insignificant. Remedial action based on ecological risk concerns or additional, more focused ecological studies is therefore unwarranted. The data used to obtain these conclusions was included in the RI report (1996, Brown and Root) and the RI addendum report (1998, Brown and Root).

Site 12

The ecological risk assessment for Site 12 concluded that there was little potential for ecological impacts due to the site's highly developed status and the lack of significant migration pathways. Subsequently, ecological risks were further reduced by the soil removal carried out by the Navy to remove soils containing antimony and lead.

Site 15

Site 15 is located in the Waterfront complex and occupies an estimated one acre area. Excellent habitat exists at and near Site 15, mainly for terrestrial receptors that use the site proper and terrestrial and wetland receptors that use the marsh to the northwest. For the most part, runoff and erosion are the main contaminant migration pathways. It is unclear exactly where disposal activities at the site took place, and runoff from an adjacent parking lot drains into a manhole that empties into the drainage swale. As a result, runoff from and to the site is not confined to discrete sources. Limited groundwater to surface water contaminant migration may be possible, but the small size of the potentially contaminated area at the site minimizes the impact of this pathway.

HQ values for most concentrations in most media at Site 15 were indicative of low potential risk. Most elevated HQs were mitigated by various factors including concentrations below background. Only a few inorganics exceeded ecotoxicity threshold (ET) values in surface water, and the HQ values were mostly indicative of low risk. Elevated HQs in surface water were aluminum (HQ=3.89), barium (HQ=12.7), cobalt (HQ=3.6), and manganese (HQ=14). Some constituents had HQ values greater than one but did not exceed background; this was mainly a function of extremely conservative ET values rather than excessively high background values. Potential risks from inorganics in sediments were also low. Previous studies indicated relatively low concentrations of contaminants in sediments. Elevated HQs in sediment were arsenic (3.1/0.36) (two HQ values separated by the / symbol signify the HQ calculated by the most conservative value available (left) and a less conservative HQ value (right), however, in cases where no less conservative reference value was available, only the EPA-supplied conservative value was used), barium (1.14), cadmium (1.58/0.2), copper (7.91/0.99), lead (3.98/0.86), mercury (4.45/0.94), silver (3.10/0.84), and zinc (3.09/1.13) A suite of SVOC contaminants in sediments exceeded ET values, but most of these exceedances were low. The highest HQ for SVOCs was benzo(b)fluoranthene (8.18/1.59) and most others ranged between 2 and 4. Three pesticides (4,4-DDD at HQ=28.1/0.98, 4,4-DDE at HQ=26.8/2.19, and 4,4-DDT at HQ=28.8/1.0) exceeded HQ value of 1.0 in sediments. Some contaminants were present in sediments for which no suitable ETs were available, but concentrations of these contaminants were low. As a result, they are not likely to pose significant potential risk. In addition, organic contaminants in sediments have a low tendency to migrate because they bind to organic fractions in sediments.

In Site 15 surface soils, no inorganics exceeded ETs or were retained as final COPCs. Aluminum was retained because no ET was available, but concentrations were only slightly above background. Potential risks from organics in surface soils were also minimal. In addition, potential risk to terrestrial plants from inorganic contaminants in surface soils was low. No suitable terrestrial plant ETs were available for organics. Most terrestrial plants do not absorb organic contaminants to the same degree as inorganics. Several organics were detected in site sediments, mainly PAHs like benzo(a) anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene and pyrene. A few of these PAHs slightly exceeded less conservative ET values. Figure 5 shows PAHs

and metals in surface water and sediment present near the site in excess of screening values, indicating moderate potential risk. However, these compounds could as likely have resulted from runoff from a nearby road and parking lot because surface drainage from those areas empties into the drainageway next to the site.

Site 15 is small and the contaminant source is not discrete. Moreover, the concentrations of contaminants are relatively low. The PAHs detected have strong affinities for organic fractions in sediments; as a result, they do not tend to migrate significantly. For these reasons, additional investigation does not appear to be necessary, nor does remediation at the site based on ecological concerns.

Site 17

Site 17 is a former landfill located a few hundred feet from Site 6, at the edge of the marsh. The results of the RI ecological risk assessment showed that several inorganics and organics, primarily PAH compounds were present in surface water and sediment near the site in excess of screening values. Concentrations of several metals in surface water and several PAHs in sediments collected near the Site 17 landfill toe were significantly elevated. Because data from the 1993 SI and 1996 RI indicated minimal impacts to groundwater, erosion, and overland runoff from the landfill toe contaminant migration pathways were considered possible. However, surface water and sediment samples were collected to determine the extent of the impacts of landfill-related contaminants on the marsh.

Significantly elevated contaminant concentrations and exceedances of threshold values from the 1995 RI report ecological risk assessment were not prevalent in surface water and sediment samples collected farther into the marsh from Site 17. Therefore, impacts of contaminants from Site 17 on the marsh are minimal. Elevated concentrations of some inorganics were present but were confined primarily to ubiquitous metals in only a few samples collected relatively far from the landfill. This indicates that these elevated concentrations are most likely only indicative of contaminant "hot spots" that do not stem from landfill-related releases. Additive impacts on the watershed and cumulative effects from contaminants from other sites on marsh receptors are also unlikely. Concentrations of contaminants that bioaccumulate and biomagnify were relatively low. Thus, potential risks to organisms from exposure via the food chain (e.g.; wading birds) appear to be highly unlikely. Concentrations of contaminants in surface water and sediments in the two samples collected upstream from the marsh were low and, as a result, impacts to the marsh from upstream sources appear to be negligible.

The data collected from Site 17 and the salt marsh indicate that the assessment endpoint chosen, the maintenance of receptor populations in the salt marsh, does not appear to be compromised from Site 17 or upstream contaminants; therefore, ecological risks to the marsh from Navy-related areas appear to be insignificant. Remedial action based on ecological risk concerns or additional, more focused ecological studies are therefore unwarranted.

REMEDIAL ACTION OBJECTIVES (RAOs)

The overall objective for the remedies at Sites 6, 12, 15, and 17 is to protect human health and the environment. Based on the baseline human health risk assessments, the ecological risk assessments, and the RI results, RAOs were developed to address environmental media status at each of the sites.

Site 6 RAOs

The following remedial action objective has been selected for Site 6:

Protection of Human Health RAO

- Prevent potential human exposure to metals in groundwater at concentrations above GWQS and/or MCL's.

Protection of the Environment RAO

- No RAO for protection of the environment is necessary.

Site 12 RAOs

Based on soil excavation work performed at Site 12 in 1999 by Foster Wheeler Environmental Corporation on behalf of the Navy, it is recommended that no further action be taken at Site 12. The work included the excavation, removal, and disposal of contaminated soils, sample collection to demonstrate that NJDEP residential cleanup standards have been met, and restoration of the site after excavation. Therefore, no remedial action objectives have been selected or are necessary for Site 12.

Site 15 RAOs

The following remedial action objectives have been selected for Site 15:

Protection of Human Health RAO

- Prevent potential human exposure to metals in surface and subsurface soils.

Protection of the Environment RAO

- None.

Site 17 RAOs

The following remedial action objectives have been selected for Site 17:

Protection of Human Health RAO

- Prevent potential human exposure to metals in groundwater at concentrations above GWQS and/or MCL's.

Protection of the Environment RAO

- None.

ALTERNATIVES DEVELOPMENT AND SCREENING

The purpose of the alternatives development and screening process is to assemble an appropriate range of possible remedial options to achieve the RAOs identified for the site. Remedial alternatives were developed for Sites 6, 15, and 17. No remedial alternatives were developed for Site 12 because site conditions require no remedial action.

In this process, technically feasible technologies are combined to form remedial alternatives that provide varying levels of risk reduction that comply with federal (EPA) and state (NJDEP) guidelines for site remediation.

The following eight criteria, as established by the **National Contingency Plan (NCP)**, were used for the detailed analysis of alternatives:

- Overall protection of human health and the environment.
- Compliance with ARARs.
- Long-term effectiveness and permanence.

- Reduction of toxicity, mobility, and volume through treatment.
- Short-term effectiveness
- Implementability.
- Cost.
- State concurrence.

The other evaluation criteria, community acceptance, will be addressed in the **Record of Decision (ROD)** that will document the selection of remedial action for OU 9 following the receipt of public comments on this Proposed Plan.

Engineering technologies capable of eliminating the unacceptable risks associated with exposure to site-related soils or groundwater were identified, and those alternatives determined to best meet the RAOs after screening were evaluated in detail. Tables 21 through 23 present the considered alternatives and the results of screening for Sites 6, 15, and 17.

Detailed Summary of Alternatives

Summaries of the remedial alternatives that passed the screening step for Sites 6, 15, and 17 are presented in the following sections.

Site 6 Remedial Alternatives

Alternative 1: No Action

The no-action alternative is developed as a baseline case, as required by the NCP. No actions would be performed under this alternative. Under this alternative, no remedial actions would be taken to protect human health or the environment.

Under the no-action alternative, no measures would be implemented to prevent potential human exposure to site groundwater or to mitigate contaminant migration in the environment.

Cost

There are no costs to implement the no-action alternative.

Alternative 2: Institutional Controls and Long Term Monitoring

Alternative 2 relies on institutional controls to limit potential exposure to contaminated groundwater. This alternative does not employ engineered treatment or containment to address groundwater contamination. Institutional controls would be enacted to prohibit use of impacted groundwater. Long-term periodic monitoring would be conducted to assess the alternative's effectiveness and potential threats to human health and the environment. Site conditions and risks would be reviewed every 5 years because contaminants would be left in place. Key components of Alternative 2 are identified on Table 24 and described below.

Existing Features - Currently, Site 6 features offer some limited protection of human health and the environment. Slope stabilization work that included removal of debris, additional soil cover, regrading, and seeding was completed at the site in 1999. Groundwater underlying Site 6 is not used as a potable water supply. As a result, there is currently no pathway for human exposure to contaminated groundwater.

Although active treatment of groundwater would not be conducted, gradual natural reduction in concentrations of groundwater contaminants by dispersion, dilution, and degradation should occur.

Security Fencing - Security fencing has been installed to deter human and animal entry into

the landfill area to protect the integrity of the existing cover. The fence is an 8-foot-high chain-link fence with galvanized steel posts installed at 8-foot intervals. Current fencing at the site would be evaluated to see if it could be used in lieu of new fencing for this remedial alternative.

Institutional Controls - Under Alternative 2, land use restrictions would be incorporated into the Base Master Plan to restrict the future use of Site 6 groundwater until natural processes have reduce contaminant concentrations to acceptable levels (GWQSs). Use of untreated, contaminated Site 6 groundwater for drinking water would be prohibited.

Because Site 6 groundwater does not meet New Jersey groundwater quality standards, a CEA pursuant to N.J.A.C. 7:9-6 would be established to provide the State official notice that the constituent standards will not be met for a specified duration and to ensure that use of groundwater in the affected area is suspended until standards are achieved.

Long-Term Monitoring - Under Alternative 2, one new well would be installed downgradient of Site 6. Groundwater would be sampled periodically to monitor the migration of contaminants from Site 6 and assess the potential impacts to downgradient receptors. The collected data would be evaluated during the five-year review period.

For the purpose of costing, it is assumed that groundwater samples would be collected from three existing monitoring wells and one new downgradient well. A total of six groundwater samples, including Quality Assurance/Quality Control (QA/QC) samples, would be collected annually. All samples would be analyzed for site-specific contaminants (metals). The sampling results would be evaluated to assess whether there have been changes in contaminant status and to determine whether additional response actions are warranted.

Five-Year Reviews - Because contaminants would remain in Site 6 groundwater, a review of site conditions and risks would be conducted every five years, as required by CERCLA. The reviews would consist of evaluating analytical and hydrogeologic data and assessing whether contaminant migration has increased to determine whether human receptors or natural resources are at risk.

Cost

Capital costs associated with Alternative 2 of $44,360 have been included in the first-year operations and maintenance (O&M) cost. The average annual O&M cost for long-term monitoring is $11,000 and five-year reviews are $15,500 per event. Over a 30-year period, the net present-worth cost is $214,280 (at a 7 percent discount rate).

Site 12 Remedial Alternatives

Because this site has been remediated by the Navy, the following presents a summary of the remedial activities carried out and a discussion of the no-further-action recommendation proposed for Site 12.

The no-further-action alternative is developed as a baseline case, as required by the NCP. No activities would be conducted under this alternative. The no-action alternative has been chosen for Site 12 based on soil excavation activities conducted by Foster Wheeler Environmental Corporation on behalf of the Navy at the site in 1999.

The purpose of the no-action alternative is to evaluate the overall human health and environmental protection provided by the site in its present state. Under this alternative, no

remedial actions would be taken (since there is no need) to protect human health or the environment.

Existing Features - Currently, site features offer sufficient protection of human health and the environment.

The excavation and removal of surface soils in the vicinity of Site 12 conducted in 1999 was based on the RI delineation of metals concentrations. Cleanup and verification sampling of site soils was performed to the NJDEP Residential Direct Contact Soil Cleanup Criteria. Therefore, no PRGs or remedial alternatives were developed for Site 12. Based on soil excavation work performed at Site 12 in 1999 by Foster Wheeler Environmental Corporation, it is recommended that no further action be taken at Site 12.

Site 15 Remedial Alternatives

Summaries of the remedial alternatives that passed the screening step for Site 15 are presented in the following sections.

Alternative 1: No Action

The no-action alternative is developed as a baseline case, as required by the NCP. No activities would be performed under this alternative. Under this alternative, no remedial actions would be taken to protect human health or the environment. No measures would be implemented to prevent potential human exposure to site groundwater or to mitigate contaminant migration in the environment.

Existing Features - Currently, site features offer significant protection of human health and the environment. The primary protective feature is that the entire site is located within a red maple/sweetgum wetland and is fenced off from the remainder of the base by a double-fenced security buffer zone.

Cost

There are no costs to implement the no-action alternative.

Alternative 2: Limited Action

Alternative 2 relies on institutional controls to limit exposures to contaminated soils. This alternative does not employ engineered treatment or containment to address soil contamination. Institutional controls would be enacted to prohibit use of impacted soils. Site conditions and risks would be reviewed every 5 years because contaminants would be left in place. Key components of Alternative 2 are identified on Table 25 and described below.

Existing Features - Currently, site security fencing at Site 15 offers significant protection of human health and the environment. The site is fenced off from the remaining base property by a double-fenced security buffer zone.

Security Fencing - Security fencing would be installed to deter human and animal entry into the landfill area to protect the integrity of the existing cover. The fence is expected to be 8-foot-high chain-link fence, with galvanized steel posts installed at 8-foot intervals. A locking gate would be installed to allow controlled access to the site. Current fencing at the site would be evaluated to see if it could be used in lieu of new fencing for this remedial alternative.

Institutional Controls - Under Alternative 2, land use restrictions would be incorporated into the Base Master Plan to restrict the future use of Site 15 to its present security buffer use.

Five-Year Reviews - Because contaminants would remain in Site 15 soils, a review of site conditions and risks would be conducted every 5 years, as required by CERCLA. For the purpose

of the five-year review, surface and subsurface soil samples would be collected every 5 years for metals concentration analysis. Analytical data from the soil sampling activity will be assessed to determine if human receptors or natural resources are at risk.

Cost

Capital costs associated with Alternative 2 of $19,490 have been included in the first-year O&M cost. The average annual O&M cost for long-term monitoring is $0, and five-year reviews (including sampling costs) are $14,500 per event. Over a 30-year period, the net present-worth cost is $50,760 (at a 7 percent discount rate).

Site 17 Remedial Alternatives

Summaries of the remedial alternatives that passed the screening step for Site 17 are presented in the following sections.

Alternative 1: No Action

The no-action alternative is developed as a baseline case, as required by the NCP. No activities would be conducted under this alternative.

The purpose of the no-action alternative is to evaluate the overall human health and environmental protection provided by the site in its present state. Under this alternative, no remedial actions would be taken to protect human health and the environment. No measures would be implemented to prevent potential human exposure to site groundwater.

Existing Features - Currently, site features offer limited protection of human health and the environment. The primary protective feature is that groundwater underlying Site 17 is not used as a potable water supply. There is currently no pathway for human exposure to metals-contaminated groundwater.

Work performed by Foster Wheeler Environmental Corporation in 1999 included grading of the flat portion of the site, topsoil cover, and seeding. A wooden barricade was also installed on the flat upper portion of the site to prevent any future deposition of soils or debris on the sloped area of Site 17. Currently, the site is fenced off from other base property.

No actions would be conducted under Alternative 1 to monitor the status of or to preclude potential contact with groundwater.

Cost

There are no costs to implement the no-action alternative.

Alternative 2: Institutional Controls and Long-Term Monitoring

Institutional controls would be enacted to prohibit use of groundwater contaminated with metals. Long-term periodic monitoring would be conducted to assess the alternative's effectiveness and potential threats to human health and the environment. Site conditions and risks would be reviewed every 5 years because contaminants would be left in place. This alternative does not employ engineered treatment or containment to address groundwater contamination. Key components of alternative 2 are identified on Table 26 and described below.

Existing Features - Currently, Site 17 features offer some limited protection of human health and the environment. Foster Wheeler Environmental Corporation conducted work at the site in 1999 that included regrading, topsoil cover, seeding, and installation of a wooden barricade. Groundwater underlying Site 17 is not

used as a potable water supply. As a result, there is currently no pathway for human exposure to contaminated groundwater. However, potable water supply wells are situated elsewhere on the base (Mainside only), and site groundwater could conceivably be used as a potable water supply in the future, posing a potential human health risk. Although active treatment of groundwater would not be conducted, a gradual reduction in concentrations of groundwater contaminants by dispersion, dilution, and degradation should occur.

Security Fencing - Security fencing was installed in 1999 to deter human and animal entry onto parts of the landfill area to protect the integrity of the existing cover. The existing fence is expected to be sufficient for the purposes of this remedial alternative. However, for cost estimating purposes, installation of fencing has been included in the cost estimate for this alternative.

Institutional Controls - Under Alternative 2, land use restrictions would be incorporated into the Base Master Plan to restrict the future use of Site 17 groundwater until natural processes have reduced contaminant concentrations to acceptable levels (GWQSs). Use of untreated, contaminated Site 17 groundwater for drinking water would be prohibited.

Because site groundwater does not meet New Jersey groundwater quality standards, a CEA pursuant to N.J.A.C. 7:9-6 would be established to provide the State official notice that the constituent standards will not be met for a specified duration and to ensure that use of groundwater in the affected area is suspended until standards are achieved.

Long-Term Monitoring - Under Alternative 2, one new well would be installed downgradient of Site 17. Groundwater would be sampled periodically to monitor the migration of contaminants from Site 17 and assess the potential impacts to downgradient receptors. The collected data would be evaluated during the five-year review period.

For the purposes of costing, it is assumed that groundwater samples would be collected from three existing monitoring wells and one new downgradient well. A total of six groundwater samples, including QA/QC samples, would be collected annually. All samples would be analyzed for site-specific contaminants (metals). The sampling results would be evaluated to assess whether there have been changes in contaminant status and to determine whether additional response actions are warranted.

Five-Year Reviews - Because contaminants would remain in Site 17 groundwater, a review of site conditions and risks would be conducted every 5 years, as required by CERCLA. The reviews would consist of evaluating analytical and hydrogeologic data and assessing whether contaminant migration has increased to determine whether human receptors or natural resources are at risk.

Cost

Capital costs associated with Alternative 2 of $44,360 have been included in the first-year O&M cost. The average annual O&M cost for long-term monitoring is $11,000, and five-year reviews are $15,500 per event. Over a 30-year period, the net present-worth cost is $214,280 (at a 7 percent discount rate).

EVALUATION OF ALTERNATIVES

The Site 6, 15, and 17 remedial alternatives were compared to one another based on the seven selection criteria to identify differences among the alternatives and how site contaminant threats are addressed.

Site 6 Analysis

As part of the detailed analysis, comparisons of the remedial alternatives are made to identify differences among the alternatives and how site contaminant threats are addressed. The two Site 6 alternatives are compared with respect to each of the evaluation criteria and differences are identified. Table 27 presents summaries of the evaluations for each of the alternatives.

Overall Protection of Human Health and the Environment

Alternative 2 would be considerably more protective than Alternative 1. Because no actions are conducted, Alternative 1 would not reduce human health risk.

Alternative 2 includes restricting access and establishing a groundwater CEA that would reduce human health risks posed by contact with groundwater. Institutional controls would provide assurance that untreated contaminated groundwater is not used as a potable water source in the future. This would significantly reduce the human health risks by eliminating potential exposure to contaminated groundwater (the driving concern in the human risk assessment).

Compliance with ARARs

Because Alternative 1 does not include any remedial actions, it may not comply with state and federal ARARs pertaining to post-closure of municipal landfills (40 CFR 258.60 & 258.61 and N.J.A.C. 7:26-2A.9). Periodic monitoring of landfill cover conditions and access restrictions would ensure that Alternative 2 complies with these ARARs.

Alternative 1 would not comply with state ARARs for attainment of groundwater quality standards (N.J.A.C. 7:9-6). Alternative 2 would comply by seeking a temporary exemption (CEA) from these requirements until the GWQS are achieved. Alternative 2 would comply with federal and State monitoring requirements through periodic monitoring and evaluation, and five-year reviews.

Long-Term Effectiveness and Permanence

Alternative 2 offers long-term protection of human health and the environment. Under Alternative 1, risks would remain the same over time. Potential future users of site groundwater may be at risk under Alternative 1 because it lacks institutional controls that would prohibit use of untreated contaminated groundwater.
Alternative 2 would mitigate long-term risks due to ingestion of site groundwater by implementing institutional controls to prohibit use of untreated, contaminated groundwater. Alternative 2 would reduce human risks due to direct exposure to groundwater by eliminating the potential for exposure.

Reduction of Toxicity, Mobility, or Volume through Treatment

Because neither of the alternatives includes treatment, they would not reduce the toxicity, mobility, or volume through treatment.

Short-Term Effectiveness

The short-term effectiveness of the alternatives would be similar because the use of appropriate engineering controls and PPE under Alternative 2 is expected to minimize adverse impacts to base residents and personnel, the local community, and workers during implementation.

Under Alternative 1, no action is proposed so there would be no opportunity for short-term impact. Alternative 2 would present a greater opportunity for short-term impact due to monitoring well installation, maintenance, and

monitoring activities. Impacts to the environment are not anticipated under Alternatives 1 and 2 because minimal activities would be conducted.

Alternative 1 would not achieve any of the RAOs. Alternative 2 would achieve all RAOs within approximately 1 year, which is the time estimated to implement the CEA.

Implementability

Alternative 1 is easily implemented since no activities are proposed. Alternative 2 is also easily implemented because the only activities would be installation of fencing and one monitoring well, long-term monitoring, and five-year reviews.
If additional actions are warranted, they could be easily implemented under Alternatives 1 and 2.

Cost

The costs associated with each alternative are provided in Table 27. Alternative 1, no action, would cost less than Alternative 2.

Site 15 Analysis

As part of the detailed analysis, comparisons of the remedial alternatives are made to identify differences among the alternatives and how site contaminant threats are addressed. The two Site 15 alternatives are compared with respect to each of the evaluation criteria and differences are identified. Table 28 presents summaries of the evaluations for each of the alternatives.

Overall Protection of Human Health and the Environment

Alternative 2 would be more protective of human health than Alternative 1. Because no actions are conducted, Alternative 1 would not reduce human health or ecological risk. Alternative 2 includes access restrictions to reduce the human health risks by eliminating potential exposure to groundwater contaminated by site soils. It would also prevent exposure to surface and subsurface soils at the site (the driving concern in the human risk assessment).

Compliance With ARARs

Alternative 2 would comply with exposure limits and federal and State long-term monitoring requirements through periodic monitoring and evaluation of soils.

Alternative 1 would not comply with state ARARs for attainment of New Jersey residential direct contact soil cleanup criteria.

Long-Term Effectiveness and Permanence

Under Alternative 1, risks would remain unchanged. Alternative 2 offers long-term protection of human health and the environment. Alternative 2 would mitigate long-term risks due to ingestion, inhalation, and dermal contact with site soils by implementing institutional controls to prohibit use and exposure to untreated, contaminated soils.

Reduction of Toxicity, Mobility, or Volume through Treatment

Because neither of the alternatives includes treatment, they would not reduce the toxicity, mobility, or volume through treatment.

Short-Term Effectiveness

The short-term effectiveness of the alternatives would be similar because the use of appropriate engineering controls and PPE is expected to minimize adverse impacts to base residents and personnel, the local community, and workers during implementation.

Alternative 2 would present a greater opportunity

for short-term impact due to installation of fencing (if needed) and long-term monitoring activities. Impacts to the environment are not anticipated under Alternatives 1 and 2 because minimal activities would be conducted.

Alternative 1 would not achieve any of the RAOs. Alternative 2 would achieve most RAOs.

Implementability

Alternative 1 is easily implemented because there are no activities proposed. Alternative 2 is also easily implemented because the only on-site activities would be installation of the fencing, long-term monitoring, and five-year reviews. If additional actions are warranted, they could be easily implemented under Alternatives 1 and 2.

Cost

The costs associated with each alternative are provided in Table 28. Alternative 1, no action, would cost less than Alternative 2.

Site 17 Analysis

The Site 17 remedial alternatives were compared to one another based on the seven selection criteria to identify differences among the alternatives and how site contaminant threats are addressed. Table 29 present summaries of the evaluations for each of the alternatives.

Overall Protection of Human Health and the Environment

Alternative 2 would be considerably more protective than Alternative 1. Because no actions are conducted, Alternative 1 would not reduce human health or ecological risk.

Alternative 2 includes access restrictions and establishing a groundwater CEA that would reduce human health risks posed by potential contact with groundwater. Institutional controls would provide assurance that untreated contaminated groundwater is not used as a potable water source in the future. This would significantly reduce the human health risks by eliminating potential exposure to contaminated groundwater (the driving concern in the human health risk assessment).

Compliance with ARARs

Because Alternative 1 does not include any remedial actions, it may not comply with state and federal ARARs pertaining to post-closure of municipal landfills (40 CFR 258.60 & 258.61 and N.J.A.C. 7:26-2A.9). Periodic monitoring of landfill cover conditions and access restrictions would ensure that Alternative 2 complies with these ARARs.

Alternative 1 would not comply with state ARARs for attainment of groundwater quality standards (N.J.A.C. 7:9-6). Alternative 2 would comply by seeking a temporary exemption (CEA) from these requirements until the GWQS are achieved. Alternative 2 would comply with federal and state monitoring requirements through periodic monitoring and evaluation, and five-year reviews.

Long-Term Effectiveness and Permanence

Alternative 2 offers long-term protection of human health and the environment. Under Alternative 1, risks would remain the same over time. Potential future users of site groundwater may be at risk under Alternative 1 because it lacks institutional controls that would prohibit use of untreated contaminated groundwater.

Alternative 2 would mitigate long-term risks due to potential ingestion of site groundwater by implementing institutional controls to prohibit use of untreated, contaminated groundwater.

Alternative 2 would reduce human risks due to direct exposure to groundwater by eliminating the potential for exposure.

Reduction of Toxicity, Mobility, or Volume through Treatment

Because neither of the alternatives includes treatment, they would not reduce the toxicity, mobility, or volume through treatment.

Short-Term Effectiveness

The short-term effectiveness of the alternatives would be similar because the use of appropriate engineering controls and PPE under Alternative 2 is expected to minimize adverse impacts to base residents and personnel, the local community, and workers during implementation. Under Alternative 1, no action is proposed so there would be no opportunity for short-term impact. Alternative 2 would present a greater opportunity for short-term impact due to monitoring well installation and fencing. Impacts to the environment are not anticipated under Alternatives 1 and 2 because minimal activities would be conducted.

Alternative 1 would not achieve any of the RAOs. Alternative 2 would achieve most RAOs within approximately 1 year, which would be the time to implement the CEA.

Implementability

Alternative 1 is easily implemented because no activities are proposed. Alternative 2 is also easily implemented because the only activities would be installation of one monitoring well, fencing, long-term monitoring, and five-year reviews.

If additional actions are warranted, they could be easily implemented under Alternatives 1 and 2.

Cost

The costs are associated with each alternative are provided in Table 29. Alternative 1, no action, would cost less than Alternative 2.

PREFERRED ALTERNATIVE SUMMARY

Site 6

The Navy, with EPA and NJDEP, has selected Alternative 2 - Institutional Controls and Long-Term Monitoring as its preferred alternative. The range of technologies in Alternative 2 is appropriate for the protection of human health and the environment at this former landfill.

Alternative 2 relies on long-term monitoring and institutional controls to limit exposures to site risks.

Long-term periodic groundwater monitoring would be conducted to assess contaminant status and potential threats to human health and the environment. Since landfill constituents would remain in the groundwater, site conditions and risks would be reviewed every 5 years.

Under Alternative 2, institutional controls would be enacted to preclude use of untreated groundwater for drinking water.

Because site groundwater does not meet New Jersey groundwater quality standards, a CEA pursuant to N.J.A.C 7:9-6 would be established to provide the state official notice that the constituent standards will not be met for a specified duration and to ensure that use of groundwater in the affected area is prohibited.

Site 12

It is recommended that no further action be performed at Site 12. The previously conducted excavation of contaminated soils at Site 12

achieves the remediation goal for protection of human health and the environment, including prevention of human exposure to contaminated surface and subsurface soils (removed) and migration of contaminants to the adjacent marsh. Based on EPA and NJDEP approval, Site 12 has met all the applicable requirements for closure.

Site 15

The Navy, with EPA and NJDEP, has selected Alternative 2 - Institutional Controls and Long-Term Monitoring for Site 15. The range of technologies in Alternative 2 is appropriate for the protection of human health and the environment at this former sludge disposal site. Alternative 2 relies on long-term monitoring and institutional controls to limit exposures to site risks. Fencing around the perimeter would limit access to the site. Access restrictions (including fencing) would be placed to limit future uses of the site that may result in direct contact with contaminated soil. Based on past sampling events no organic contamination was found in groundwater at a level of significant concern. It is not anticipated that there will be any contamination of groundwater since the site is completely isolated and inactive. The site had been isolated by the existing security fencing and protected against further dumping or spill activity for a number of years before the RI activities were carried out in the 1990's.

Long-term periodic monitoring and five-year reviews would assess soil contaminant status and potential threats to human health and the environment. Since waste constituents would remain in place, five-year reviews would provide interim protection by prohibiting use of the site until soil cleanup criteria are achieved.

Site 17

The Navy, with EPA and NJDEP, has selected Alternative 2 - Institutional Controls and Long-Term Monitoring as its preferred alternative for Site 17. The range of technologies in Alternative 2 is appropriate for the protection of human health and the environment at this former landfill. Alternative 2 relies on long-term monitoring and institutional controls to limit exposures to site risks.

Long-term periodic groundwater monitoring would be conducted to assess contaminant status and potential threats to human health and the environment. Since landfill constituents would remain in the groundwater, site conditions and risks would be reviewed every 5 years.

Under Alternative 2, institutional controls would be enacted to preclude use of untreated groundwater for drinking water.
Because site groundwater does not meet New Jersey groundwater quality standards, a CEA pursuant to N.J.A.C 7:9-6 would be established to provide the state official notice that the constituent standards will not be met for a specified duration and to ensure that use of groundwater in the affected area is prohibited.

COSTS OF THE PREFERRED ALTERNATIVES

Site 6

The estimated present worth cost for Alternative 2 is $214,280.

Site 12

No further action is proposed; therefore no cost is to be incurred.

Site 15

The estimated present worth cost for Alternative 2 is $50,760.

Site 17

The estimated present worth cost for Alternative 2 is $214,280.

State and Community Acceptance

The State of New Jersey supports the preferred alternatives for Sites 6, 12, 15, and 17. Community acceptance of the preferred alternatives will be evaluated at the conclusion of the public comment period and will be described in the Record of Decision. Public comments on this Proposed Plan will help address state acceptance and community acceptance.

THE COMMUNITY ROLE IN THE SELECTION PROCESS

The Navy solicits written comments from the community on the Proposed Plan for OU 9. The Navy has set a public comment period from **October 1, 2004** through **October 30, 2004** to encourage public participation in the decision process for OU 9.

The Navy will hold a public meeting during the comment period. At the public meeting, the Navy, with input from EPA, will present the Proposed Plan; answer questions, and solicit both oral and written questions. **The public meeting is scheduled for 7:30 p.m. on Tuesday, October 5, 2004 and will be held at the Howell Township Municipal Building, Main Meeting Room, 251 Preventorium Road, Howell, New Jersey.**

Comments received during the public comment period will be summarized and responses will be provided in the Responsiveness Summary section of the ROD. The ROD is the document that will present the Navy's decision for OU 9.

To send written comments, or to obtain further information, contact:

Commanding Officer
Naval Weapons Station Earle
Environmental Department, Alicia Hartmann
201 Highway 34 South
Colts Neck, New Jersey 07722-5014

For further information, contact Michele DiGeambeardino, Remedial Project Manager
Phone: (610) 595-0567 ext. 117.

Please note that all comments must be submitted and postmarked on or before October 30,2004.

TERMS USED IN THE PROPOSED PLAN

Applicable or Relevant and Appropriate Requirements (ARARs): The federal and state requirements that a selected remedy must attain. These requirements may vary among sites and remedial activities.

Administrative Record: An official compilation of site-related documents, data, reports, and other information that are considered important to the status of and decisions made relative to a Superfund site. The public has access to this material.

Central Tendency Exposure (CTE): Human health risk assessment calculation approach using average, 50th percentile, receptor risk behavior patterns to estimate a realistic expectation of receptor risk.

Chemical of Potential Concern (COPC): A contaminant found in site-specific media, deemed by the human health assessment estimation calculation rules to be a compound potentially contributing to human health risk. Chemicals are selected to represent site contamination.

Carcinogenic: A type of risk resulting from exposure to chemicals that may cause cancer in one or more organs.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act (SARA). The Act created a trust fund, known as Superfund, to investigate and clean up abandoned or uncontrolled hazardous substance facilities.

Explosive safety quantity distance (ESQD): A restrictive design and land use criterion in the Facility Master Plan for military explosives safe handling and operational controls. An ESQD arc is drawn around each facility storing or containing explosives to ensure personnel and facilities maintain sufficient separation from potential explosive hazards. Land use within the ESQD arc is typically limited to transient activities only (e.g., transit or entry for ordnance inspection and maintenance activities).

Feasibility Study (FS): Report identifying and evaluating alternatives for addressing the contamination present at a site or group of sites.

Groundwater Quality Standards (GWQS): New Jersey promulgated groundwater quality requirements, N.J.A.C. 7:9-6.

Hazard Index (HI): The sum of chemical-specific Hazard Quotients. A Hazard Index of greater than 1 is associated with an increased level of concern about adverse non-cancer health effects.

Hazard Quotient (HQ): A comparison of the level of exposure to a substance in contact with the body per unit time to a chemical-specific Reference Dose to evaluate potential non-cancer health effects. Exceedence of a Hazard Quotient of 1 is associated with an increased level of concern about adverse non-cancer health effects.

IEUBK Lead Model: This model is used for hypothetical children 0 to 7 years to predict potential blood lead levels.

Initial Assessment Study (IAS): Preliminary investigation usually consisting of review of available data and information of a site, interviews, and a non-sampling site visit to observe areas of potential waste disposal and migration pathways.

Maximum Contaminant Level (MCL): EPA-published (promulgated as law) maximum concentration level for compounds found in water in a public water supply system.

Noncarcinogenic: A type of risk resulting from the exposure to chemicals that may cause systemic human health effects.

National Contingency Plan (NCP): The National Contingency Plan is the basis for the nationwide environmental restoration program known as Superfund and is administered by EPA under the direction of the U.S. Congress.

National Priorities List (NPL): EPA's list of the nation's top priority hazardous substance disposal facilities that may be eligible to receive federal money for response under CERCLA.

Polycyclic aromatic hydrocarbons (PAHs): A class of semi volatile hydrocarbon compounds characterized by the presence of carbon ring structures in their construction.

Polychlorinated Biphenyls (PCBs): Class of chlorinated aromatic compounds (formerly used as cooling fluids in electrical devices) which are strongly adsorbed on solid particles.

Record of Decision (ROD): A legal document that describes the remedy selected for a Superfund facility, why the remedial actions were chosen and others not, how much they are expected to cost, and how the public responded.

Reference Dose (RD): An estimate with an uncertainty spanning an order of magnitude or greater of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a portion of a lifetime.

Remedial Action Objective (RAO): An objective selected in the FS, against which all potential remedial actions are judged.

Remedial Investigation (RI): Study that determines the nature and extent of contamination at a site.

Reasonable Maximum Exposure (RME): The highest exposure that is reasonably expected to occur at a site. The RME estimates include both "high end" exposure factors (> 90^{th} percentile) with average factors to develop an RME estimate of cancer risks and non-cancer HIs.

Site Inspection (SI): Sampling investigation with the goal of identifying potential sources of contamination, types of contaminants, and potential migration of contaminants. The SI is conducted prior to the RI.

Semivolatile Organic Compounds (SVOCs): Organic chemicals [e.g., phthalates or polycyclic aromatic hydrocarbons (PAHs)] that do not readily evaporate under atmospheric conditions.

Target Compound List/Target Analyte List (TCL/TAL): List of routine organic compounds (TCL) or metals (TAL) included in the EPA Contract Laboratory Program.

Total Petroleum Hydrocarbons (TPH): Analysis to measure petroleum-related compounds in total, rather than as individual chemicals

Volatile Organic Compounds (VOCs): Organic liquids [e.g., vinyl chloride or trichloroethylene (TCE)] that readily evaporate under atmospheric conditions.

FOR FURTHER INFORMATION

MAILING LIST

If you did not receive this Proposed Plan in the mail and wish to be placed on the mailing list for future information pertaining to this site, please fill out, detach, and mail this form to:

Commanding Officer
Naval Weapons Station Earle
Environmental Department, Alicia Hartmann
201 Highway 34 South
Colts Neck, New Jersey 07722-5014

Name: _____
Affiliation: _____

Address: _____
Phone: ( )_____

_____

FIGURES

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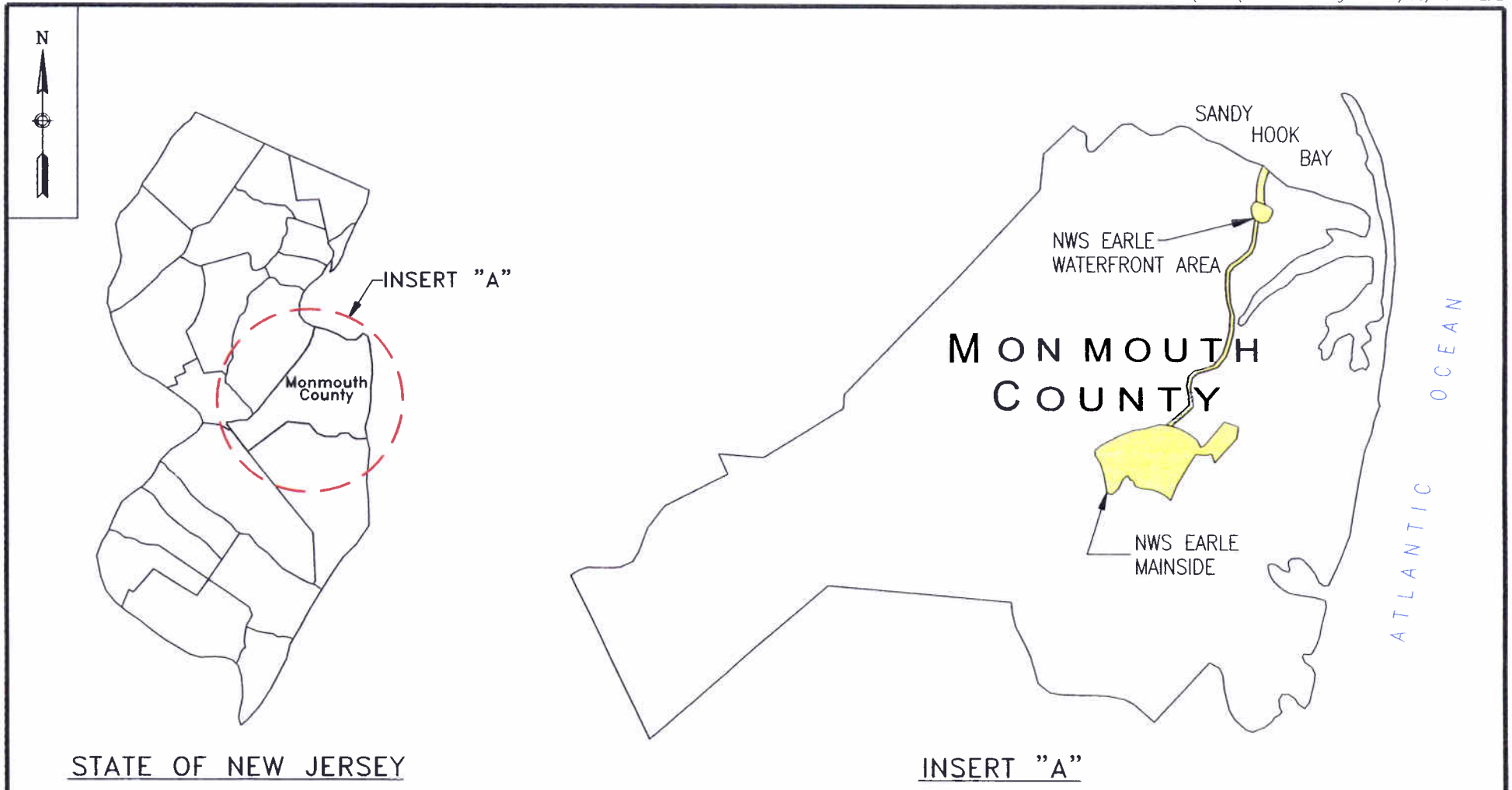

TETRA TECH NUS, INC.

SITE LOCATION MAP
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

SCALE	NONE
FILE:	2128cm10.dwg 3/18/03 LDL PHL
REV	DATE 3/18/03
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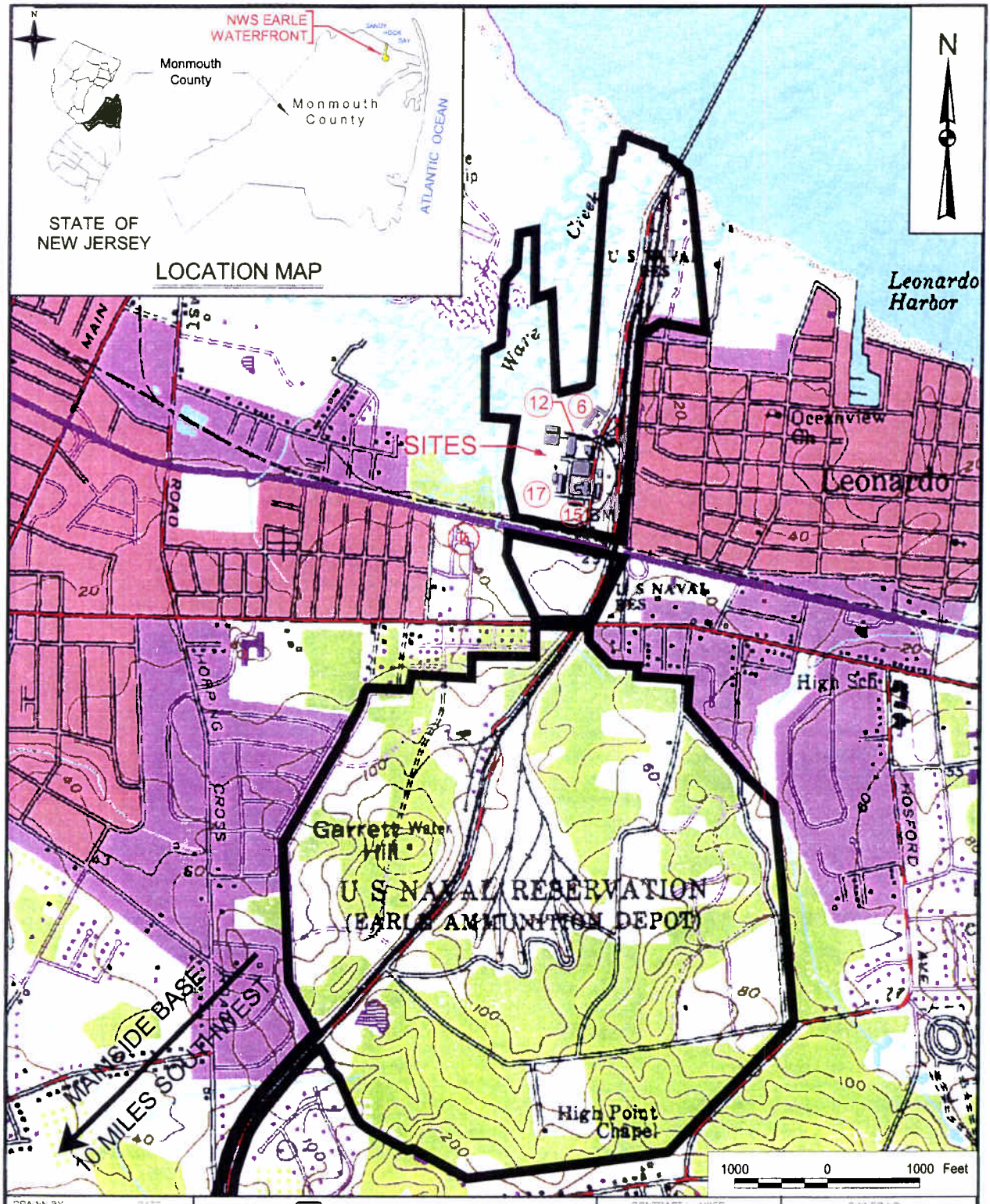
01047 BBIY



DRAWN BY: LDL	DATE: 3/18/03	Tetra Tech NUS, Inc.	CONTRACT NUMBER: 2128 / OWNER NO: OU-9
CHECKED BY:	DATE:	GENERAL LOCATION MAP WATERFRONT BASE SITES 6, 12, 15, & 17 NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	PROJECT FILE: NWS-EARLE_FIVE-YEAR REVIEW.apr LAYOUT: OU-9 WATERFRONT BASE
COST/SCHEDULE AREA:			APPROVED BY: RET / DATE: 3/18/03
SCALE: AS NOTED			DRAWING NO: FIGURE 2 / REV:

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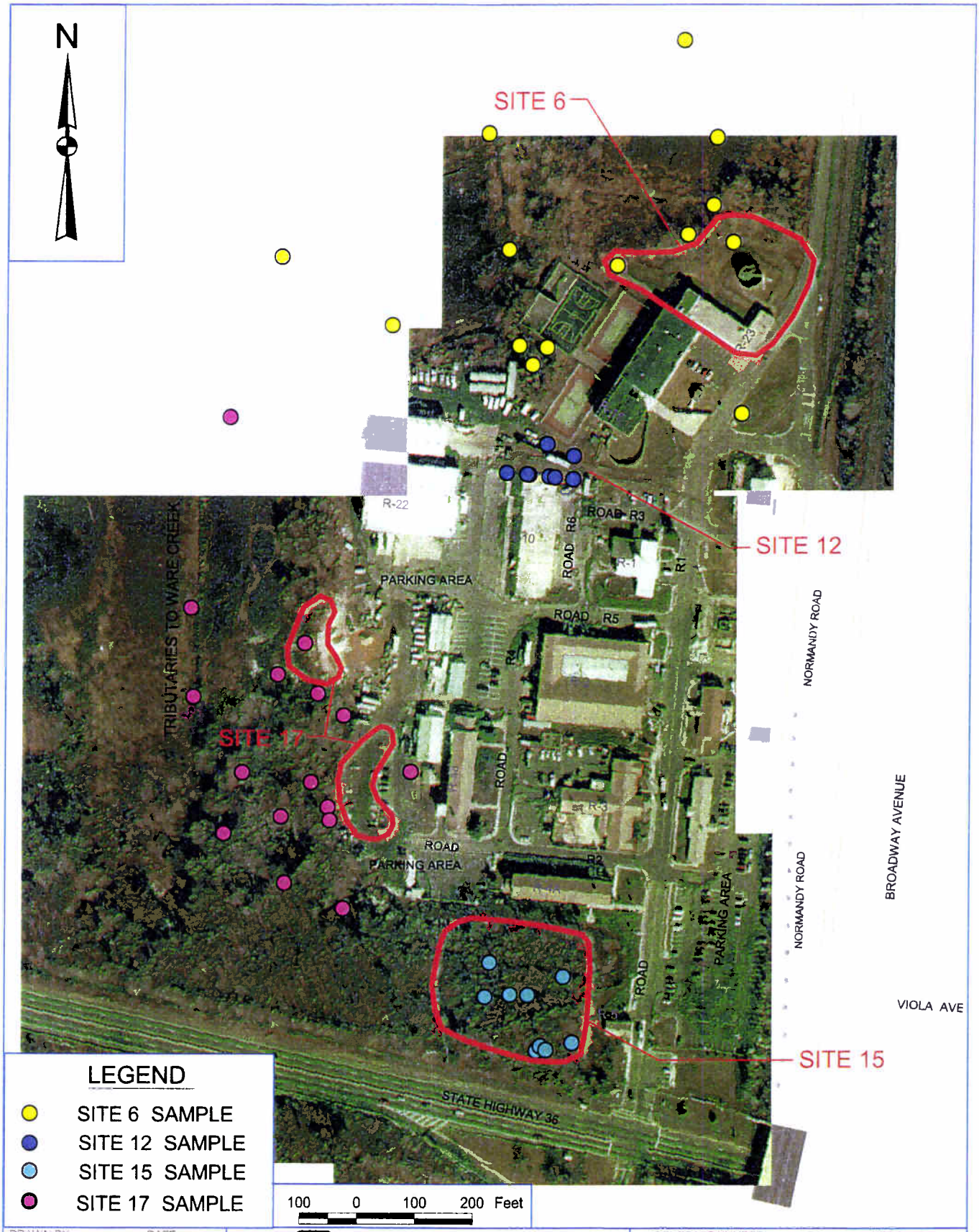

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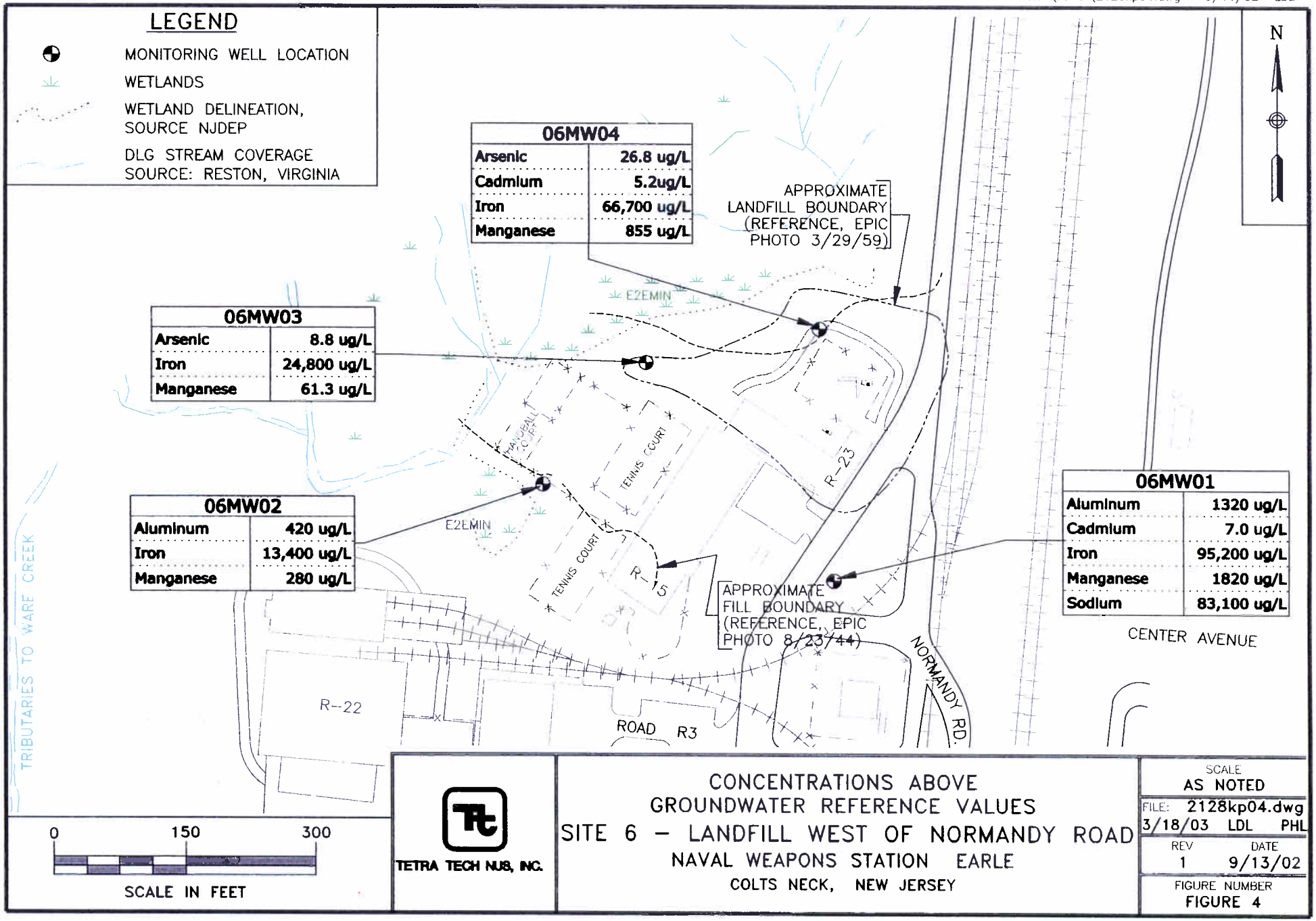
CHECKED BY:	DATE:	SAMPLE LOCATIONS SITES 6, 12, 15, & 17 NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	PROJECT FILE: NWS-Earle-Sites 6,12,15&17-PHL.apr LAYOUT: SITES 6, 12, 15 & 17 Sample Locations
COST/SCHEDULE-AREA:			APROVED BY: RET / REV DATE: 3/18/03 / DATE: 8/16/02
SCALE: AS NOTED			DRAWING No: FIGURE 3 / REV: 1

2128\PRAP\2128kp04.dwg 9/11/02 LDL

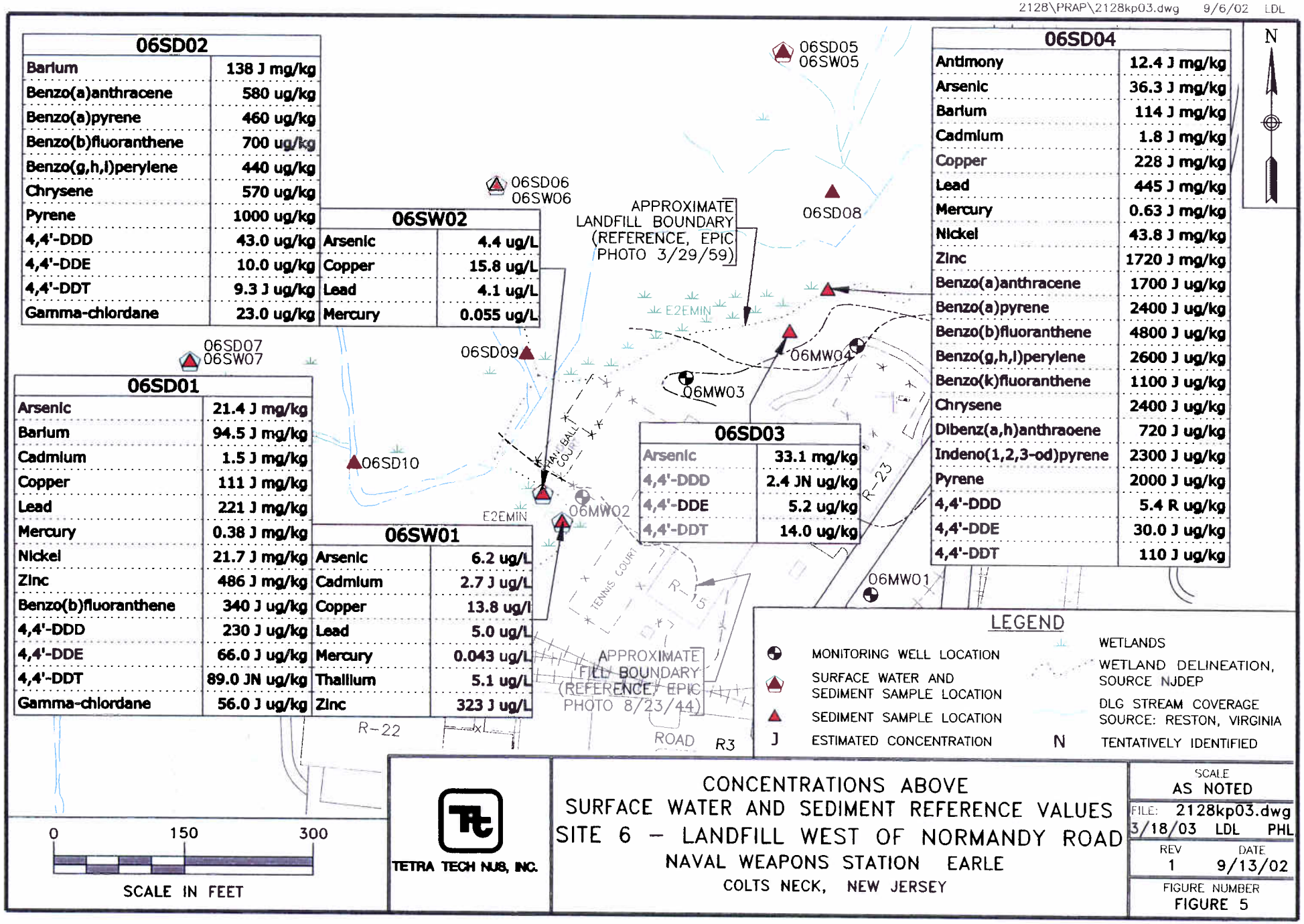


TETRA TECH NUS, INC.

CONCENTRATIONS ABOVE GROUNDWATER REFERENCE VALUES
SITE 6 – LANDFILL WEST OF NORMANDY ROAD
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

SCALE	AS NOTED
FILE:	2128kp04.dwg
	3/18/03 LDL PHL
REV	DATE
1	9/13/02
FIGURE NUMBER	FIGURE 4

2128\PRAP\2128kp03.dwg 9/6/02 LDL



TETRA TECH NUS, INC.

CONCENTRATIONS ABOVE SURFACE WATER AND SEDIMENT REFERENCE VALUES SITE 6 – LANDFILL WEST OF NORMANDY ROAD

NAVAL WEAPONS STATION EARLE

COLTS NECK, NEW JERSEY

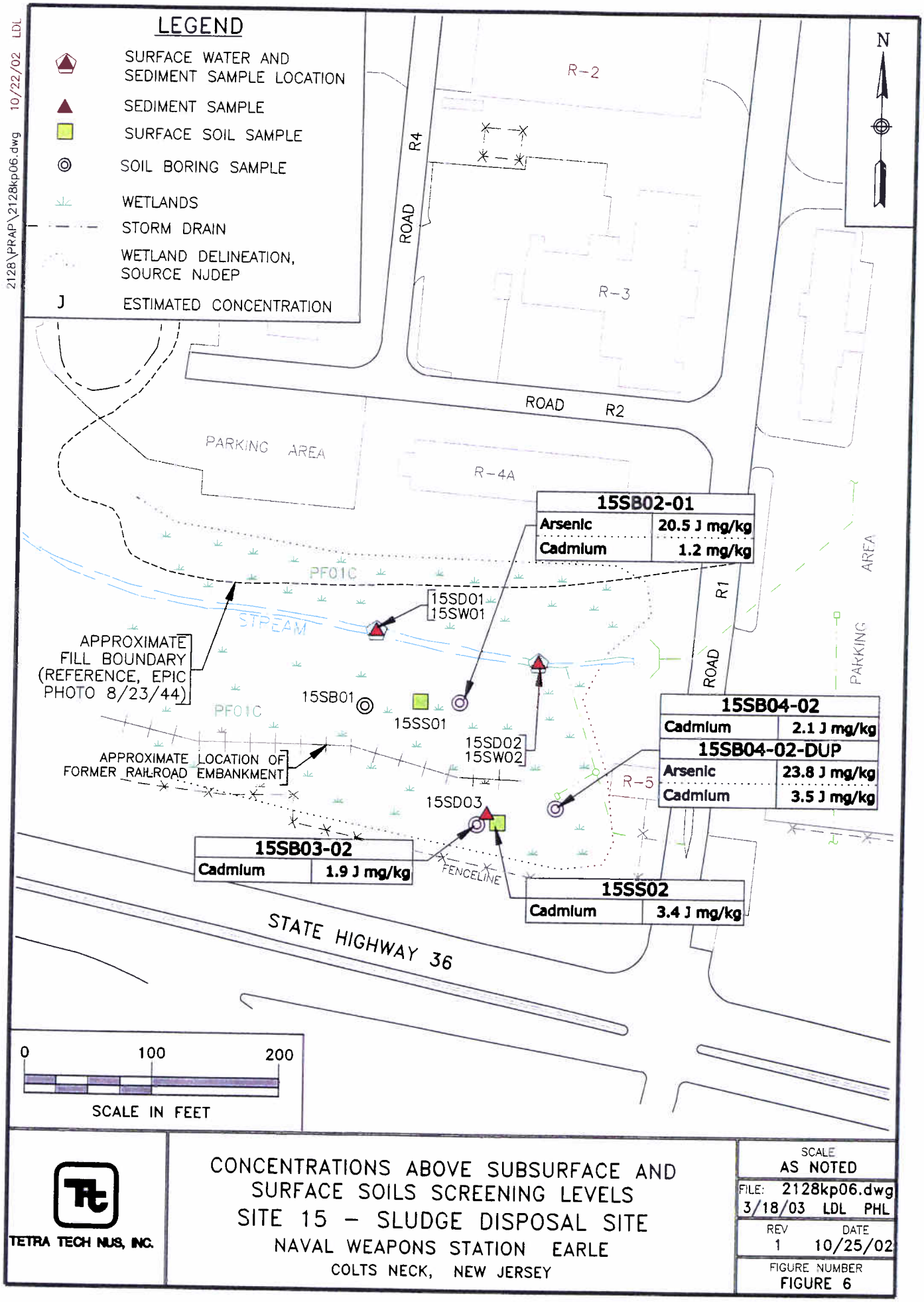
SCALE AS NOTED

FILE: 2128kp03.dwg

3/18/03 LDL PHL

REV 1 DATE 9/13/02

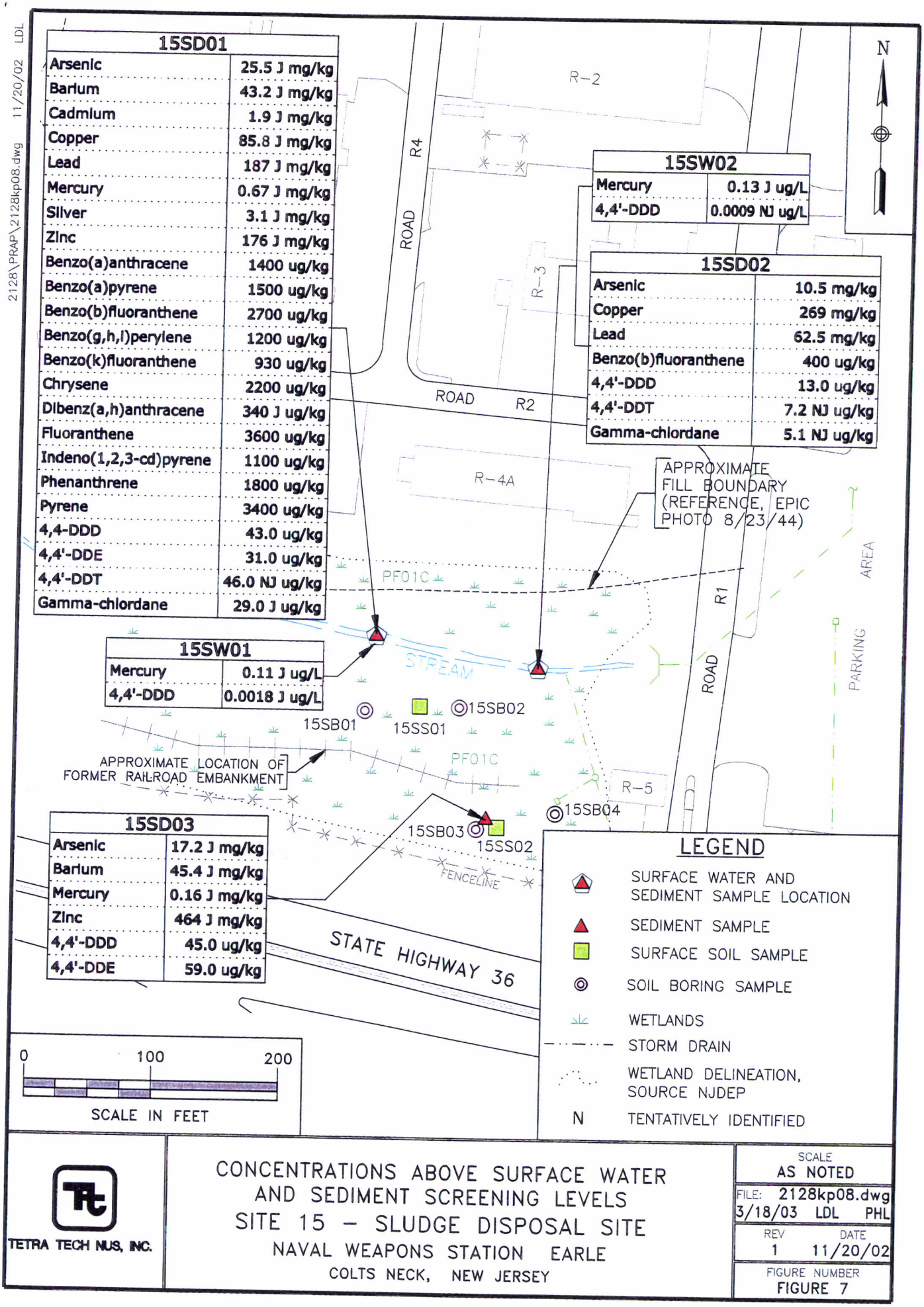
FIGURE NUMBER FIGURE 5



TETRA TECH NUS, INC.

CONCENTRATIONS ABOVE SUBSURFACE AND SURFACE SOILS SCREENING LEVELS
SITE 15 – SLUDGE DISPOSAL SITE
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

SCALE	AS NOTED
FILE:	2128kp06.dwg
	3/18/03 LDL PHL
REV	DATE
1	10/25/02
FIGURE NUMBER	FIGURE 6

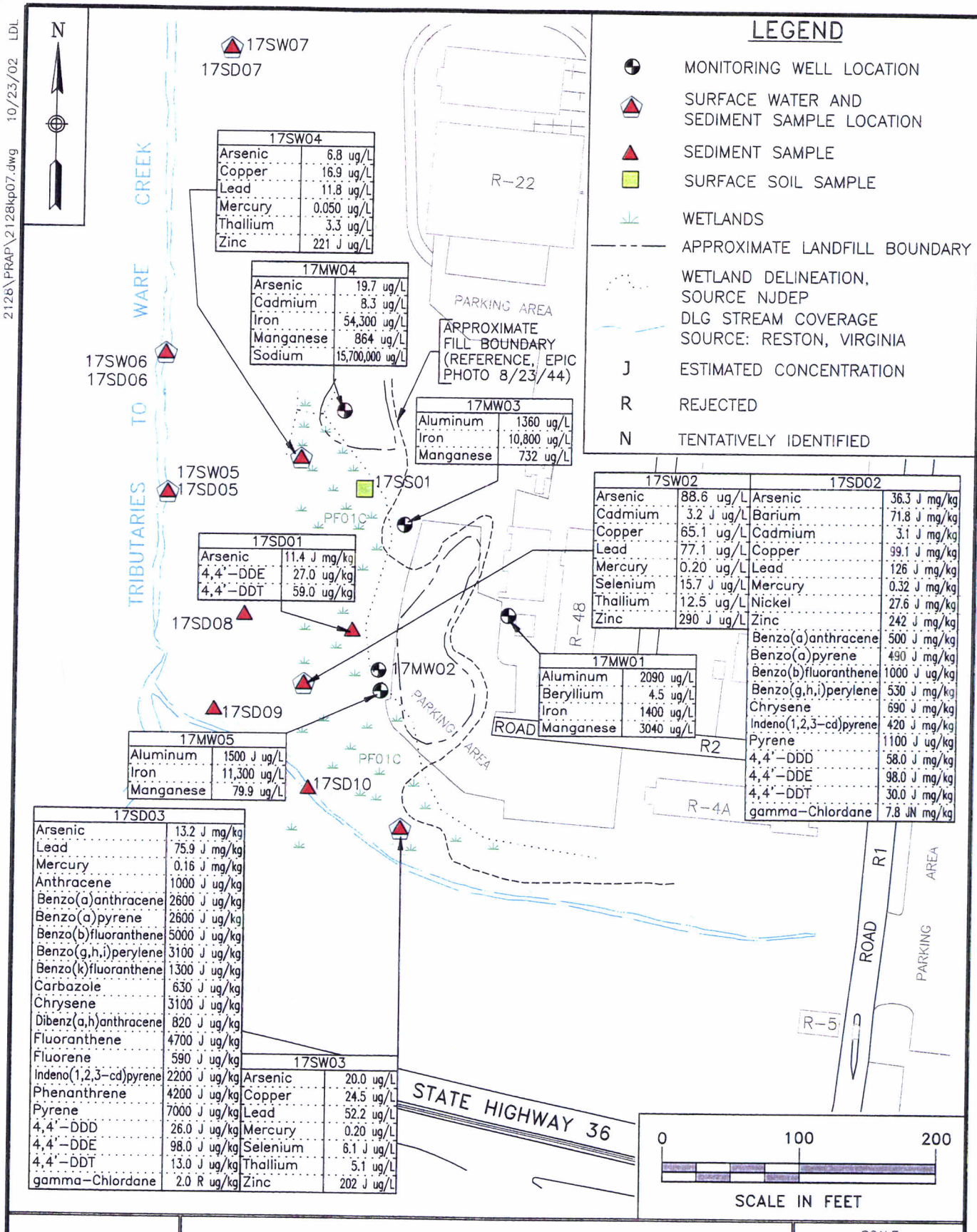


TETRA TECH NUS, INC.

CONCENTRATIONS ABOVE SURFACE WATER AND SEDIMENT SCREENING LEVELS
SITE 15 – SLUDGE DISPOSAL SITE
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

SCALE	AS NOTED
FILE:	2128kp08.dwg
	3/18/03 LDL PHL
REV	DATE
1	11/20/02
FIGURE NUMBER	FIGURE 7

2128\PRAP\2128kp07.dwg 10/23/02 LDL



LEGEND

- MONITORING WELL LOCATION
- SURFACE WATER AND SEDIMENT SAMPLE LOCATION
- SEDIMENT SAMPLE
- SURFACE SOIL SAMPLE
- WETLANDS
- APPROXIMATE LANDFILL BOUNDARY
- WETLAND DELINEATION, SOURCE NJDEP
- DLG STREAM COVERAGE SOURCE: RESTON, VIRGINIA
- J ESTIMATED CONCENTRATION
- R REJECTED
- N TENTATIVELY IDENTIFIED

17SW04	
Arsenic	6.8 ug/L
Copper	16.9 ug/L
Lead	11.8 ug/L
Mercury	0.050 ug/L
Thallium	3.3 ug/L
Zinc	221 J ug/L

17MW04	
Arsenic	19.7 ug/L
Cadmium	8.3 ug/L
Iron	54,300 ug/L
Manganese	864 ug/L
Sodium	15,700,000 ug/L

17MW03	
Aluminum	1360 ug/L
Iron	10,800 ug/L
Manganese	732 ug/L

17SD01	
Arsenic	11.4 J mg/kg
4,4'-DDE	27.0 ug/kg
4,4'-DDT	59.0 ug/kg

17SW02	
Arsenic	88.6 ug/L
Cadmium	3.2 J ug/L
Copper	65.1 ug/L
Lead	77.1 ug/L
Mercury	0.20 ug/L
Selenium	15.7 J ug/L
Thallium	12.5 ug/L
Zinc	290 J ug/L

17SD02	
Arsenic	36.3 J mg/kg
Barium	71.8 J mg/kg
Cadmium	3.1 J mg/kg
Copper	99.1 J mg/kg
Lead	126 J mg/kg
Mercury	0.32 J mg/kg
Nickel	27.6 J mg/kg
Zinc	242 J mg/kg
Benzo(a)anthracene	500 J mg/kg
Benzo(a)pyrene	490 J mg/kg
Benzo(b)fluoranthene	1000 J ug/kg
Benzo(g,h,i)perylene	530 J mg/kg
Chrysene	690 J mg/kg
Indeno(1,2,3-cd)pyrene	420 J mg/kg
Pyrene	1100 J ug/kg
4,4'-DDD	58.0 J mg/kg
4,4'-DDE	98.0 J mg/kg
4,4'-DDT	30.0 J mg/kg
gamma-Chlordane	7.8 JN mg/kg

17MW01	
Aluminum	2090 ug/L
Beryllium	4.5 ug/L
Iron	1400 ug/L
Manganese	3040 ug/L

17MW05	
Aluminum	1500 J ug/L
Iron	11,300 ug/L
Manganese	79.9 ug/L

17SD03	
Arsenic	13.2 J mg/kg
Lead	75.9 J mg/kg
Mercury	0.16 J mg/kg
Anthracene	1000 J ug/kg
Benzo(a)anthracene	2600 J ug/kg
Benzo(a)pyrene	2600 J ug/kg
Benzo(b)fluoranthene	5000 J ug/kg
Benzo(g,h,i)perylene	3100 J ug/kg
Benzo(k)fluoranthene	1300 J ug/kg
Carbazole	630 J ug/kg
Chrysene	3100 J ug/kg
Dibenz(a,h)anthracene	820 J ug/kg
Fluoranthene	4700 J ug/kg
Fluorene	590 J ug/kg
Indeno(1,2,3-cd)pyrene	2200 J ug/kg
Phenanthrene	4200 J ug/kg
Pyrene	7000 J ug/kg
4,4'-DDD	26.0 J ug/kg
4,4'-DDE	98.0 J ug/kg
4,4'-DDT	13.0 J ug/kg
gamma-Chlordane	2.0 R ug/kg

17SW03	
Arsenic	20.0 ug/L
Copper	24.5 ug/L
Lead	52.2 ug/L
Mercury	0.20 ug/L
Selenium	6.1 J ug/L
Thallium	5.1 ug/L
Zinc	202 J ug/L

TETRA TECH NUS, INC.

CONCENTRATIONS ABOVE SCREENING LEVELS
SITE 17 - LANDFILL
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

SCALE: AS NOTED

FILE: 2128kp07.dwg
3/18/03 LDL PHL

REV 1 DATE 10/25/02

FIGURE NUMBER
FIGURE 8

TABLES

TABLE 1
OCCURRENCE AND DISTRIBUTION OF INORGANICS IN SEDIMENT AT SITE 6
OU-9 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
(mg/kg)

	BACKGROUND***				SITE-RELATED					
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	UTL**	2 X AVERAGE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	AVERAGE CONCENTRATION	MEAN > 2 X BKGD?	MEAN > BACK UTL?	REPRESENTATIVE CONCENTRATION
ALUMINUM	6 / 6	839 - 3940	8.1E+07	5459.67	10 / 10	2050 - 14500	5491.00	YES	NO	7578.17
ANTIMONY *	NOT DETECTED	-	-	-	2 / 10	0.51 - 12.4	2.42	YES	-	4.63
ARSENIC *	5 / 6	2.4 - 9.9	2.9E+02	11.23	10 / 10	1.9 - 36.3	13.93	YES	NO	21.60
BARIUM	6 / 6	3.2 - 15.8	2.9E+02	16.80	10 / 10	5 - 138	42.69	YES	NO	72.47
BERYLLIUM	4 / 6	0.34 0.57	3.3E-01	0.72	9 / 10	0.11 - 1.2	0.42	NO	YES	0.64
CADMIUM	2 6	0.44 - 0.46	1.1E+00	0.93	2 / 10	1.5 - 1.8	0.41	NO	NO	0.80
CALCIUM	6 / 6	179 - 518	6.7E+05	690.83	10 / 10	92.4 - 8820	1890.64	YES	NO	3522.28
CHROMIUM	6 / 6	4.3 - 56	2.6E+03	40.42	7 / 7	14.4 - 77.2	34.64	NO	NO	50.89
COBALT	4 / 6	0.51 2.1	6.4E+00	2.85	9 / 10	0.33 - 8.2	2.62	NO	NO	4.38
COPPER *	6 / 6	1 - 13	1.9E+01	9.08	10 / 10	0.75 - 228	39.85	YES	YES	82.70
IRON	6 / 6	228 - 21400	7.2E+09	23589	10 / 10	1790 - 52200	21524	NO	NO	32677
LEAD *	6 / 6	4 - 34.3	4.8E+01	21.07	10 / 10	3.8 - 445	80.28	YES	YES	163.62
MAGNESIUM	6 / 6	60.7 - 880	2.0E+06	809.90	9 / 10	401 - 2460	1165.04	YES	NO	2460.00
MANGANESE	6 / 6	3.9 - 63.1	8.9E+01	36.22	10 / 10	4.1 - 451	72.84	YES	NO	152.91
MERCURY *	1 / 6	0.068 0.068	8.5E-03	0.09	4 / 10	0.027 - 0.63	0.15	YES	YES	0.27
NICKEL	5 / 6	1.6 - 6	3.4E+01	6.90	10 / 10	0.93 - 43.8	9.09	YES	NO	17.03
POTASSIUM	5 / 6	86.1 - 2900	1.4E+07	1892.03	10 / 10	172 - 2630	1093.70	NO	NO	2411.68
SELENIUM	0 / 6	-	1.9E+00	-	4 / 10	1.2 - 3.4	1.22	YES	NO	1.88
SILVER	2 / 6	0.1125 0.15	2.8E+00	1.13	2 10	0.12 - 0.26	0.35	NO	NO	0.26
SODIUM	4 / 6	26.6 - 2280	2.9E+03	876.80	9 / 10	28.6 - 6960	1105.26	YES	NO	2320.44
THALLIUM *	NOT DETECTED	-	-	-	2 / 10	0.92 - 2.1	0.67	YES	-	0.98
VANADIUM	6 / 6	5.9 - 42.7	2.1E+03	39.42	10 / 10	3.9 - 104	37.67	NO	NO	104.00
ZINC	6 / 6	12.5 - 34.7	1.5E+03	41.23	10 / 10	4.5 - 1720	244.76	YES	NO	556.85

* - Selected as a COPC

** - Upper Tolerance Limit = UTL is the concentration that is estimated to contain a designated portion (95%) of all possible sample measurements.

*** - Background samples are as follows: BGSD01, BGSD02, BGSD04 through BGSD07

TABLE 2
OCCURRENCE AND DISTRIBUTION OF ORGANICS IN SEDIMENT AT SITE 6
OU-9 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/kg)

SUBSTANCE	BACKGROUND**			SITE-RELATED		
	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION
4,4'-DDD *	2 / 6	4.9 - 21	11.98	4 / 9	2.4 - 230	80.01
4,4'-DDE *	1 / 6	1.7 - 1.7	1.7	5 / 10	3.6 - 66	24.62
4,4'-DDT *	1 / 6	19 - 19	10.64	4 / 10	9.3 - 110	47.12
ALPHA-CHLORDANE *	NOT DETECTED	-	-	3 / 9	9.8 - 48	19.64
DIELDRIN *	NOT DETECTED	-	-	2 / 10	0.31 - 1.6	1.6
ENDOSULFAN II *	NOT DETECTED	-	-	3 / 10	2.6 - 24	8.82
ENDRIN *	NOT DETECTED	-	-	1 / 10	1.6 - 1.6	1.6
ENDRIN KETONE *	1 / 5	1.6 - 1.6	1.6	1 / 10	7.3 - 7.3	7.3
GAMMA-CHLORDANE *	1 / 6	0.095 - 0.095	0.095	4 / 10	0.34 - 56	19.82
HEPTACHLOR *	NOT DETECTED	-	-	2 / 10	0.16 - 0.35	0.35
HEPTACHLOR EPOXIDE *	NOT DETECTED	-	-	4 / 10	0.2 - 2.3	2.30
ACENAPHTHYLENE *	NOT DETECTED	-	-	2 / 10	56 - 160	160.00
ANTHRACENE *	NOT DETECTED	-	-	3 / 10	88 - 260	260.00
BENZ(A)ANTHRACENE *	3 / 6	85 - 560	560	5 / 10	75 - 1700	676.58
BENZO(A)PYRENE *	3 / 6	110 - 590	393.60	6 / 10	100 - 2400	852.30
BENZO(B)FLUORANTHENE *	3 / 6	150 - 490	346.54	5 / 10	190 - 4800	1587.69
BENZO(G,H,I)PERYLENE *	3 / 6	51 - 380	380	4 / 10	150 - 2600	912.89
BENZO(K)FLUORANTHENE *	3 / 6	63 - 470	470	5 / 10	66 - 1100	451.37
BIS(2-ETHYLHEXYL)PHTHALATE	NOT DETECTED	-	-	2 / 10	96 - 880	521.76
BUTYLBENZYLPHTHALATE *	NOT DETECTED	-	-	1 / 10	300 - 300	300.00
CARBAZOLE *	NOT DETECTED	-	-	1 / 10	140 - 140	140
CHRYSENE *	3 / 6	130 - 940	577.87	5 / 10	130 - 2400	884.84
DIBENZ(A,H)ANTHRACENE *	NOT DETECTED	-	-	2 / 10	150 - 720	385.24
DIBENZOFURAN *	NOT DETECTED	-	-	1 / 10	78 - 78	78
FLUORANTHENE *	3 / 6	240 - 1800	1024.31	5 / 10	110 - 1600	819.64
FLUORENE *	1 / 6	190 - 190	190	2 / 10	65 - 83	83
INDENO(1,2,3-CD)PYRENE *	3 / 6	55 - 310	310	5 / 10	69 - 2300	800.89
NAPHTHALENE *	NOT DETECTED	-	-	1 / 10	90 - 90	90.00
PHENANTHRENE *	3 / 6	110 - 1900	1052.11	4 / 10	210 - 740	421.54
PYRENE *	3 / 6	200 - 1900	1076.74	5 / 10	130 - 2000	884.61
4-METHYL-2-PENTANONE *	NOT DETECTED	-	-	1 / 4	2 - 2	2
TOLUENE *	1 / 3	480 - 480	480	1 / 4	31 - 31	31
XYLENE (TOTAL) *	NOT DETECTED	-	-	1 / 4	3 - 3	3

* - Selected as a COPC

** - Background samples are as follows: BGSD01, BGSD02, BGSD04 through BGSD07

Since organic compounds are not considered to be naturally occurring, all organic compounds detected at the site were selected as COPC's.

TABLE 3
OCCURRENCE AND DISTRIBUTION OF INORGANICS IN GROUNDWATER AT SITE 6
OU-9 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/L)

	BACKGROUND***				SITE-RELATED					
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	UTL**	2 X AVERAGE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	AVERAGE CONCENTRATION	MEAN > 2 X BKGD?	MEAN > BACK UTL?	REPRESENTATIVE CONCENTRATION
ALUMINUM	3 / 3	1320 - 2090	1.6E+11	3386.67	4 / 4	145 - 1320	518.75	NO	NO	1320.00
ARSENIC *	1 / 3	5.1 - 5.1	1.7E+02	5.60	3 / 4	5.1 - 26.8	10.59	YES	NO	26.80
BARIUM	3 / 3	30.4 - 78.1	2.5E+06	105.47	4 / 4	30.4 - 64.9	47.13	NO	NO	64.90
BERYLLIUM	2 / 3	0.23 - 4.5	7.7E+01	3.19	1 / 4	0.21 - 0.21	0.09	NO	NO	0.21
CADMIUM	3 / 3	0.43 - 7	2.2E+01	5.29	4 / 4	1.2 - 7	3.90	NO	NO	7.00
CALCIUM	3 / 3	11000 - 24100	9.4E+14	38067	4 / 4	5670 - 89800	31440	NO	NO	89800
CHROMIUM *	NOT DETECTED	-	-	-	1 / 4	1.2 - 1.2	0.66	YES	-	1.20
COBALT	3 / 3	3.2 - 24.7	4.2E+04	23.67	3 / 4	0.81 - 7.6	3.18	NO	NO	7.60
IRON	3 / 3	1400 - 95200	2.4E+16	66847	4 / 4	13400 - 95200	50025	NO	NO	95200
MAGNESIUM	3 / 3	8610 - 17300	2.5E+14	26940	4 / 4	3120 - 53000	19660	NO	NO	53000
MANGANESE	3 / 3	720 - 3040	7.3E+11	3720	4 / 4	61.3 - 1820	754.08	NO	NO	1820.00
NICKEL	3 / 3	3.7 - 43.2	2.7E+05	38.33	4 / 4	0.76 - 5	2.61	NO	NO	5.00
POTASSIUM	3 / 3	3000 - 3620	1.1E+12	6780	4 / 4	2250 - 9270	4395	NO	NO	9270
SODIUM	3 / 3	15800 - 92500	1.9E+17	127600	4 / 4	20800 - 83100	40925	NO	NO	83100
ZINC	2 / 2	18.9 - 30.9	7.3E+11	49.80	3 / 4	3.3 - 18.9	10.55	NO	NO	18.90

* - Selected as a COPC

** - Upper Tolerance Limit = UTL is the concentration that is estimated to contain a designated portion (95%) of all possible sample measurements.

*** - Background samples are as follows: MW4-04, BGMW-02, BGMW-01, MW26-03, MW3-06, MW5-02, MW5-03, MW19-01, MW1-03, MW5-08, MW11-03

TABLE 4
OCCURRENCE AND DISTRIBUTION OF ORGANICS IN GROUNDWATER AT SITE 6
OU-9 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/L)

SUBSTANCE	BACKGROUND**			SITE-RELATED		
	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION
ENDOSULFAN I *	NOT DETECTED	-	-	1 / 4	0.0021	0.0021
GAMMA-BHC (LINDANE) *	NOT DETECTED	-	-	1 / 4	0.0008	0.0008

* - Selected as a COPC

** - Background samples are as follows: MW4-04, BGMW-02, BGMW-01, MW26-03, MW3-06, MW5-02, MW5-03, MW19-01, MW1-03, MW5-08, MW11-03

TABLE 5
OCCURRENCE AND DISTRIBUTION OF INORGANICS IN SURFACE WATER AT SITE 6
OU-9 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/L)

	BACKGROUND***				SITE-RELATED					
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	UTL **	2 X AVERAGE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	AVERAGE CONCENTRATION	MEAN > 2 X BKGD?	MEAN > BACK UTL?	REPRESENTATIVE CONCENTRATION
ALUMINUM *	5 / 6	102 - 1540	2.2E+03	904.20	5 / 5	213 - 15100	3310.40	YES	YES	9594.70
ANTIMONY *	NOT DETECTED	-	-	-	1 / 5	3.3 3.3	2.99	YES	YES	3.30
ARSENIC *	1 / 6	9 - 9	1.3E+01	5.32	4 / 5	4.4 - 42.4	12.34	YES	NO	28.49
BARIUM	6 / 6	16.3 - 36.4	2.4E+03	55.05	5 / 5	30.1 - 468	127.78	YES	NO	309.61
BERYLLIUM	3 / 6	0.22 - 1.2	1.7E+00	0.70	4 / 5	0.14 - 2.4	0.81	YES	NO	2.40
CADMIUM *	1 / 6	0.18 0.18	3.2E-01	0.23	1 / 5	2.7 - 2.7	0.62	YES	YES	1.73
CALCIUM	6 / 6	462 - 177000	2.3E+05	71114	5 / 5	20000 - 159000	55140	NO	NO	111621
CHROMIUM	3 / 5	0.72 - 2.6	4.4E+00	1.78	1 / 4	1.1 - 1.1	1.44	NO	NO	1.10
COBALT	6 / 6	0.81 - 2	5.2E+00	3.10	4 / 5	0.79 - 6.6	2.51	NO	NO	4.73
COPPER	5 / 6	1.1 - 17.8	3.0E+02	11.92	5 / 5	6.6 - 102	29.16	YES	NO	68.16
IRON *	6 / 6	160 - 23100	3.0E+04	9576.67	5 / 5	2060 - 349000	75894	YES	YES	221526
LEAD *	2 / 6	4.4 - 16	2.2E+01	7.31	5 / 5	1.2 - 506	103.84	YES	YES	318.18
MAGNESIUM	6 / 6	369 - 559000	7.0E+05	190703	5 / 5	5360 - 447000	129810	NO	NO	447000
MANGANESE	6 / 6	14 - 203	3.8E+02	172.43	5 / 5	170 - 338	261.40	YES	NO	338.00
MERCURY	2 / 6	0.023 - 0.028	2.3E-01	0.12	3 / 5	0.043 - 0.29	0.12	NO	NO	0.29
NICKEL	6 / 6	2.1 - 7.9	8.2E+01	10.23	4 / 5	1.8 - 27.2	8.45	NO	NO	18.54
POTASSIUM	5 / 6	251 - 259000	3.2E+05	88923	5 / 5	3250 - 207000	60552	NO	NO	207000
SELENIUM	2 / 6	3.5 - 9.2	1.4E+01	6.27	3 / 5	3.9 - 8.5	4.08	NO	NO	8.50
SILVER	1 / 6	0.86 - 0.86	1.3E+00	0.75	1 / 5	0.74 - 0.74	0.46	NO	NO	0.71
SODIUM	3 / 3	11150 - 4340000	1.3E+07	2912233	5 / 5	53900 - 3480000	1043320	NO	NO	3480000
THALLIUM	3 / 6	3.5 - 5.5	2.8E+01	5.90	4 / 5	5.1 - 10.7	7.06	YES	NO	10.70
VANADIUM	4 / 6	0.225 - 9	1.2E+01	3.79	4 / 5	0.92 - 40.5	9.79	YES	NO	26.20
ZINC	5 / 5	7.6 - 29.4	1.5E+03	30.60	2 / 2	55.4 - 323	189.20	YES	NO	323.00

* - Selected as a COPC

** - Upper Tolerance Limit = UTL is the concentration that is estimated to contain a designated portion (95%) of all possible sample measurements.

*** - Background samples are as follows: BGSW01, BGSW02, BGSW04 through BGSW07

TABLE 6
OCCURRENCE AND DISTRIBUTION OF INORGANICS IN SURFACE SOIL AT SITE 15
OU-9 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
(mg/kg)

SUBSTANCE	BACKGROUND			SITE-RELATED				
	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	2 X AVERAGE BKGD CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	AVERAGE CONCENTRATION	MEAN > 2 X BKGD	REPRESENTATIVE CONCENTRATION
ALUMINUM*	4 / 4	1710 - 5310	6152.50	2 / 2	897 - 9250	5073.5	NO	9250
ANTIMONY	NOT DETECTED	-	-	1 / 2	1.8	1.11	YES	1.8
ARSENIC	4 / 4	1.35 - 14.4	13.43	2 / 2	10.1 - 19.2	14.65	YES	19.2
BARIUM	4 / 4	1.85 - 31	22.53	2 / 2	7.8 - 18	12.9	NO	18
BERYLLIUM	1 / 4	0.28	0.39	1 / 2	0.97	0.49375	YES	0.97
CADMIUM	1 / 4	0.57	0.67	2 / 2	0.85 - 3.4	2.125	YES	3.4
CALCIUM	4 / 4	40.1 - 519	551.80	2 / 2	407 - 828	617.5	YES	828
CHROMIUM*	4 / 4	7.8 - 59.5	69.05	2 / 2	3.7 - 37.7	20.7	NO	37.7
COBALT	2 / 4	0.75 - 5	3.15	2 / 2	1.1 - 2.8	1.95	NO	2.8
COPPER	4 / 4	0.97 - 8.4	10.06	2 / 2	14.3 - 33.2	23.75	YES	33.2
IRON	4 / 4	3745 - 62500	52402.50	2 / 2	10900 - 52300	31600	NO	52300
LEAD	4 / 4	1.8 - 39.4	37.30	2 / 2	56.8 - 110	83.4	YES	110
MAGNESIUM	4 / 4	71.7 - 619	578.85	2 / 2	118 - 2260	1189	YES	2260
MANGANESE	4 / 4	3.45 - 214	128.33	2 / 2	60.7 - 92.9	76.8	NO	92.9
MERCURY	4 / 4	0.035 - 0.17	0.18	2 / 2	0.051 - 0.16	0.1055	NO	0.16
NICKEL*	2 / 4	1.8 - 7.2	5.18	2 / 2	3 - 7.5	5.25	YES	7.5
POTASSIUM	4 / 4	95 - 792	912.50	2 / 2	122 - 6790	3456	YES	6790
SODIUM	4 / 4	17.5 - 86.2	78.30	2 / 2	47.4 - 195	121.2	YES	195
THALLIUM	2 / 4	0.7 - 1.9	1.64	1 / 2	1.5	1.025	NO	1.5
VANADIUM	4 / 4	11.05 - 64	70.13	2 / 2	14.9 - 36	25.45	NO	36
ZINC	3 / 4	1.1 - 27.6	22.80	2 / 2	7.2 - 52.4	29.8	YES	52.4

Note: Selected COPCs are indicated in boldface type.
*** - Indicates COPCs eliminated based on amended risk assessment.**

TABLE 7
OCCURRENCE AND DISTRIBUTION OF ORGANICS IN SURFACE SOIL AT SITE 15
OU-9 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/kg)

	BACKGROUND			SITE-RELATED		
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION
4,4'-DDE	2 / 4	16 - 330	277.86	2 / 2	13 - 43	43
4,4'-DDT	2 / 4	43 - 420	355.71	1 / 1	12	12
ALPHA-BHC	NOT DETECTED	-	-	1 / 2	0.13	0.13
BENZO(A)ANTHRACENE	NOT DETECTED	-	-	1 / 2	71	71
BENZO(A)PYRENE	NOT DETECTED	-	-	2 / 2	58 - 69	69
BENZO(B)FLUORANTHENE	NOT DETECTED	-	-	2 / 2	120 - 160	160
BIS(2-ETHYLHEXYL)PHTHALATE	NOT DETECTED	-	-	2 / 2	100 - 110	110
CHRYSENE	NOT DETECTED	-	-	2 / 2	68 - 90	90
FLUORANTHENE	2 / 4	40 - 84	84	2 / 2	130 - 180	180
PHENANTHRENE	NOT DETECTED	-	-	2 / 2	69 - 100	100
PYRENE	1 / 4	46	46	2 / 2	140 - 210	210

TABLE 8
OCCURRENCE AND DISTRIBUTION OF INORGANICS IN SUBSURFACE SOIL AT SITE 15
OU-9 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
(mg/kg)

	BACKGROUND			SITE-RELATED				
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	2 X AVERAGE BKGD CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	AVERAGE CONCENTRATION	MEAN > 2 X BKGD	REPRESENTATIVE CONCENTRATION
ALUMINUM*	8 / 8	675 - 5310	5370.00	4 / 4	890 - 7185	3288.75	NO	7185
ARSENIC	8 / 8	1.35 - 14.4	13.29	3 / 4	8.8 - 20.5	12.40	NO	20.5
BARIUM	8 / 8	0.92 - 31	17.92	4 / 4	3.9 - 11.25	6.96	NO	11.25
BERYLLIUM*	2 / 8	0.12 - 0.28	0.28	4 / 4	0.12 - 0.275	0.17	NO	0.275
CADMIUM	1 / 8	0.57	0.58	3 / 4	1.2 - 2.8	1.49	YES	2.8
CALCIUM	8 / 8	28.6 - 799	577.55	4 / 4	70.8 - 584	228.55	NO	584
CHROMIUM*	8 / 8	4.7 - 59.5	54.73	4 / 4	2.4 - 16.8	8.10	NO	16.8
COBALT	4 / 8	0.75 - 5	2.77	3 / 4	0.16 - 0.69	0.33	NO	0.69
COPPER	8 / 8	0.97 - 8.6	8.66	4 / 4	0.35 - 3.3	1.81	NO	3.3
IRON	8 / 8	3745 - 62500	40871.25	4 / 4	1600 - 43400	22525.00	NO	43400
LEAD*	8 / 8	1.4 - 39.4	24.33	4 / 4	1.9 - 6.65	4.49	NO	6.65
MAGNESIUM	8 / 8	18.5 - 619	504.05	4 / 4	68.8 - 464.5	210.53	NO	464.5
MANGANESE	8 / 8	2.6 - 214	92.51	4 / 4	1.9 - 7.35	4.19	NO	7.35
MERCURY	8 / 8	0.03 - 0.17	0.13	1 / 4	0.0054	0.00	NO	0.00
NICKEL	4 / 8	1.8 - 7.2	4.75	4 / 4	0.48 - 1.7	1.14	NO	1.7
POTASSIUM	7 / 8	95 - 792	793.35	4 / 4	55 - 553	297.00	NO	553
SELENIUM	2 / 8	0.57 - 0.93	0.79	2 / 4	1.3 - 1.6	1.01	YES	1.6
SODIUM	8 / 8	17.5 - 94.8	79.35	4 / 4	29.3 - 116.3	56.28	NO	116.3
THALLIUM	4 / 8	0.7 - 1.9	1.38	2 / 4	1.3 - 1.5	0.93	NO	1.5
VANADIUM	8 / 8	11.05 - 64	64.71	4 / 4	4.5 - 39.4	20.95	NO	39.4
ZINC	6 / 8	1.1 - 50.7	31.35	4 / 4	0.75 - 11.4	4.76	NO	11.4

Note: Selected COPCs are indicated in boldface type.

*** - Indicates COPCs eliminated based on amended risk assessment.**

TABLE 9
OCCURRENCE AND DISTRIBUTION OF ORGANICS IN SUBSURFACE SOIL AT SITE 15
OU-9 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/kg)

SUBSTANCE	BACKGROUND			SITE-RELATED		
	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION
BIS(2-ETHYLHEXYL)PHTHALATE	NOT DETECTED	-	-	4 / 4	59 - 260	260

TABLE 10
OCCURRENCE AND DISTRIBUTION OF INORGANICS IN SEDIMENT AT SITE 15
OU-9 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
(mg/kg)

	BACKGROUND			SITE-RELATED				
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	2 X AVERAGE BKGD CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	AVERAGE CONCENTRATION	MEAN > 2 X BKGD	REPRESENTATIVE CONCENTRATION
ALUMINUM	3 / 3	839 - 3940	5492.67	3 / 3	2550 - 10600	6086.67	YES	10600
ARSENIC	2 / 3	2.4 - 6.2	5.95	3 / 3	10.5 - 25.5	17.73	YES	25.5
BARIUM	3 / 3	3.9 - 10.6	14.07	3 / 3	28.9 - 45.4	39.17	YES	45.4
BERYLLIUM	1 / 3	0.57	0.67	2 / 3	0.32 - 1.7	0.69	YES	1.7
CADMIUM	NOT DETECTED	-	-	1 / 3	1.9	0.92	YES	1.9
CALCIUM	3 / 3	179 - 518	685.33	3 / 3	282 - 5100	2144.00	YES	5100
CHROMIUM	3 / 3	4.3 - 56	43.13	3 / 3	8.6 - 58.7	33.27	NO	58.7
COBALT	1 / 3	2.1	3.30	2 / 3	5.6 - 7.1	4.47	YES	7.1
COPPER	3 / 3	1.5 - 13	12.47	3 / 3	11.3 - 269	122.03	YES	269
IRON	3 / 3	228 - 7650	6578.67	3 / 3	20800 - 84000	49833.33	YES	84000
LEAD	3 / 3	4.6 - 34.3	30.60	3 / 3	42.5 - 187	97.33	YES	187
MAGNESIUM	3 / 3	60.7 - 256	306.47	3 / 3	251 - 1530	970.33	YES	1530
MANGANESE	3 / 3	4.6 - 9.2	13.80	3 / 3	12 - 72.8	45.90	YES	72.8
MERCURY	1 / 3	0.068	0.05	3 / 3	0.11 - 0.67	0.31	YES	0.67
NICKEL	2 / 3	2.1 - 6	7.93	2 / 3	11.1 - 15.5	9.42	YES	15.5
POTASSIUM	2 / 3	86.1 - 681	589.40	3 / 3	395 - 576	476.33	NO	576
SELENIUM	NOT DETECTED	-	-	2 / 3	1.5 - 2.2	1.35	YES	2.2
SILVER	NOT DETECTED	-	-	2 / 3	0.52 - 3.1	1.34	YES	3.1
SODIUM	3 / 3	26.6 - 116	115.27	3 / 3	222 - 317	276.67	YES	317
THALLIUM	NOT DETECTED	-	-	3 / 3	1 - 2.8	2.07	YES	2.8
VANADIUM	3 / 3	5.9 - 42.7	36.93	3 / 3	20.1 - 48.7	34.67	NO	48.7
ZINC	3 / 3	14.2 - 26.9	37.33	3 / 3	136 - 464	258.67	YES	464

Note: Selected COPCs are indicated in boldface type.

TABLE 11

OCCURRENCE AND DISTRIBUTION OF ORGANICS IN SEDIMENT AT SITE 15
OU-9 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/kg)

	BACKGROUND			SITE-RELATED		
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION
2-BUTANONE	NOT DETECTED	-	-	1 / 3	86	86
2-METHYLNAPHTHALENE	NOT DETECTED	-	-	1 / 3	300	300
4,4'-DDD	2 / 3	4.9 - 21	21	3 / 3	13 - 45	45
4,4'-DDE	1 / 3	1.7	1.7	3 / 3	2.1 - 59	59
4,4'-DDT	1 / 3	19	19	2 / 3	7.2 - 46	46
ACENAPHTHENE	NOT DETECTED	-	-	1 / 3	140	140
ALPHA-CHLORDANE	NOT DETECTED	-	-	2 / 3	3.8 - 31	31
ANTHRACENE	NOT DETECTED	-	-	2 / 3	52 - 240	240
AROCLOR-1260	NOT DETECTED	-	-	2 / 3	16 - 100	100
BENZO(A)ANTHRACENE	2 / 3	140 - 560	560	2 / 3	270 - 1400	1400
BENZO(A)PYRENE	2 / 3	160 - 590	590	2 / 3	260 - 1500	1500
BENZO(B)FLUORANTHENE	2 / 3	150 - 490	490	3 / 3	130 - 2700	2700
BENZO(G,H,I)PERYLENE	2 / 3	130 - 380	380	2 / 3	170 - 1200	1200
BENZO(K)FLUORANTHENE	2 / 3	150 - 470	470	2 / 3	140 - 930	930
BUTYLBENZYLPHTHALATE	NOT DETECTED	-	-	1 / 3	910	910
CARBAZOLE	NOT DETECTED	-	-	1 / 3	250	250
CHRYSENE	2 / 3	250 - 940	940	3 / 3	120 - 2200	2200
DI-N-BUTYLPHTHALATE	NOT DETECTED	-	-	1 / 3	160	160
DIBENZ(A,H)ANTHRACENE	NOT DETECTED	-	-	1 / 3	340	340
DIBENZOFURAN	NOT DETECTED	-	-	1 / 3	130	130
ENDRIN	NOT DETECTED	-	-	1 / 3	10	10
FLUORANTHENE	2 / 3	300 - 1800	1800	3 / 3	200 - 3600	3600
FLUORENE	1 / 3	190	190	1 / 3	180	180
GAMMA-CHLORDANE	1 / 3	0.095	0.095	2 / 3	5.1 - 29	29
HEPTACHLOR EPOXIDE	NOT DETECTED	-	-	2 / 3	0.47 - 3.2	3.2
INDENO(1,2,3-CD)PYRENE	2 / 3	110 - 310	310	2 / 3	150 - 1100	1100
NAPHTHALENE	NOT DETECTED	-	-	1 / 3	140	140
PHENANTHRENE	2 / 3	200 - 1900	1900	3 / 3	120 - 1800	1800
PYRENE	2 / 3	350 - 1900	1900	3 / 3	180 - 3400	3400
STYRENE	NOT DETECTED	-	-	1 / 3	11	11

TABLE 12
OCCURRENCE AND DISTRIBUTION OF INORGANICS IN SURFACE WATER AT SITE 15
OU-9 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/L)

	BACKGROUND			SITE-RELATED				
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	2 X AVERAGE BKGD CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	AVERAGE CONCENTRATION	MEAN > 2 X BKGD	REPRESENTATIVE CONCENTRATION
ALUMINUM	3 / 3	265 - 409	705.33	2 / 2	104 - 338	221	NO	338
BARIUM	3 / 3	16.3 - 34	53.73	2 / 2	34.6 - 49.5	42.05	NO	49.5
BERYLLIUM	2 / 3	0.22 - 0.33	0.41	2 / 2	0.22 - 0.88	0.55	YES	0.88
CADMIUM	1 / 3	0.18	0.23	2 / 2	0.31 - 0.37	0.34	YES	0.37
CALCIUM	3 / 3	462 - 10100	9128.00	2 / 2	22200 - 26900	24550	YES	26900
COBALT	3 / 3	0.81 - 1.9	2.54	2 / 2	5 - 10.9	7.95	YES	10.9
COPPER	2 / 3	1.1 - 9.8	7.40	2 / 2	3.3 - 6.8	5.05	NO	6.8
IRON	3 / 3	160 - 702	1040.00	2 / 2	7460 - 7940	7700	YES	7940
LEAD	1 / 3	4.4	3.43	1 / 2	2	1.185	NO	2
MAGNESIUM	3 / 3	369 - 2770	2525.33	2 / 2	7300 - 9020	8160	YES	9020
MANGANESE	3 / 3	14 - 55.5	59.93	2 / 2	885 - 1120	1002.5	YES	1120
MERCURY	2 / 3	0.023 - 0.028	0.04	2 / 2	0.11 - 0.13	0.12	YES	0.13
NICKEL	3 / 3	2.1 - 7.1	8.60	2 / 2	5.6 - 12.5	9.05	YES	12.5
POTASSIUM	2 / 3	251 - 1850	1482.33	2 / 2	4180 - 4870	4525	YES	4870
SODIUM	NOT DETECTED	-	-	2 / 2	61400 - 80800	71100	YES	80800
ZINC	3 / 3	7.6 - 29.4	32.67	2 / 2	14.7 - 68.1	41.4	YES	68.1

Note: Selected COPCs are indicated in boldface type.

TABLE 13
OCCURRENCE AND DISTRIBUTION OF ORGANICS IN SURFACE WATER AT SITE 15
OU-9 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/L)

	BACKGROUND			SITE-RELATED		
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION
4,4'-DDD	NOT DETECTED	-	-	1 / 1	0.0018	0.0018

TABLE 14
OCCURRENCE AND DISTRIBUTION OF INORGANICS IN SURFACE SOIL AT SITE 17 (OU-9)
NWS EARLE, COLTS NECK, NEW JERSEY
(mg/kg)

	BACKGROUND***					SITE-RELATED	
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	UTL**	2 X AVERAGE CONCENTRATION	REPRESENTATIVE CONCENTRATION	FREQUENCY OF DETECTION	REPRESENTATIVE CONCENTRATION
ALUMINUM	4 / 4	1710 - 5310	7.5E+03	6153	5310	1 / 1	525
ARSENIC*	4 / 4	1.35 - 14.4	2.3E+01	13.43	14.4	1 / 1	2.3
BARIUM	4 / 4	1.85 - 31	4.7E+01	22.53	31	1 / 1	3.2
BERYLLIUM	1 / 4	0.28	5.6E+00	0.39	0.28	1 / 1	0.049
CADMIUM	1 / 4	0.57	7.5E-01	0.67	0.52	1 / 1	0.098
CALCIUM	4 / 4	40.1 - 519	6.8E+03	551.80	519	1 / 1	129
CHROMIUM	4 / 4	7.8 - 59.5	1.1E+02	69.05	59.5	1 / 1	5.4
COBALT	2 / 4	0.75 - 5	7.6E+00	3.15	4.27	1 / 1	0.27
COPPER	4 / 4	0.97 - 8.4	1.5E+01	10.06	8.4	1 / 1	2.2
IRON	4 / 4	3745 - 62500	9.6E+04	52403	62500	1 / 1	3060
LEAD	4 / 4	1.8 - 39.4	4.0E+02	37.30	39.4	1 / 1	7.5
MAGNESIUM	4 / 4	71.7 - 619	9.0E+02	578.85	619	1 / 1	95.5
MANGANESE	4 / 4	3.45 - 214	3.3E+02	128.33	182.62	1 / 1	9.9
MERCURY	4 / 4	0.035 - 0.17	5.9E-01	0.18	0.17	1 / 1	0.019
NICKEL	2 / 4	1.8 - 7.2	1.1E+01	5.18	7.2	1 / 1	1.3
POTASSIUM	4 / 4	95 - 792	4.1E+03	912.50	792	1 / 1	104
SODIUM	4 / 4	17.5 - 86.2	1.2E+02	78.30	86.2	1 / 1	444
VANADIUM	4 / 4	11.05 - 64	2.0E+02	70.13	64	1 / 1	6
ZINC	3 / 4	1.1 - 27.6	4.6E+02	22.80	27.6	1 / 1	10.4

Note:
* - Selected as a COPC
** - Upper Tolerance Limit = UTL is the concentration that is estimated to contain a designated portion (95%) of all possible sample measurements.
*** - Background samples are as follows: BGSB0100, BGSB0200 (and a duplicate, DUP-4), BGSB0300, and BGSB0400.

TABLE 15
OCCURRENCE AND DISTRIBUTION OF ORGANICS IN SURFACE SOIL AT SITE 17
OU-9 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/kg)

	BACKGROUND			SITE-RELATED		
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION
4,4'-DDT*	2 / 4	43 - 420	355.71	1 / 1	1.2	1.2

* - Selected as a COPC

TABLE 16
OCCURRENCE AND DISTRIBUTION OF INORGANICS IN SEDIMENT AT SITE 17
OU-9 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
(mg/kg)

	BACKGROUND***				SITE-RELATED					
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	UTL**	2 X AVERAGE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	AVERAGE CONCENTRATION	MEAN > 2 X BKGD?	MEAN > BACK UTL?	REPRESENTATIVE CONCENTRATION
ALUMINUM	6 / 6	839 - 3940	8.1E+07	5460	10 / 10	745 - 19300	7190	YES	NO	19300
ANTIMONY *	NOT DETECTED	-	-	-	1 / 10	2.3 - 2.3	2.19	YES	-	2.30
ARSENIC *	5 / 6	2.40 - 9.90	2.9E+02	11.23	10 / 10	4 - 41.9	15.10	YES	NO	21.77
BARIUM	6 / 6	3.20 - 15.80	2.9E+02	16.80	10 / 10	2.4 - 71.8	26.40	YES	NO	38.20
BERYLLIUM	4 / 6	0.34 - 0.57	3.3E-01	0.72	10 / 10	0.11 - 1.9	0.67	NO	YES	0.94
CADMIUM	2 / 6	0.44 - 0.46	1.1E+00	0.93	6 / 10	0.23 - 3.1	0.57	NO	NO	1.04
CALCIUM	6 / 6	179 - 518	6.7E+05	690.83	10 / 10	109 - 4660	1038	YES	NO	1870
CHROMIUM	6 / 6	4.30 - 56	2.6E+03	40.42	10 / 10	6.8 - 69	34.17	NO	NO	69
COBALT	4 / 6	0.51 - 2.10	6.4E+00	2.85	10 / 10	0.58 - 21.1	3.55	YES	NO	6.86
COPPER *	6 / 6	1 - 13	1.9E+01	9.08	10 / 10	2 - 99.1	24.07	YES	YES	42.63
IRON	6 / 6	228 - 21400	7.2E+09	23589	10 / 10	5640 - 66400	25035	YES	NO	49496
LEAD *	6 / 6	4.00 - 34.30	4.8E+01	21.07	10 / 10	5.2 - 236	50.69	YES	YES	89.83
MAGNESIUM	6 / 6	60.70 - 880	2.0E+06	809.90	10 / 10	117 - 4800	1171.18	YES	NO	1968
MANGANESE	6 / 6	3.90 - 63.10	8.9E+01	36.22	10 / 10	4 - 218	44.32	YES	NO	77.55
MERCURY *	1 / 6	0.07 - 0.07	8.5E-03	0.09	4 / 10	0.02 - 0.32	0.13	YES	YES	0.19
NICKEL	5 / 6	1.60 - 6	3.4E+01	6.90	9 / 10	2.7 - 29.3	8.30	YES	NO	13.82
POTASSIUM	5 / 6	86.10 - 2900	1.4E+07	1892	10 / 10	235 - 4000	1642	NO	NO	3536
SELENIUM *	NOT DETECTED	-	1.9E+00	-	5 / 10	0.93 - 7.4	1.78	YES	-	4.47
SILVER	2 / 6	0.11 - 0.15	2.8E+00	1.13	3 / 10	0.13 - 0.17	0.45	NO	NO	0.17
SODIUM	4 / 6	26.60 - 2280	2.9E+03	676.80	7 / 10	50.2 - 10800	1223	YES	NO	2965
THALLIUM*	NOT DETECTED	-	2.2E+00	-	1 / 10	1.5 - 1.5	0.78	YES	-	1.10
VANADIUM	6 / 6	5.90 - 42.70	2.1E+03	39.42	10 / 10	9.4 - 101	46.73	YES	NO	95.83
ZINC	6 / 6	12.50 - 34.70	1.5E+03	41.23	10 / 10	7.3 - 242	66.15	YES	NO	107.97

* - Selected as a COPC

** - Upper Tolerance Limit = UTL is the concentration that is estimated to contain a designated portion (95%) of all possible sample measurements.

*** - Background samples are as follows: BGSD01, BGSD02, BGSD04 through BGSD07

TABLE 17

OCCURRENCE AND DISTRIBUTION OF ORGANICS IN SEDIMENTAT SITE 17
OU-9 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/kg)

SUBSTANCE	BACKGROUND**			SITE-RELATED		
	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION
4,4'-DDD *	2 / 6	4.9 -	11.98	4 / 9	23 - 58	58
4,4'-DDE *	1 / 6	1.7 - 1.7	1.70	6 / 9	4.8 - 110	110
4,4'-DDT *	1 / 6	19 - 19	10.64	4 / 10	13 - 59	59
ALPHA-CHLORDANE *	NOT DETECTED	-	-	3 / 9	4.5 - 14	13.90
AROCLOR-1248 *	1 / 6	5.8 - 5.8	5.80	1 / 9	57 - 57	57
AROCLOR-1254 *	NOT DETECTED	-	-	1 / 9	120 - 120	107.08
AROCLOR-1260 *	NOT DETECTED	-	-	2 / 9	31 - 80	60.54
ENDOSULFAN II *	NOT DETECTED	-	-	1 / 10	0.21 - 0.21	0.21
ENDRIN *	NOT DETECTED	-	-	1 / 10	10 - 10	8.58
GAMMA-CHLORDANE *	1 / 6	0.095 - 0.095	0.10	3 / 9	5 - 10	10
METHOXYCHLOR *	NOT DETECTED	-	-	2 / 10	1.6 - 3.9	3.90
2-METHYLNAPHTHALENE *	NOT DETECTED	-	-	1 / 8	170 - 170	170
4-METHYLPHENOL *	NOT DETECTED	-	-	2 / 8	420 - 820	766.58
ACENAPHTHENE *	NOT DETECTED	-	-	1 / 8	340 - 340	340
ACENAPHTHYLENE *	NOT DETECTED	-	-	1 / 8	89 - 89	89
ANTHRACENE *	NOT DETECTED	-	-	1 / 8	1000 - 1000	1000
BENZ(A)ANTHRACENE *	3 / 6	85 - 560	560	3 / 8	120 - 2600	2317
BENZO(A)PYRENE *	3 / 6	110 - 590	393.60	5 / 8	41 - 2600	2600
BENZO(B)FLUORANTHENE *	3 / 6	150 - 490	346.54	7 / 8	62 - 5000	5000
BENZO(G,H,I)PERYLENE *	3 / 6	51 - 380	380	3 / 8	66 - 3100	3100
BENZO(K)FLUORANTHENE *	3 / 6	63 - 470	470	3 / 8	92 - 1300	1197
BIS(2-ETHYLHEXYL)PHTHALATE *	NOT DETECTED	-	-	3 / 8	54 - 9400	9400
BUTYLBENZYLPHTHALATE *	NOT DETECTED	-	-	1 / 8	610 - 610	610
CARBAZOLE *	NOT DETECTED	-	-	1 / 8	630 - 630	630
CHRYSENE *	3 / 6	130 - 940	577.87	8 / 8	50 - 3100	3100
DI-N-BUTYLPHTHALATE *	1 / 6	97 97	97	1 / 8	140 - 140	140
DIBENZ(A,H)ANTHRACENE *	NOT DETECTED	-	-	1 / 8	820 - 820	820
DIBENZOFURAN *	NOT DETECTED	-	-	1 / 8	220 - 220	220
DIETHYLPHTHALATE *	1 / 6	44 - 44	44	2 / 8	43 - 100	100
FLUORANTHENE *	3 / 6	240 - 1800	1024.31	8 / 8	93 - 4700	4700
FLUORENE *	1 / 6	190 - 190	190	1 / 8	590 - 590	590
INDENO(1,2,3-CD)PYRENE *	3 / 6	55 - 310	310	3 / 8	68 - 2200	2200
ISOPHORONE *	NOT DETECTED	-	-	1 / 8	75 - 75	75
NAPHTHALENE *	NOT DETECTED	-	-	1 / 8	160 - 160	160
PHENANTHRENE *	3 / 6	110 - 1900	1052	5 / 8	63 - 4200	4131
PYRENE *	3 / 6	200 - 1900	1077	8 / 8	75 - 7000	7000
TOLUENE *	1 / 3	480 - 480	480	1 / 4	4 - 4	4

* - Selected as a COPC

** - Background samples are as follows: BGSD01, BGSD02, BGSD04 through BGSD07

TABLE 18
OCCURRENCE AND DISTRIBUTION OF INORGANICS IN GROUNDWATER AT SITE 17
OU-9 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/L)

	BACKGROUND***				SITE-RELATED					
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	UTL**	2 X AVERAGE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	AVERAGE CONCENTRATION	MEAN > 2 X BKGD?	MEAN > BACK UTL?	REPRESENTATIVE CONCENTRATION
ALUMINUM	3 / 3	1320 - 2090	1.6E+11	3387	4 / 4	96.8 - 2090	1262	NO	NO	2090
ARSENIC *	1 / 3	5.1 - 5.1	1.7E+02	5.60	3 / 4	4.2 - 19.7	8.14	YES	NO	19.70
BARIUM	3 / 3	30.4 - 78.1	2.5E+06	105.47	4 / 4	16 - 590	193.43	YES	NO	590
BERYLLIUM	2 / 3	0.23 - 4.5	7.7E+01	3.19	2 / 4	1.4 - 4.5	1.50	NO	NO	4.50
CADMIUM	3 / 3	0.43 - 7	2.2E+01	5.29	3 / 4	0.43 - 8.3	2.45	NO	NO	7.05
CALCIUM	3 / 3	11000 - 24100	9.4E+14	38067	4 / 4	1700 - 517000	134248	YES	NO	434535
CHROMIUM *	NOT DETECTED	-	1.1E+00	-	2 / 4	1.1 - 4.6	1.67	YES	YES	3.99
COBALT	3 / 3	3.2 - 24.7	4.2E+04	23.67	4 / 4	0.72 - 24.7	10.41	NO	NO	24.70
COPPER *	NOT DETECTED	-	4.0E-02	-	3 / 4	0.83 - 2.5	1.18	YES	YES	2.50
IRON	3 / 3	1400 - 95200	2.4E+16	66847	4 / 4	1400 - 54300	19450	NO	NO	54300
LEAD *	NOT DETECTED	-	3.8E-01	-	2 / 4	3.8 - 5.7	2.75	YES	YES	5.70
MAGNESIUM	3 / 3	8610 - 17300	2.5E+14	26940	4 / 4	1440 - 89900	28208	YES	NO	77011
MANGANESE	3 / 3	720 - 3040	7.3E+11	3720	4 / 4	79.9 - 3040	1179	NO	NO	3040
MERCURY	1 / 3	0.044 - 0.044	1.1E-05	0.03	1 / 4	0.054	0.02	NO	YES	0.05
NICKEL	3 / 3	3.7 - 43.2	2.7E+05	38.33	3 / 4	3.2 - 43.2	15.64	NO	NO	43.20
POTASSIUM	3 / 3	3000 - 3620	1.1E+12	6780	4 / 4	2460 - 92700	25300	YES	NO	78174
SODIUM	3 / 3	15800 - 92500	1.9E+17	127600	4 / 4	4780 - 15700000	3937370	YES	NO	13164690
VANADIUM *	1 / 3	1.1 - 1.1	9.4E-01	1.14	3 / 4	1.1 - 18.1	7.43	YES	YES	18.10
ZINC	2 / 2	18.9 - 30.9	7.3E+11	49.80	2 / 4	3.8 - 10.5	43.81	NO	NO	10.50

* - Selected as a COPC

** - Upper Tolerance Limit = UTL is the concentration that is estimated to contain a designated portion (95%) of all possible sample measurements.

*** - Background samples are as follows: MW4-04, BGMW-02, BGMW-01, MW26-03, MW3-06, MW5-02, MW5-03, MW19-01, MW1-03, MW5-08, MW11-03

TABLE 19
OCCURRENCE AND DISTRIBUTION OF INORGANICS IN SURFACE WATER AT SITE 17
OU-9 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/L)

	BACKGROUND***				SITE-RELATED					
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	UTL**	2 X AVERAGE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	AVERAGE CONCENTRATION	MEAN > 2 X BKGD?	MEAN > BACK UTL?	REPRESENTATIVE CONCENTRATION
ALUMINUM *	5 / 6	102 - 1540	2.2E+03	904.20	6 / 6	124 - 9680	3027	YES	YES	6348
ARSENIC *	1 / 6	9 - 9	1.3E+01	5.32	3 / 6	6.8 - 88.6	20.03	YES	YES	48.28
BARIUM	6 / 6	16.3 - 36.4	2.4E+03	55.05	6 / 6	17.2 - 331	165.65	YES	NO	290.13
CADMIUM	3 / 6	0.22 - 1.2	1.7E+00	0.70	1 / 6	1.3 - 1.3	0.31	NO	NO	0.71
CALCIUM	1 / 6	0.18 - 0.18	3.2E-01	0.23	1 / 6	3.2 - 3.2	0.96	YES	YES	1.94
CHROMIUM	6 / 6	462 - 177000	2.3E+05	71114	6 / 6	10200 - 52600	27000	NO	NO	52600
COBALT *	3 / 5	0.72 - 2.6	4.4E+00	1.78	2 / 4	13.9 - 20.4	9.69	YES	YES	20.40
COPPER	6 / 6	0.81 - 2	5.2E+00	3.10	5 / 6	0.67 - 6.2	2.79	NO	NO	6.20
IRON	5 / 6	1.1 - 17.8	3.0E+02	11.92	6 / 6	3.5 - 65.1	20.72	YES	NO	39.70
LEAD *	6 / 6	160 - 23100	3.0E+04	9577	6 / 6	2480 - 170000	42570	YES	YES	95730
MAGNESIUM	2 / 6	4.4 - 16	2.2E+01	7.31	5 / 6	1.6 - 77.1	24.18	YES	YES	50.98
MANGANESE	6 / 6	369 - 559000	7.0E+05	190703	6 / 6	4930 - 118000	26908	NO	NO	63886
MERCURY	6 / 6	14 - 203	3.8E+02	172.43	6 / 6	81.2 - 646	299.53	YES	NO	646
NICKEL	2 / 6	0.023 - 0.028	2.3E-01	0.12	3 / 6	0.05 - 0.2	0.13	YES	NO	0.20
POTASSIUM	6 / 6	2.1 - 7.9	8.2E+01	10.23	6 / 6	3.3 - 11	8.02	NO	NO	11
SODIUM	5 / 6	251 - 259000	3.2E+05	88923	6 / 6	3190 - 54700	13788	NO	NO	30456
THALLIUM	2 / 6	3.5 - 9.2	1.4E+01	6.27	3 / 6	4.6 - 15.7	5.21	NO	NO	9.72
VANADIUM	3 / 3	11150 - 4340000	1.3E+07	2912233	6 / 6	26500 - 3000000	701617	NO	NO	1685764
ZINC	3 / 6	3.5 - 5.5	2.8E+01	5.90	4 / 6	3.3 - 12.5	4.62	NO	NO	7.98

* - Selected as a COPC

** - Upper Tolerance Limit = UTL is the concentration that is estimated to contain a designated portion (95%) of all possible sample measurements.

*** - Background samples are as follows: BGSW01, BGSW02, BGSW04 through BGSW07

TABLE 20
OCCURRENCE AND DISTRIBUTION OF ORGANICS IN SURFACE WATER AT SITE 17
OU-9 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/L)

	BACKGROUND**			SITE-RELATED		
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION
PYRENE*	0 / 6	-	-	2 / 6	1 - 1	1

* - Selected as a COPC
** - Background samples are as follows: BGSW01, BGSW02, BGSW04 through BGSW07

TABLE 21
SITE 6 - SCREENING OF REMEDIAL ALTERNATIVES
OPERABLE UNIT 9 FEASIBILITY STUDY
NAVY WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

	ALTERNATIVE	EFFECTIVENESS	IMPLEMENTABILITY	COST	COMMENTS
1	No Action	Provides no additional protection of human health or the environment. Does not reduce potential for human exposure to groundwater contaminants. No reduction in toxicity, mobility, or volume of contaminants.	Readily implementable. No technical or administrative difficulties.	Capital: None O&M: None	Retained as baseline alternative, in accordance with NCP. Retained.
2	Limited Action (Institutional controls, access restrictions, long-term monitoring, Five-year reviews)	Provides added protection of human health through fencing and institutional controls. Groundwater use would be restricted. No reduction in toxicity, mobility, or volume of contaminants.	Readily implementable. No technical or administrative difficulties.	Capital: Low O&M: Low	Relative to Alt. 1, provides significant additional protectiveness for little additional cost. Retained.

TABLE 22
SITE 15 - SCREENING OF REMEDIAL ALTERNATIVES
OPERABLE UNIT 9 FEASIBILITY STUDY
NAVY WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

	ALTERNATIVE	EFFECTIVENESS	IMPLEMENTABILITY	COST	COMMENTS
1	No Action	Provides no additional protection of human health or the environment. Does not reduce potential for human exposure to groundwater contaminants. No reduction in toxicity, mobility, or volume of contaminants.	Readily implementable. No technical or administrative difficulties.	Capital: None O&M: None	Retained as baseline alternative, in accordance with NCP. Retained.
2	Limited Action (Institutional controls, access restrictions, long-term monitoring, Five-year reviews)	Provides added protection of human health through fencing and institutional controls. Groundwater use would be restricted. No reduction in toxicity, mobility, or volume of contaminants.	Readily implementable. No technical or administrative difficulties.	Capital: Low O&M: Low	Relative to Alt. 1, provides significant additional protectiveness for little additional cost. Retained.

TABLE 23
SITE 17 - SCREENING OF REMEDIAL ALTERNATIVES
OPERABLE UNIT 9 FEASIBILITY STUDY
NAVY WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

	ALTERNATIVE	EFFECTIVENESS	IMPLEMENTABILITY	COST	COMMENTS
1	No Action	Provides no additional protection of human health or the environment. Does not reduce potential for human exposure to groundwater contaminants. No reduction in toxicity, mobility, or volume of contaminants.	Readily implementable. No technical or administrative difficulties.	Capital: None O&M: None	Retained as baseline alternative, in accordance with NCP. Retained.
2	Limited Action (Institutional controls, access restrictions, long-term monitoring, Five-year reviews)	Provides added protection of human health through fencing and institutional controls. Groundwater use would be restricted. No reduction in toxicity, mobility, or volume of contaminants.	Readily implementable. No technical or administrative difficulties.	Capital: Low O&M: Low	Relative to Alt. 1, provides significant additional protectiveness for little additional cost. Retained.

TABLE 24
SITE 6 - REMEDIAL ALTERNATIVE COMPONENTS
OPERABLE UNIT 9 FEASIBILITY STUDY
NAVY WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

	ALTERNATIVE	KEY COMPONENTS OF ALTERNATIVE
1	No Action	• No actions would be taken
2	Limited Action	• Fencing (fencing is already in place) • Institutional controls (land use restrictions, CEA*) • Long-term periodic groundwater monitoring • Five-year reviews

Notes:

* Classification Exception Area pursuant to the New Jersey Groundwater Quality Standards (N.J. A.C. 7:9-6) would be established for groundwater that does not meet State groundwater quality standards.

TABLE 25
SITE 15 - REMEDIAL ALTERNATIVE COMPONENTS
OPERABLE UNIT 9 FEASIBILITY STUDY
NAVY WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

	ALTERNATIVE	KEY COMPONENTS OF ALTERNATIVE
1	No Action	• No actions would be taken
2	Limited Action	• Institutional controls (land use restrictions) • Fencing (fencing is already in place) • Five-year reviews (including sampling and analysis)

TABLE 26
SITE 17 - REMEDIAL ALTERNATIVE COMPONENTS
OPERABLE UNIT 9 FEASIBILITY STUDY
NAVY WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

	ALTERNATIVE	KEY COMPONENTS OF ALTERNATIVE
1	No Action	• No actions would be taken
2	Limited Action	• Institutional controls (land use restrictions, CEA*) • Fencing (fencing is already in place) • Five-year reviews (including sampling and analysis)

Notes:

* Classification Exception Area pursuant to the New Jersey Groundwater Quality Standards (N.J. A.C. 7:9-6) would be established for groundwater that does not meet State groundwater quality standards.

TABLE 27
SITE 6 - COMPARATIVE ANALYSIS OF REMEDIAL ACTION ALTERNATIVES
OPERABLE UNIT 9 FEASIBILITY STUDY
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: INSTITUTIONAL CONTROLS AND LONG-TERM MONITORING
OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT		
Prevent Human Exposure to Metals Contaminants in Groundwater	No action taken to prevent human exposure to contaminated groundwater. Carcinogenic and non-carcinogenic risks exceeding EPA guidelines would remain. No institutional controls implemented to prohibit use of untreated groundwater.	Institutional controls would minimize potential exposure to site groundwater by prohibiting its use. In time, contaminants would gradually decrease until reaching levels that would not pose excess risk.
COMPLIANCE WITH ARARs		
Chemical-Specific ARARs	Would not comply with State groundwater quality standards.	A CEA would be established to provide the State official notification that standards would not be met for a specified duration.
Location-Specific ARARs	Not applicable.	Would comply with federal and State ARARs for wetlands, floodplains, and other sensitive receptors.
Action-Specific ARARs	Would comply with all action-specific ARARs. Federal or State ARARs for post-closure maintenance of municipal landfills may not be met.	Would comply with all action-specific ARARs. Five-year review process would ensure Federal or State ARARs for post-closure maintenance of municipal landfills will be met.
LONG-TERM EFFECTIVENESS AND PERMANENCE		
Magnitude of Residual Risk	Existing risks would remain: approximately 6E-04 cancer risk and HI > 1 non-carcinogenic risk from exposure to site groundwater assuming future residential land use and consumption of contaminated groundwater.	Existing risks would remain: approximately 6E-04 cancer risk and HI > 1 non-carcinogenic risk from exposure to site groundwater. Implementation and enforcement of institutional controls would block exposure to site groundwater. Fencing would reduce potential contact with shallow groundwater.
Adequacy and Reliability of Controls	No new controls implemented. Existing site features provide limited controls.	If implemented and enforced, institutional controls could prevent contact with and use of contaminated groundwater.
Need for Five-Year Review	Not applicable.	Review would be required because groundwater contaminants would be left in place.
REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT		
Reduction of Toxicity, Mobility, or Volume Through Treatment	No reduction, because no treatment would be employed.	No reduction, because no treatment would be employed.

TABLE 27
SITE 6 - COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
OU-9 FEASIBILITY STUDY
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: INSTITUTIONAL CONTROLS AND LONG-TERM MONITORING
SHORT-TERM EFFECTIVENESS		
Community Protection	No additional risk to community anticipated.	No significant risk to community anticipated. Engineering controls would be used during implementation to mitigate risks.
Worker Protection	No risk to workers anticipated.	No significant risk to workers anticipated if proper PPE is used during well and fence installation and long-term monitoring.
Environmental Impacts	No adverse impacts to the environment anticipated.	No adverse impacts to the environment anticipated.
Time Until Action is Complete	Not applicable.	Approximately 1 year to institute CEA.
IMPLEMENTABILITY		
Ability to Construct and Operate	No construction or operation involved.	No difficulties anticipated. Monitoring well and fencing installation are readily implementable technologies.
Ease of Doing More Action if Needed	Additional actions would be easily implemented if required.	Additional actions would be easily implemented if required.
Ability to Monitor Effectiveness	Not applicable.	Monitoring would provide assessment of potential exposures, contaminant presence, and migration, or changes in site conditions.
Ability to Obtain Approvals and Coordinate with Other Agencies	Not applicable.	Coordination for five-year reviews may be required and would be obtainable. Coordination with the State would be required to establish a CEA and would be obtainable.
Availability of Treatment, Storage Capacities, and Disposal Services	None required.	None required.
Availability of Equipment, Specialists, and Materials	Not applicable.	Ample availability of equipment and personnel to install monitoring well/fencing and perform long-term maintenance, monitoring, and five-year reviews.
Availability of Technology	Not required.	Common construction techniques and materials required for construction.
COST		
Capital Cost	$0	$44,360
First-Year Annual O&M Cost	$0	$11,000
Five-Year Reviews	$0	$15,500
Present Worth Cost*	$0	$214,280

* Present worth cost is based on discount rate of 7 percent

TABLE 28
SITE 15 - COMPARATIVE ANALYSIS OF REMEDIAL ACTION ALTERNATIVES
OPERABLE UNIT 9 FEASIBILITY STUDY
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY
PAGE 1 OF 2

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: INSTITUTIONAL CONTROLS AND LONG-TERM MONITORING
OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT		
Prevent Human Exposure to Metals Contaminants in Surface and Subsurface Soils	No action taken to prevent human exposure to contaminated soils. Carcinogenic and non-carcinogenic risks would remain. No institutional controls implemented to prohibit exposure to contaminated soils.	Institutional controls would minimize potential exposure to site soils by prohibiting use and access. In time, contaminants would gradually decrease until reaching levels that would not exceed NJDEP soil criteria.
Minimize Contaminant Migration	No actions taken (or needed) to reduce contaminant migration.	No actions taken (or needed) to reduce contaminant migration.
COMPLIANCE WITH ARARs		
Chemical-Specific ARARs	Would not comply with State soil cleanup criteria.	Soil contaminant concentrations would initially exceed State cleanup criteria; over time cleanup criteria would be achieved.
Location-Specific ARARs	Would comply with Federal and State ARARs for wetlands, floodplains, and other sensitive receptors.	Would comply with Federal and State ARARs for wetlands, floodplains, and other sensitive receptors.
Action-Specific ARARs	Not applicable.	Would comply with those ARARs pertaining to the proposed construction, maintenance, and monitoring activities.
LONG-TERM EFFECTIVENESS AND PERMANENCE		
Magnitude of Residual Risk	Existing risks would remain: cancer risk within EPA's target range and sum of HIs > 1 for non-carcinogenic risks from exposure to site soils assuming future residential land use and ingestion, inhalation, or dermal contact with contaminated soils.	Existing risks would remain: cancer risk within EPA's target range and sum of HIs > 1 for non-carcinogenic risks from exposure to site soils. Implementation and enforcement of fencing/institutional controls would block exposure to site soils.
Adequacy and Reliability of Controls	No new controls implemented. Existing site features provide limited controls.	If implemented and enforced, institutional controls could prevent contact with contaminated soils.
Need for Five-Year Review	Not applicable.	Review would be required because soil contaminants would be left in place at levels above NJDEP guidelines.
REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT		
Reduction of Toxicity, Mobility, or Volume Through Treatment	No reduction, because no treatment would be employed.	No reduction, because no treatment would be employed.

TABLE 28
SITE 15 - COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
OU-9 FEASIBILITY STUDY
NWS NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: INSTITUTIONAL CONTROLS AND LONG-TERM MONITORING
SHORT-TERM EFFECTIVENESS		
Community Protection	No risk to community anticipated.	No significant risk to community anticipated. Engineering controls would be used during implementation to mitigate risks.
Worker Protection	No risk to workers anticipated.	No risk to workers anticipated if proper PPE is used during fence installation, maintenance, and long-term monitoring.
Environmental Impacts	No adverse impacts to the environment anticipated.	No adverse impacts to the environment anticipated.
Time Until Action is Complete	Not applicable.	Nearly immediate if existing fence is deemed sufficient for the purposes.
IMPLEMENTABILITY		
Ability to Construct and Operate	No construction or operation involved.	No difficulties anticipated. Fencing is a readily implementable technology.
Ease of Doing More Action if Needed	Additional actions would be easily implemented if required.	Additional actions would be easily implemented if required.
Ability to Monitor Effectiveness	Not applicable.	Monitoring would provide assessment of potential exposures, contaminant presence of, migration, or changes in site conditions.
Ability to Obtain Approvals and Coordinate with Other Agencies	Not applicable.	Coordination for 5-year reviews may be required and would be obtainable.
Availability of Treatment, Storage Capacities, and Disposal Services	None required.	None required.
Availability of Equipment, Specialists, and Materials	Not applicable.	Ample availability of equipment and personnel to install fencing and perform long-term monitoring, maintenance, and five-year reviews.
Availability of Technology	Not required.	Common techniques and materials required for implementation.
COST		
Capital Cost	$0	$19,490
First-Year Annual O&M Cost	$0	$0
Five-Year Reviews	$0	$14,500
Present Worth Cost*	$0	$50,760

* Present worth cost is based on discount rate of 7 percent

TABLE 29
SITE 17 - COMPARATIVE ANALYSIS OF REMEDIAL ACTION ALTERNATIVES
OPERABLE UNIT 9 FEASIBILITY STUDY
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY
PAGE 1 OF 2

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: INSTITUTIONAL CONTROLS AND LONG-TERM MONITORING
OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT		
Prevent Human Exposure to Metals Contaminants in Groundwater	No action taken to prevent human exposure to contaminated groundwater. Carcinogenic and non-carcinogenic risks exceeding EPA's guideline would remain. No institutional controls implemented to prohibit use of untreated groundwater.	Institutional controls would minimize potential exposure to site groundwater by prohibiting its use. In time, contaminants would gradually decrease until reaching levels that would not pose excess risk.
COMPLIANCE WITH ARARs		
Chemical-Specific ARARs	Would not comply with State groundwater quality standards.	Groundwater contaminant concentrations would initially exceed State GWQs. A CEA would be established to provide the State official notification that standards would not be met for a specified duration.
Location-Specific ARARs	Not applicable.	Would comply with federal and State ARARs for wetlands, floodplains, and other sensitive receptors.
Action-Specific ARARs	Would comply with all action-specific ARARs. Federal or State ARARs for post-closure maintenance of municipal landfills may not be met.	Would comply with all action-specific ARARs. Five-year review process would ensure Federal or State ARARs for post-closure maintenance of municipal landfills will be met.
LONG-TERM EFFECTIVENESS AND PERMANENCE		
Magnitude of Residual Risk	Existing risks would remain: approximately 6E-04 cancer risk and HI > 1 non-carcinogenic risk from exposure to site groundwater assuming future residential land use and consumption of contaminated groundwater.	Existing risks would remain: approximately 6E-04 cancer risk and HI > 1 non-carcinogenic risks from exposure to site groundwater. Implementation and enforcement of institutional controls would block exposure to site groundwater. Fencing would reduce potential contact with shallow groundwater.
Adequacy and Reliability of Controls	No new controls implemented. Existing site features provide limited controls.	If implemented and enforced, institutional controls could prevent contact with and use of contaminated groundwater.
Need for Five-Year Review	Not applicable.	Review would be required because groundwater contaminants would be left in place.
REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT		
Reduction of Toxicity, Mobility, or Volume Through Treatment	No reduction, because no treatment would be employed.	No reduction, because no treatment would be employed.

TABLE 29
SITE 17 - COMPARATIVE ANALYSIS OF REMEDIAL ACTION ALTERNATIVES
OPERABLE UNIT 9 FEASIBILITY STUDY
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: INSTITUTIONAL CONTROLS AND LONG-TERM MONITORING
SHORT-TERM EFFECTIVENESS		
Community Protection	No additional risk to community anticipated.	No significant risk to community anticipated. Engineering controls would be used during implementation to mitigate risks.
Worker Protection	No risk to workers anticipated.	No significant risk to workers anticipated if proper PPE is used during well and fence installation and long-term monitoring.
Environmental Impacts	No adverse impacts to the environment anticipated.	No adverse impacts to the environment anticipated.
Time Until Action is Complete	Not applicable.	Approximately 1 year to institute CEA.
IMPLEMENTABILITY		
Ability to Construct and Operate	No construction or operation involved.	No difficulties anticipated. Monitoring well and fencing installation are readily implementable technologies.
Ease of Doing More Action if Needed	Additional actions would be easily implemented if required.	Additional actions would be easily implemented if required.
Ability to Monitor Effectiveness	Not applicable.	Monitoring would provide assessment of potential exposures, contaminant presence, and migration, or changes in site conditions.
Ability to Obtain Approvals and Coordinate with Other Agencies	Not applicable.	Coordination for five-year reviews may be required and would be obtainable. Coordination with the State would be required to establish a CEA and would be obtainable.
Availability of Treatment, Storage Capacities, and Disposal Services	None required.	None required.
Availability of Equipment, Specialists, and Materials	Not applicable.	Ample availability of equipment and personnel to install monitoring well/fencing and perform long-term maintenance, monitoring, and five-year reviews.
Availability of Technology	Not required.	Common construction techniques and materials required for construction.
COST		
Capital Cost	$0	$44,360
First-Year Annual O&M Cost	$0	$11,000
Five-Year Reviews	$0	$15,500
Present Worth Cost*	$0	$214,280

* Present worth cost is based on discount rate of 7 percent.

ATTACHMENT 1

CONFIRMATION SAMPLING SUMMARY TABLES

(See Appendix C of the OU 9 FS for the full report)

TABLE 4-4
NWS-EARLE
Site 12: 2nd Round Confirmatory Soil Sample Analytical Results
TAL Metals

SAMPLE ID		12SS08-99-02		12SS11-99-02		12SS12-99-02		12SS14-99-02	
LAB ID	Residential	92499		92500		92501		92502	
DATE COLLECTED	Direct Contact	11/2/1999		11/2/1999		11/2/1999		11/2/1999	
LOCATION	Soil Cleanup	SIDEWALL		BOTTOM		SIDEWALL		SIDEWALL	
MATRIX	Criteria	soil		soil		soil		soil	
UNITS	mg/Kg	mg/Kg		mg/Kg		mg/Kg		mg/Kg	
DEPTH BGS (ft)		2.5		4.0		4.0		2.0	
COMMENTS		POST-EX		POST-EX		POST-EX		POST-EX	
Aluminum	NA	N/A		N/A		N/A		N/A	
Antimony	14	N/A	U	N/A		N/A		N/A	
Arsenic	20	25.69		19.19		27.67		12.56	
Barium	700	26.05		ND		19.3		14.88	
Beryllium	2	N/A		N/A		N/A		N/A	
Cadmium	39	ND	U	ND	U	ND		N/A	
Calcium	NA	N/A		N/A		N/A		N/A	
Chromium	240	36.61		42.3		12.62		28.95	
Cobalt	NA	N/A		N/A		N/A		N/A	
Copper	600	3.6		7.58		10.44		29.07	
Iron	NA	N/A		N/A		N/A		N/A	
Lead	400	8.16		12.22		18.81		14.42	
Magnesium	NA	N/A		N/A		N/A		N/A	
Manganese	NA	N/A		N/A		N/A		N/A	
Mercury	14	0.048	U	0.073		0.073		0.07	
Nickel	250	7.2		7.58		5.2		4.07	
Potassium	NA	N/A		N/A		N/A		N/A	
Selenium	63	0.48		1.1		1.46		0.81	
Silver	110	ND	U	ND		ND		ND	
Sodium	NA	N/A		N/A		N/A		N/A	
Thallium	2	N/A	U	N/A		N/A		N/A	
Vanadium	370	N/A		N/A		N/A		N/A	
Zinc	1500	31.69		34.84		24.39		34.19	

U-concentration is less than detection limit.
NA-not applicable

TABLE 4-5
NWS-EARLE
Site 12: 3rd Round Confirmatory Soil Sample Analytical Results
TAL Metals

SAMPLE ID		12SS08-99-03		12SS12-99-03					
LAB ID	Residential	92499		92500					
DATE COLLECTED	Direct Contact	11/9/1999		11/2/1999					
LOCATION	Soil Cleanup	SIDEWALL		BOTTOM					
MATRIX	Criteria	soil		soil					
UNITS	mg/Kg	mg/Kg		mg/Kg					
DEPTH BGS (ft)		3.0		5.0					
COMMENTS		POST-EX		POST-EX					
Aluminum	NA	3350		3490					
Antimony	14	0.54	U	0.55	U				
Arsenic	20	16.8		8.1					
Barium	700	12.6		23					
Beryllium	2	0.4	B	0.3	B				
Cadmium	39	0.11	U	0.11	U				
Calcium	NA	545		1210					
Chromium	240	7.3		10.7					
Cobalt	NA	9.8		1.6	B				
Copper	600	6.1		10.8					
Iron	NA	26,600		12,900					
Lead	400	5.9		24.9					
Magnesium	NA	451		270	B				
Manganese	NA	172		21.6					
Mercury	14	0.11	U	0.11	U				
Nickel	250	3.2	B	4.2	B				
Potassium	NA	391		400	B				
Selenium	63	0.64		0.6	U				
Silver	110	0.11	U	0.11	U				
Sodium	NA	80.8	B	158	B				
Thallium	2	0.75	U	0.77	U				
Vanadium	370	32.2		21.2					
Zinc	1500	19		18.1					

U-concentration is less than detection limit.
NA-not applicable