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PROPOSED REMEDIAL ACTION PLAN OPERABLE UNIT 8 (OU8) NWS EARLE NJ

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NWS EARLE

Department of the Navy

Proposed Remedial Action Plan for OU 8

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

NOVEMBER 2003

NAVY ANNOUNCES PROPOSED REMEDIAL ACTION PLAN

The Department of the Navy has completed a **feasibility study** (FS) for Operable Unit 8 (OU 8) to address contamination associated with Sites 1 (Ordnance Demilitarization Site) and 11 (Contract Ordnance Disposal Area) at Naval Weapons Station (NWS) Earle in Colts Neck, New Jersey. Both OU 8 sites are located within the Mainside area of NWS Earle (Figures 1 and 2).

The **FS** was completed 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 8 consists of Sites 1 and 11.

Site 1 is a former explosive ordnance demilitarization site that was used between 1943 and 1975 for burning ordnance materials. Site 11 is a former ordnance demilitarization site used for several years (dates unknown) and later occasionally used between 1974 and 1975 for firefighting training.

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

The purpose of the FS was to evaluate the clean-up alternatives available for Sites 1 and 11.

This Proposed Plan summarizes the findings of the OU 8 FS report, identifies the cleanup alternative preferred by the Navy and 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 detailed in the FS and state the rationale for the preferred alternative for cleanup of OU 8.

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

PUBLIC MEETING

A public meeting to discuss this Proposed Plan will be held on Wednesday, December 10, 2003 at 7:30 PM at the Colts Neck Library Meeting Room, 1 Winthrop Drive (near Town Hall), Colts Neck, New Jersey. The meeting date will also be published in the *Asbury Park Press.*

comments have been reviewed and considered, the Navy and EPA will select the final remedies for Sites 1 and 11.

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 8, based on the FS. The Proposed Plan also summarizes information that can be found in greater detail in the RI report for OU-8 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 8 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 Mainside Area and highlights where the two OU 8 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 Naval Weapons Station 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. 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 1 and 11 are located in the Mainside area (Figure 2). A brief description of each site follows.

Site 1 – Ordnance Demilitarization Site

Site 1 is a 6-acre open field that was used for burning ordnance material between 1943 and 1975 (Figures 3 and 3a). During site abandonment, the area was plowed, and a layer of diesel-soaked hay was burned on site to remove residual ordnance. This procedure was carried out three times. For several years during the early 1990s, a United States Army communications station and tower were located near the center of the site. The site is currently cleared of all structures. The **Initial Assessment Study (IAS)** in 1983 consisting of a document search and employee interviews concluded minimal impact at Site 1.

Site 11 – Contract Ordnance Disposal Area

Site 11 is a 2-acre site that was used for disposal of obsolete ordnance material for several years (dates unknown) (Figures 4 and 4a). The site was occasionally used from 1974 to 1977 for firefighting training. Training activities took place in two unlined pits, approximately 20 feet long. During firefighting training, reject vehicles were soaked with fuel or oil and ignited and then extinguished. Unburned fuel and waste oil used for ignition were allowed to evaporate or soak into the soil. It has been estimated that 50 gallons of oil per year may have been lost in this manner.

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 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.

The sites at NWS Earle were subsequently addressed 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.

Summaries of OU 8 site investigations are discussed below.

Site 1

Initial Assessment and Confirmation Study

The 1983 IAS, consisting of a document search, personnel interviews and on-site observations, concluded minimal impact at Site 1.

Phase I RI/FS Results

Phase I activities were conducted by Weston in 1993 at NWS Earle. In 1993, 16 soil samples were collected from a grid across the site at depths ranging from 0 to 0.5 feet below ground surface (bgs) and 0.5 to 1.5 feet bgs. The samples were submitted for Target Analyte List (TAL) metals, explosive compounds, and total petroleum hydrocarbons (TPH). Thirteen metals were detected in some or all of the samples at levels below regulatory concern. The most significant compounds detected were cadmium (up to 2.2 ppm), chromium (up to 65.7 ppm), mercury (up to 0.96 ppm), and lead (up to 179 ppm). Nitrite (0.32 ppm) was detected in one sample. Nitrate (up to 2.6 ppm) was detected in soil samples. Explosive compounds were found at very low levels in one surface soil sample. TPH concentrations ranged from non-detectable to 450 ppm.

During the 1993 activities, three monitoring wells were installed and groundwater samples were collected and submitted for Target Compound List (TCL) volatile organic compounds (VOC), TCL semi-volatile organic compounds (SVOC), and explosive compound analysis. Elevated levels of the following TCL VOCs were found in MW1-01: acetone (up to 7 ppb) and 1,1-dichloroethylene (up to 80 ppb). Elevated levels of TAL inorganics such as chromium (up to 538 ppb), lead (up to 12.5 ppb), and iron (up to 76,000 ppb) were detected generally in all three monitoring wells. Explosive compounds RDX (up to 8.98 ppb), 2,4-DNT (up to 0.82 ppb), and nitrite - nitrate combined (up to 1.4 ppm) were detected in two wells.

Phase II Remedial Investigation

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

- Sampling and analysis of groundwater samples from eight hydropunch locations.
- Sampling and analysis of subsurface soil samples from 10 soil borings.
- Drilling and installation of two shallow permanent monitoring wells.
- Sampling and analysis of groundwater from the wells.
- Measurement of static-water levels in the monitoring wells.
- Execution of slug tests in two of the monitoring wells.

Regional mapping places Site 1 within the outcrop area of the Vincentown Formation. The Vincentown Formation ranges between 10 and 130 feet in thickness and the soil borings are no more than 16 feet deep. The lithology of the sediments encountered in the on-site borings generally agrees with the published description of the Vincentown Formation. In general, the borings encountered alternating beds of yellowish-brown, micaceous, silty, fine- to medium-grained sand and light olive brown, glauconitic, silty sand and sand. Trace amounts of clay and gravel are present in the upper two feet of some of the borings and possibly represent the plow zone.

Tables 1 through 3 compare the results of background samples to samples collected at Site 1. Figure 5 shows sample locations and concentrations of compounds that exceed applicable or relevant and appropriate requirements (ARARs) and other guidance to be considered (TBCs).

Subsurface Soil

Twenty site-related subsurface soil samples were collected at Site 1. Table 1 presents the occurrence and distribution of inorganic chemicals detected in site-related subsurface soil samples and compares them to background concentrations.

Concentrations of most metals in site-related subsurface soil samples were similar to the ranges associated with background samples. Certain metals were detected at concentrations slightly greater than the range associated with background samples: antimony, 5.1 mg/kg in sample 01SB10-02; arsenic, 27.8 mg/kg in sample 01SB03-00; and silver, 2.2 mg/kg in 01SB07-00.

Explosive compounds were analyzed for in 20 subsurface soil samples. Nitrocellulose was detected at a depth of two feet in sample location 01SB02-02 at a concentration of 77,000 ug/kg. This compound was detected in one background subsurface soil sample.

The miscellaneous parameters analyzed at Site 1 consisted of nitrate, nitrite, and TPH. TPH levels found in the background samples ranged from 9.0 mg/kg to 660 mg/kg, which is three times greater than the upper range reported for site-related samples (120 mg/kg to 240 mg/kg). In addition, nitrate levels were less than 0.7 mg/kg in all samples, which is within the range found in background samples and less than one-third of the maximum nitrate level reported in soil sampled during the previous 1992 investigation. Therefore, nitrate and TPH results do not demonstrate subsurface soil impacts related to past ordnance burning activities.

Groundwater

Five site-related groundwater samples (01GW01 through 01GW05) were collected at Site 1. Tables 2 and 3 present the occurrence and distribution of inorganic and organic chemicals detected in site-related groundwater samples compared to background.

Three unfiltered monitoring well samples, 01GW02, 01GW03, and 01GW05, exhibited elevated levels of several metals. Unfiltered monitoring well samples 01GW02 and 01GW05 exhibited the highest concentrations of aluminum, arsenic, cadmium, chromium, iron, lead, and zinc. Thallium was detected in 01GW03 but was not detected in background groundwater samples. Sample 01GW05 required filtering in the field, despite the use of micro-flow purge techniques to minimize suspended solids. Filtered sample results from the same location did not exhibit elevated levels of any metals except cadmium (3.0 ug/L) and zinc (182 ug/L).

Chloroform (3 ug/L), gamma-BHC (0.001 ug/L), and methylene chloride (1 ug/L) were each detected in one site-related groundwater sample collected at Site 1. None of these compounds were detected in background groundwater samples.

Explosives or their degradation by-products were detected in two groundwater samples. 01GW01 contained low levels of 2-amino-4,6-dinitrotoluene, and 01GW02 contained levels of 2,4-dinitrotoluene (0.64 ug/L) and RDX (5.7 ug/L).

The following landfill parameters were analyzed in the Site 1 groundwater samples: biochemical oxygen demand (BOD), chemical oxygen demand (COD), nitrate, and total organic carbon (TOC). In addition, two samples were analyzed for TPH (both 0.20 mg/L). Nitrate levels in site-related groundwater samples were within a range from 0.28 mg/L to 1.5 mg/L, which is less than the upper range detected in background samples and consistent with results of the 1992 sampling investigation. Therefore, nitrate results do not demonstrate groundwater impacts from past

ordnance burning activities. No TPH was detected in background groundwater samples above the detection limit of 0.30 mg/L.

Site 11

Initial Assessment and Confirmation Study

The IAS in 1983, consisting of a document search, interviews, and on-site observations, concluded minimal impact. At the time, the site was not selected for a confirmation study (involving actual sample collection and analysis to confirm or deny the existence of suspected contamination and to quantify the extent of any problems that may exist) because of the small quantity of waste materials believed to be available for migration.

Phase I Remedial Investigation

During the 1993 SI, four soil borings were drilled and three monitoring wells were installed and sampled at the site perimeter. A soil sample from one of the soil borings had high concentrations of oil and grease. Eight total soil samples (from 0.5 to 1.5 feet) were collected from the site during the 1993 RI/FS. Soil and groundwater samples were analyzed for explosives, TPH, and nitrite/nitrate. Analytical results, summarized in Table 4, indicated that no explosive compounds were present, although six samples showed low TPH results. Two monitoring wells were installed during the RI/FS. All SI and RI/FS monitoring wells were sampled and analyzed for TCL volatiles, SVOCs, TAL metals/CN, pesticides/PCBs, and explosives. One semivolatile, three volatiles (common laboratory artifacts), and metals were detected in site wells. Groundwater results indicate that no pesticides, PCBs, or explosives were detected at the site. Similar results were obtained during later rounds of sampling at these wells.

Phase II Remedial Investigation

Between July and October 1995, the Navy conducted the following field investigation activities at Site 11:

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

Based on the existence of soils data from the SI (the 1993 RI/FS report concluded that impacts to site soils were negligible), site soil was not sampled during the RI. Also, due to rainy conditions at the time and the resultant close proximity of the water table to the surface at Site 11, and the location of the site amid area wetlands, it was concluded that monitoring of site groundwater would be comparable to monitoring of surface site conditions.

The site is a fan-shaped open area surrounded by woods and wetlands on all sides. An undeveloped dirt road off the transmission line right-of-way accesses the site. No runoff of contaminants from the site is expected to occur, nor any groundwater to surface water discharge.

Groundwater flow direction is generally to the northeast, based on groundwater-level measurements. The topography of the site slopes to the northwest from approximately 100 feet above MSL near MW11-02 to 90 feet above MSL near MW11-05. Most of the site is characterized as wetlands. An endangered plant, Knieskern's beaked-rush, has been observed on this site.

Regional mapping places Site 11 within the outcrop area of the Vincentown Formation; upper colluvium may be present at the site. The upper colluvium has a maximum thickness of 10 feet, the Vincentown Formation ranges between 10 and 130 feet in thickness, and the soil borings are no more than 25 feet deep. The lithology of the

sediments encountered in the on-site borings generally agrees with the published description of the upper colluvium and the Vincentown Formation. In general, the borings encountered gray and black silt and white sand (possibly representative of the upper colluvium), and brownish-yellow, olive, glauconitic, fine- to medium-grained sand (probably representative of the Vincentown Formation). Based upon the boring log descriptions, wells MW11-1, MW11-2, MW11-4, and MW11-5 penetrated the upper colluvium and the Vincentown Formation, and well MW11-3 penetrated the Vincentown Formation.

Five groundwater samples (11GW01 through 11GW05) were collected at Site 11. Tables 5 and 6 present the occurrence and distribution of inorganic and organic chemicals in site-related groundwater samples and compare them to background. Figure 6 shows sample locations and concentrations of compounds that exceed ARARs or TBCs.

Inorganics

Concentrations of most metals in site-related groundwater samples were similar to background ranges. The maximum concentration of aluminum in groundwater (3010 ug/L in sample 11GW03) was greater than the corresponding NJDEP GWQS (200 ug/L) but was less than half of the maximum background concentration encountered for aluminum (7870 ug/L). The maximum concentration of iron in Site 11 groundwater (4310 ug/L in sample 11GW03) was also greater than the corresponding NJDEP GWQS (300 ug/L) but was less than half of the maximum background concentration encountered for iron (7690 ug/L).

Organics

Chloroform was detected at low levels in groundwater samples 11GW01 (3.0 ug/L), 11GW03 (2.0 ug/L), and 11GW04 (1.0 ug/L) collected at Site 11. This compound was not detected in background groundwater samples.

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 1 and 11.

Human Health Risks

The human health risk assessment estimated the potential risks to human health posed by exposure to contaminated groundwater, surface water, and sediment at the sites. 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.

In addition, results were compared to applicable federal and/or state standards such as federal **Maximum Contaminant Levels (MCLs)** for drinking water, NJDEP GWQS, or other published lists of reference values.

A baseline human health risk assessment was conducted for the OU 8 sites. Results of this assessment are discussed for each site.

Site 1

Subsurface soil and groundwater were sampled at Site 1. This risk assessment does not take into account future loading of COPCs from subsurface soils to groundwater. It is assumed that loading of COPCs from subsurface soils to groundwater is currently occurring; therefore, groundwater exposure to potential receptors will adequately characterize this phenomenon, and risks from subsurface soils and groundwater are combined. The potential receptors for this site were future industrial and residential receptors.

The results of the Site 1 baseline human health risk assessment concluded that reasonable maximum exposure (RME) cancer risks estimated for future residents exposed to subsurface soil and consuming groundwater from beneath the site (5.6E-04) slightly exceeded the upper end of the target maximum acceptable risk range. The estimated human health risk for the future industrial (subsurface soil and groundwater) exposure scenario (1.4E-04) was at the upper end of the target maximum acceptable risk range. Arsenic (via ingestion of groundwater) was by far the greatest contributor to the estimated human health risks for the future residential (5.1E-04) and future industrial (1.2E-04) exposure scenarios. However, these RME estimates are probably overly conservative because a central tendency calculation shows that cancer risks are more likely to be within the mid-range of the target acceptable risk range.

RME estimates for non-carcinogenic risks associated with future industrial (subsurface soil and groundwater) and future residential (subsurface soil and groundwater) exposure scenarios exceeded 1.0, the cutoff point below which adverse non-carcinogenic effects are not expected to occur. Arsenic (maximum concentration 22.7 ug/L), chromium (maximum concentration 148 ug/L), and iron (maximum concentration 23,350 ug/L), all via ingestion of groundwater, were the principal compounds of concern in Site 1 groundwater that contributed to the estimated Hazard Index (HI) greater than the EPA guidance for these exposure scenarios. For example, for the future residential child groundwater ingestion scenario, the target organ, corresponding RME HI, and the associated principal COPC are as follows: digestive system (5.8 - iron), liver (5.1 – iron), skin (4.9 – arsenic), and kidney (2.6 – chromium). Adverse noncarcinogenic effects cannot be ruled out when the HI is estimated to be greater than 1.

Lead groundwater concentrations at the site were below the EPA action level for public water supplies and lead soil concentrations were below EPA guidelines. These lead concentrations are not expected to be associated with significant increases in blood-lead levels based on the results of the IEUBK Lead Model (v. 0.99).

Site 11

Groundwater was sampled at Site 11. The potential receptors considered for this site were future industrial and residential receptors. The cancer risks associated with the future residential (groundwater) exposure scenario was approximately 3E-06; near the lower end of the acceptable target risk range.

The non-carcinogenic HIs associated with the future industrial and future residential (groundwater) exposure scenarios were below 1.0; the cutoff point below which adverse effects are not expected to occur.

Lead concentrations at the site were below the EPA action level for public water supplies and are not expected to be associated with significant increases in blood-lead levels based on the results of the IEUBK Lead Model (v. 0.99).

Ecological Risks

Site 1

Site 1 contains limited terrestrial habitat due to the previous burning activities, which removed the existing natural organic matter. No migration pathways exist at the site that could carry contaminants to the higher quality upland areas that border the site or contribute contaminants to the Hockhockson Brook Watershed. Some metals are present in surface soil that had HQs indicative of moderate potential risks to terrestrial receptors, but almost all of these compounds were detected at concentrations comparable to background. For example, for Site 1 surface soils, aluminum (HQ = 5.0), copper (HQ = 2.7), chromium (HQ = 164), mercury (HQ = 9.6, and vanadium (HQ = 2.2) exceeded ecological toxicity (ET) reference values and were retained as final COPCs. Surface soil samples taken as part of the 1993 SI were sufficient to characterize potential ecological risks and, therefore, further study based on ecological risk should not be necessary.

If unaltered, succession should continue to progress at the site, and subsequent receptor use should increase. Remediation, such as soil removal, based on potential risks would disrupt succession at the site. Any potential risks caused by inorganics at this site should attenuate over time. For these reasons, remediation at Site 1 based on ecological concerns is considered undesirable.

Site 11

Site 11 and the surrounding area contain extensive wetland and upland habitat. Most of the site is classified as a wetland, and contains grasses and some small trees. Nearby wooded areas, primarily south and southeast of the site provide excellent upland habitats that are expected to attract most upland wildlife species found on the installation. The federally threatened Knieskern's beaked-rush, a grass-like plant, has been identified on Site 11.

No runoff of contaminants from the site is expected to occur, nor any groundwater to surface water discharge. For these reasons, further study or remediation based on ecological concerns at Site 11 is considered unwarranted. However, monitoring of the status of the Knieskern's beaked-rush on the site should be considered and is actually underway as a responsibility of the NWS Earle staff ecologist.

REMEDIAL ACTION OBJECTIVES (RAOs)

The overall objective for the remedy at Sites 1 and 11 is to protect human health and the environment. Based on the baseline human health risk assessment, the ecological risk assessment, and the RI results, RAOs were developed to address environmental media status at Sites 1 and 11.

Site 1 RAOs

The following remedial action objective has been selected for Site 1:

Protection of Human Health RAO

- Prevent potential human exposure to metals in groundwater

Protection of the Environment RAO

No RAO for protection of the environment is necessary.

Site 11 RAOs

Based on the findings of the RI/FS process, no remedial action objectives have been selected or are necessary for Site 11.

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 Site 1 only. Site 11 conditions require no remedial action, no RAOs were set for the site.

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 8 following the receipt of public comments.

Based on the nature of contamination and site conditions at Site 1, the standards that will be used to gauge the achievement of remedial action objectives will be the New Jersey GWQS.

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 RAOs after screening were evaluated in detail. Table 7 presents the considered alternatives and the results of screening.

Detailed Summary of Alternatives

Summaries of the remedial alternatives that passed the screening step for Site 6 are presented in the following sections.

Site 1 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 or animal exposure to site soils or site groundwater or to preclude contaminant migration to the environment.

Cost

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

Alternative 2: Limited Action (Long Term Monitoring)

Alternative 2 relies on long-term groundwater monitoring on an annual basis to assess the contaminant status, and potential threats to human health and the environment. This alternative does not rely on access restrictions or other institutional controls to limit exposures to site risks. This alternative does not employ treatment or containment to address site contamination.

Since contaminated media would be left in place, site conditions and risks would be reviewed every five years. Key components of Alternative 2 are identified on Table 8 and described below.

Existing Features - Existing site features offer limited protection of human health and the environment. The main protective feature is a vegetated sandy soil cover that reduces the potential for human and animal contact with groundwater. The cover is moderately vegetated and serves to reduce infiltration of precipitation into soils and limit surface runoff and erosion. Where present and in good condition, the vegetation may reduce precipitation infiltration and surface runoff.

Because no actions would be conducted under Alternative 2 to maintain or further cover the ordnance demilitarization site, the site surface may continue to erode, potentially exposing more bare soils and potentially increasing infiltration. Remnants of the Army communications station tower (e.g., concrete pad, protruding wires and metal objects) would remain at the surface of the site.

Long-Term Monitoring - Under Alternative 2, the groundwater would be sampled annually to monitor the migration of contaminants from the site and the potential for impacts to downgradient areas until groundwater reaches MCL's. Background well data would be used for evaluation of site contaminant status. The data would be evaluated during the 5-year review period.

For the purpose of costing, it is assumed that groundwater samples would be collected from one new monitoring well, along with three existing monitoring wells, and the 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 - Since contaminants remain on the site, 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, assessing whether contaminant migration has increased, and determining whether human or ecological receptors or natural resources are at risk.

Cost

The capital costs for Alternative 2 total $15,900. The average annual O&M costs are $8,050, and 5-year reviews cost $15,500 per event. Over a 30-year period, the net present-worth cost is $149,200 (at a 7 percent discount rate).

Alternative 3: Limited Action (Institutional Controls, and Long-Term Monitoring)

Alternative 3 relies on long-term groundwater monitoring conducted on an annual basis and institutional controls to limit exposures to site-related contaminants. Active treatment is not employed to address site contamination. Over time, the minimal metal contaminants in groundwater will likely gradually decrease through adsorption and dispersion.

Long-term annual monitoring of site groundwater would be conducted to assess contaminant status and potential threats to human health and the environment. Since wastes would be left in place, site conditions and risks would be reviewed every five years. Key components of Alternative 3 are identified on Table 8 and described below.

Institutional Controls – A set of institutional controls involving active monitoring and enforcement by the Navy will be documented in a Land Use Control (LUC) work plan or remedial design in agreement with the set of LUC principles and procedures agreed to between EPA and the Navy. 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 3, one new downgradient well would be installed. The groundwater would be sampled periodically to monitor the migration of contaminants from the site and the potential impacts to downgradient areas. As mentioned for Alternative 2, background well data would be used for comparison to evaluate site contaminant status. The collected data would be evaluated during the 5-year review period.

For the purpose of costing, it is assumed that groundwater samples would be collected from the one new monitoring well, along with four existing monitoring wells, and the 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 remain on the site, a review of site conditions and risks would be conducted every five years, as required by CERCLA. The reviews would consist of evaluation of analytical and hydrogeologic data and assess whether contaminant migration has increased and whether human or biological receptors or groundwater resources are at risk. The collected data would be evaluated during the 5-year reviews until MCLs are met.

Cost

The capital costs for Alternative 3 total $41,900. The average annual O&M costs are $8,050, and 5-year reviews cost $15,500 per event. Over a 30-year period, the net present-worth cost is $175,200 (at a 7 percent discount rate).

Site 11 Remedial Alternatives

No remedial alternatives are needed or were developed for Site 11.

EVALUATION OF ALTERNATIVES

The Site 1 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.

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 three Site 1 alternatives are compared with respect to each of the evaluation criteria and differences are identified. Table 9 presents summaries of the evaluations for each of the alternatives.

Overall Protection of Human Health and the Environment

Alternatives 2 and 3 would be protective of human health and the environment. Because no actions are conducted, Alternative 1 would not reduce human health or ecological risk and would not reduce contaminant migration to the environment. Because no actions would be taken under Alternative 1 and 2 to prevent use of contaminated site groundwater, health risks and adverse impacts to the environment are expected to be greater compared to Alternative 3.

Alternative 2 is more protective of human health and the environment than Alternative 1. The use of long-term groundwater monitoring would allow for assessment of site contaminant status and subsequent evaluation of risk to human and ecological receptors.

Alternative 3 is most protective of human health and the environment. Use of institutional controls (CEA) in addition to long-term groundwater monitoring would provide assurance that untreated contaminated groundwater is not used as a potable water source in the future during the period in which contaminant status is being assessed.

Compliance with ARARs

Because Alternative 1 does not include any remedial actions, it would not comply with state and federal ARARs. Alternatives 2 and 3 would comply with these requirements. Alternative 3 would offer greater protection since a CEA would be established.

Alternatives 2 and 3 would comply with federal and state long-term monitoring requirements through annual monitoring and evaluation of groundwater.

Alternatives 1 and 2 would not comply with state ARARs for attainment of groundwater quality standards (N.J.A.C. 7:9-61). Alternative 3 would comply by seeking a temporary exemption (CEA) from these requirements until the GWQS are achieved.

Long-Term Effectiveness and Permanence

Alternative 3 offers the most substantial long-term protection of human health and the environment of the three alternatives. Under all three alternatives, risks would remain the same or decrease over time as the site surface vegetation continues to follow natural ecological succession, thereby improving the vegetative cover. However, potential future users of site groundwater may be at risk under Alternatives 1 and 2 because they lack institutional controls that would prohibit use of untreated contaminated groundwater.

Alternatives 2 and 3 would allow for assessment of contaminant status through the use of long-term groundwater monitoring.

Alternative 3 would reduce human risks due to ingestion of site groundwater by reducing the potential for exposure. Long-term risks due to ingestion of site groundwater would be reduced by implementing institutional controls to prohibit

use of untreated, contaminated groundwater.

Reduction of Toxicity, Mobility, or Volume through Treatment

Because none 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 three alternatives would be similar since the use of appropriate engineering controls and PPE is expected to minimize adverse impacts to station residents and personnel, the local community, and workers during implementation.

No on-site actions are proposed under Alternative 1. Alternatives 2 and 3 would present a greater opportunity for short-term effectiveness due to long-term groundwater monitoring and institutional controls (Alternative 3 only).

Impacts to the environment are not anticipated under any of the three alternatives since minimal activities would be conducted.

Alternative 1 would not achieve the RAO. Alternative 2 would achieve the RAO within approximately one year, which would be the time to conduct annual groundwater monitoring and evaluate the results. Alternative 3 would achieve the RAO within approximately less than one year, which would be the time to implement the CEA.

Implementability

Alternative 1 is the most easily implemented since no activities are proposed. Alternative 2 would be more difficult to implement since it would involve long-term monitoring; however, no difficulties are anticipated, since common installation techniques are required and materials are available from several vendors. Alternative 3 would be most difficult to implement since it involves implementation of the CEA; however, no difficulties are anticipated.

If additional actions are warranted, they could be easily implemented under all three alternatives.

Cost

The costs associated with each alternative are provided in Table 9. Alternative 1, no action, would have no associated costs and Alternative 2, limited action, would cost more than Alternative 1 but less to implement than Alternative 3.

PREFERRED ALTERNATIVE SUMMARY

Site 1

The Navy, with EPA and NJDEP, has selected Alternative 3 - Limited Action, Institutional Controls and Long-Term Monitoring- as its preferred alternative. The range of technologies in Alternative 3 is appropriate for the protection of human health and the environment at this former explosive ordnance demilitarization site.

Alternative 3 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 wastes would be left in place, site conditions and risks would be reviewed every 5 years.

Under Alternative 3, 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 11

Based on the results of the RI/FS process, no remedial action is proposed or deemed necessary for Site 11.

COSTS OF THE PREFERRED ALTERNATIVE

Site 1

The estimated cost for Alternative 3 is $175,200.

Site 11

No remediation is proposed; therefore no cost is to be incurred.

State and Community Acceptance

The state of New Jersey supports the preferred alternatives for Sites 1 and 11. 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 8. The Navy has set a public comment period from **November 21, 2003** through **December 22, 2003** to encourage public participation in the decision process for OU 8.

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 Wednesday, December 10, 2003 and will be held at the Colts Neck Library Meeting Room, 1 Winthrop Drive (near Town Hall),** Colts Neck, 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 8.

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

Commanding Officer
Naval Weapons Station Earle
Environmental Department, Lawrence Burg
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 December 22, 2003.

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, 50^{th} 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: Accounts for multi-media nature of lead exposure to determine the risk likely to occur at a site.

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 (typically used as cooling fluids in electrical transformers) 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): Human health risk assessment calculation approach using 90^{th} percentile receptor risk behavior patterns to estimate a conservative expectation of receptor risk.

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, Lawrence Burg
201 Highway 34 South
Colts Neck, New Jersey 07722-5014

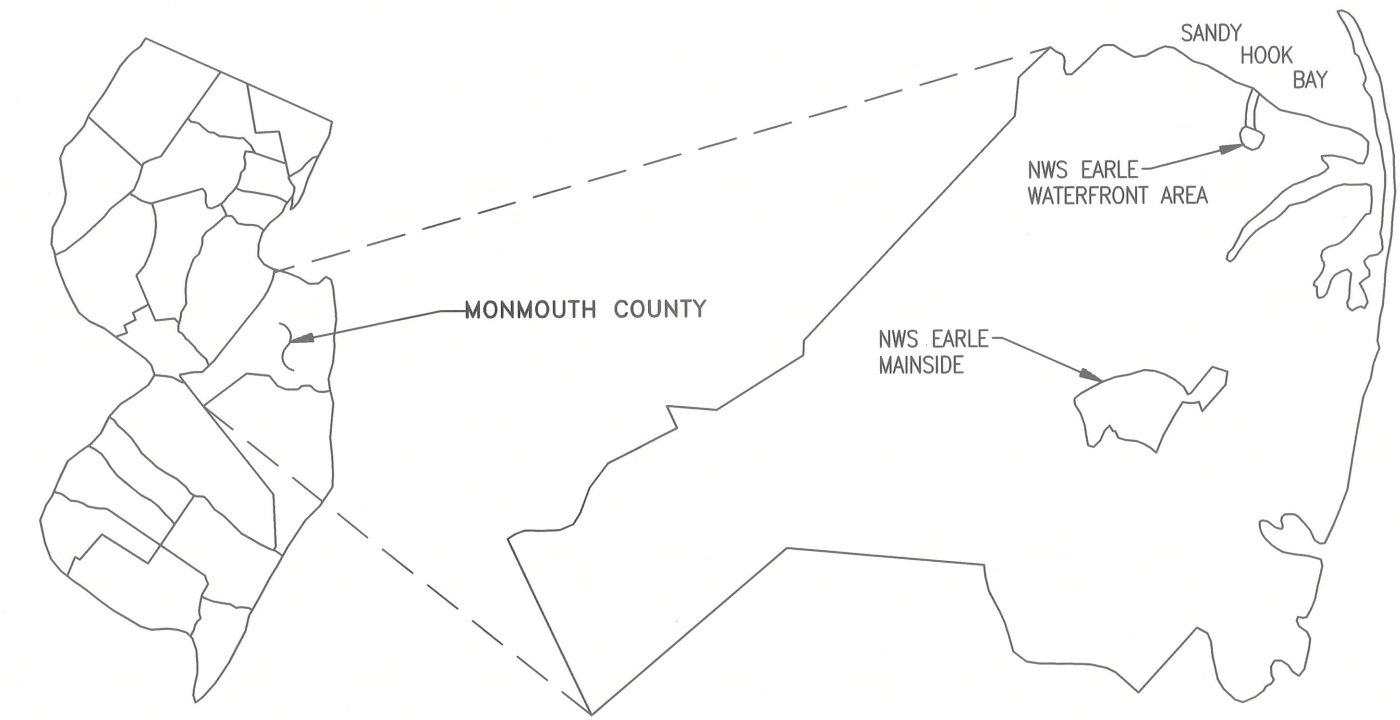
Name: _____
Affiliation: _____

Address: _____
Phone: ( )_____

_____

FIGURES

2128–1203/2128cm01.dwg 7/2/03 LDL



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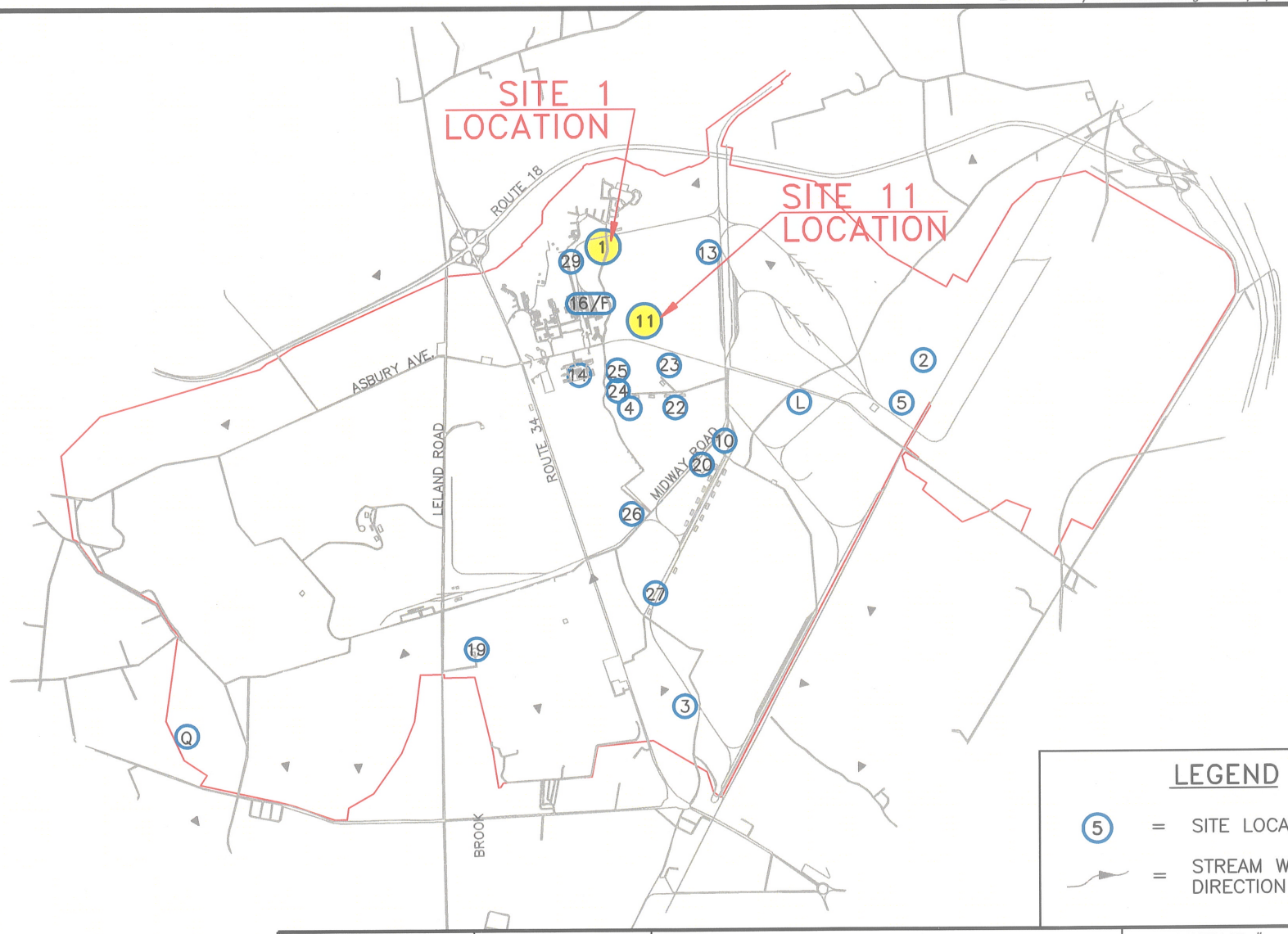
CHECKED BY RET DATE			FILE NUMBER: 2128cm01.dwg LDL PHL
REVISED BY DATE			APPROVED BY DATE
SCALE NOT TO SCALE			DRAWING NO. FIGURE 1 REV.

PRAP OU-8

2128–1203/2128cm02.dwg 7/2/03 LDL



LEGEND

5 = SITE LOCATION

= STREAM WITH FLOW DIRECTION

0 5,000 10,000

SCALE IN FEET

DRAWN BY LDL	DATE 7/2/03
CHECKED BY	DATE
REVISED BY	DATE
SCALE AS SHOWN	

Tetra Tech NUS, Inc.

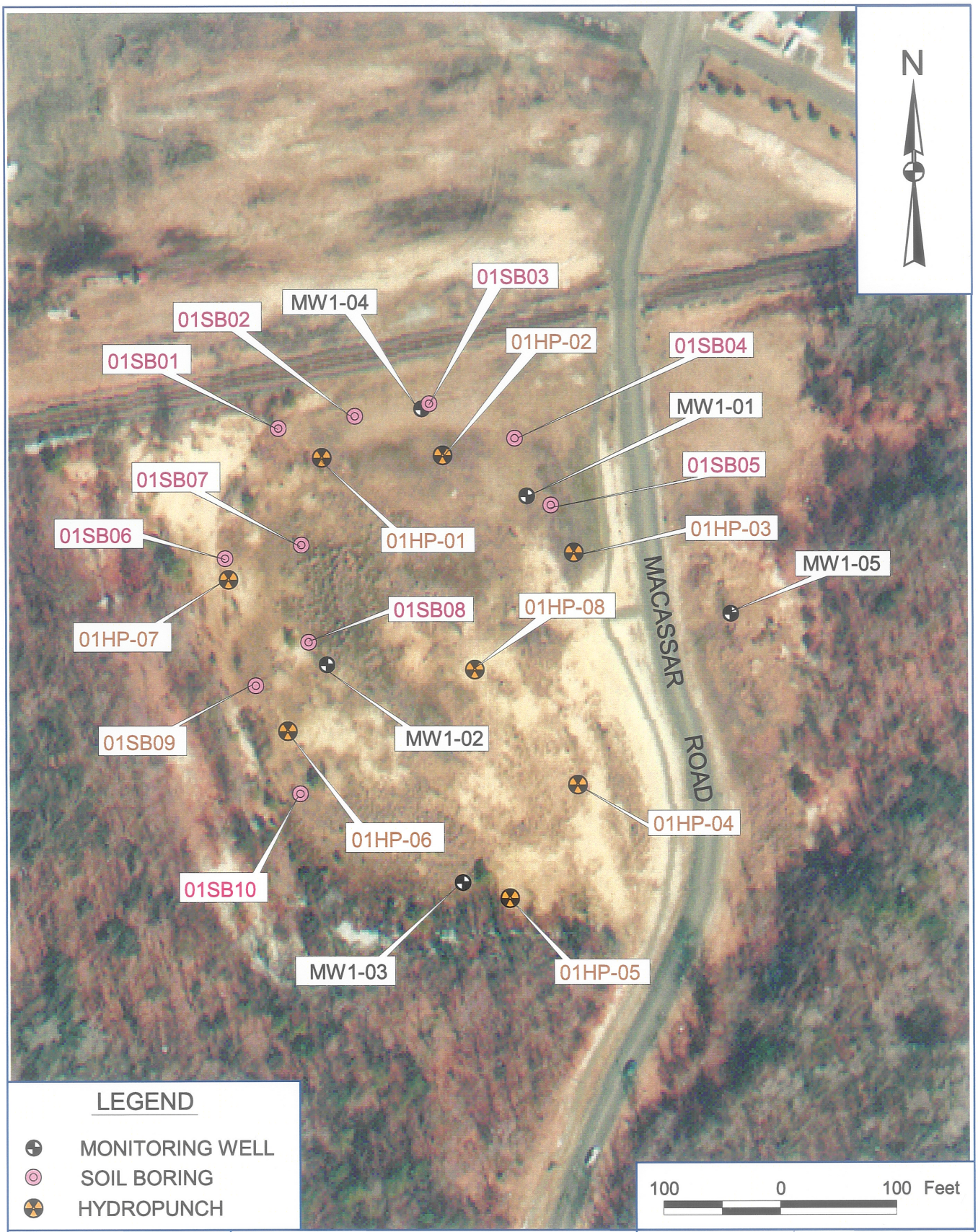
OU–8 LOCATION

NAVAL WEAPONS STATION EARLE

COLTS NECK, NEW JERSEY

CONTRACT # – CTO # 2128 – 1203	
FILE NUMBER: 2128cm02.dwg LDL PHL	
APPROVED BY	DATE
DRAWING NO. FIGURE 2	REV.

PRAP OU–8



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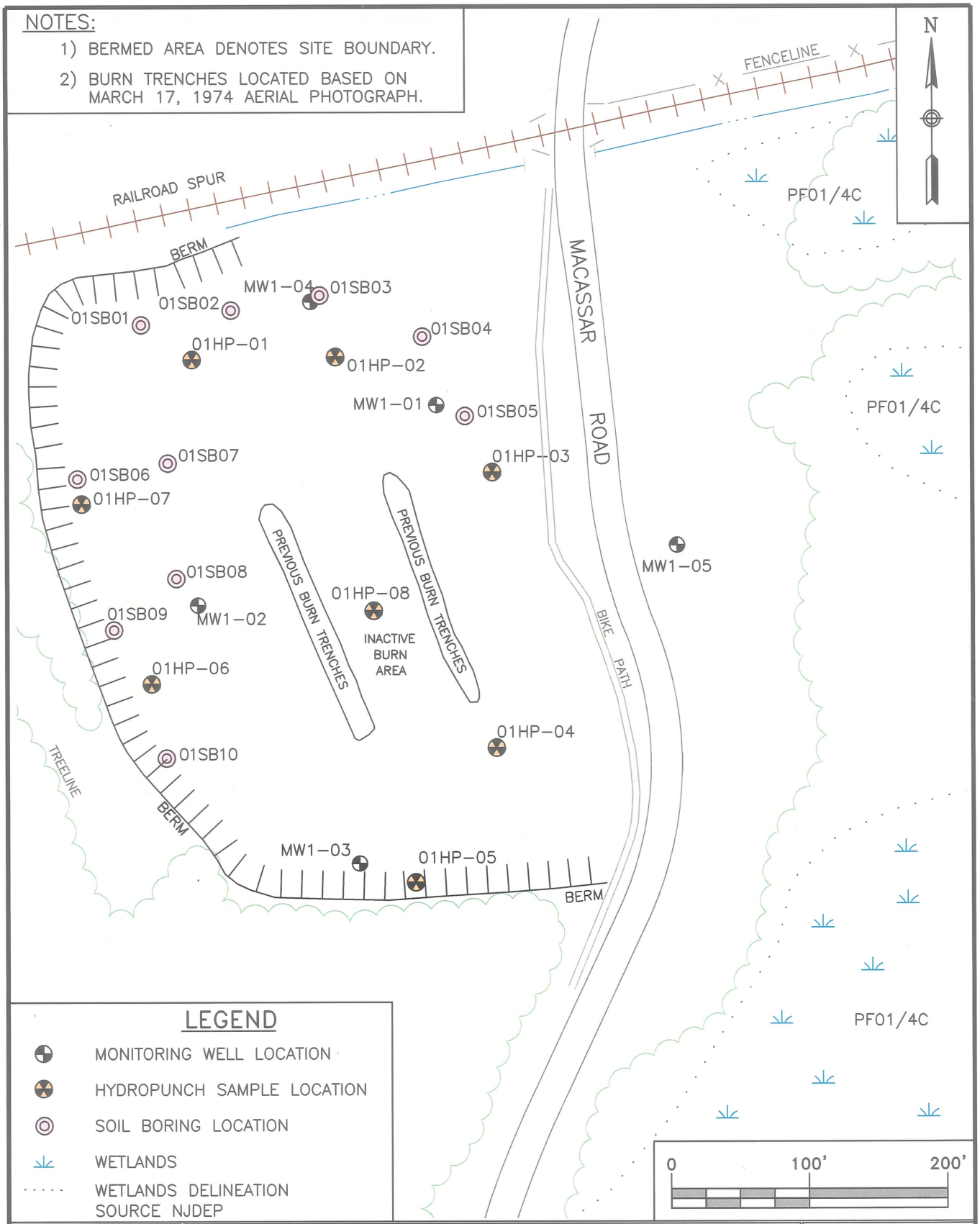
COST/SCHEDULE-AREA			APROVED BY / DATE
SCALE: AS NOTED			DRAWING No.: FIGURE 3 / REV: _

ACAD: 2128-1203/2128cp01.dwg 7/2/03 LDL

NOTES:

1) BERMED AREA DENOTES SITE BOUNDARY.
2) BURN TRENCHES LOCATED BASED ON MARCH 17, 1974 AERIAL PHOTOGRAPH.



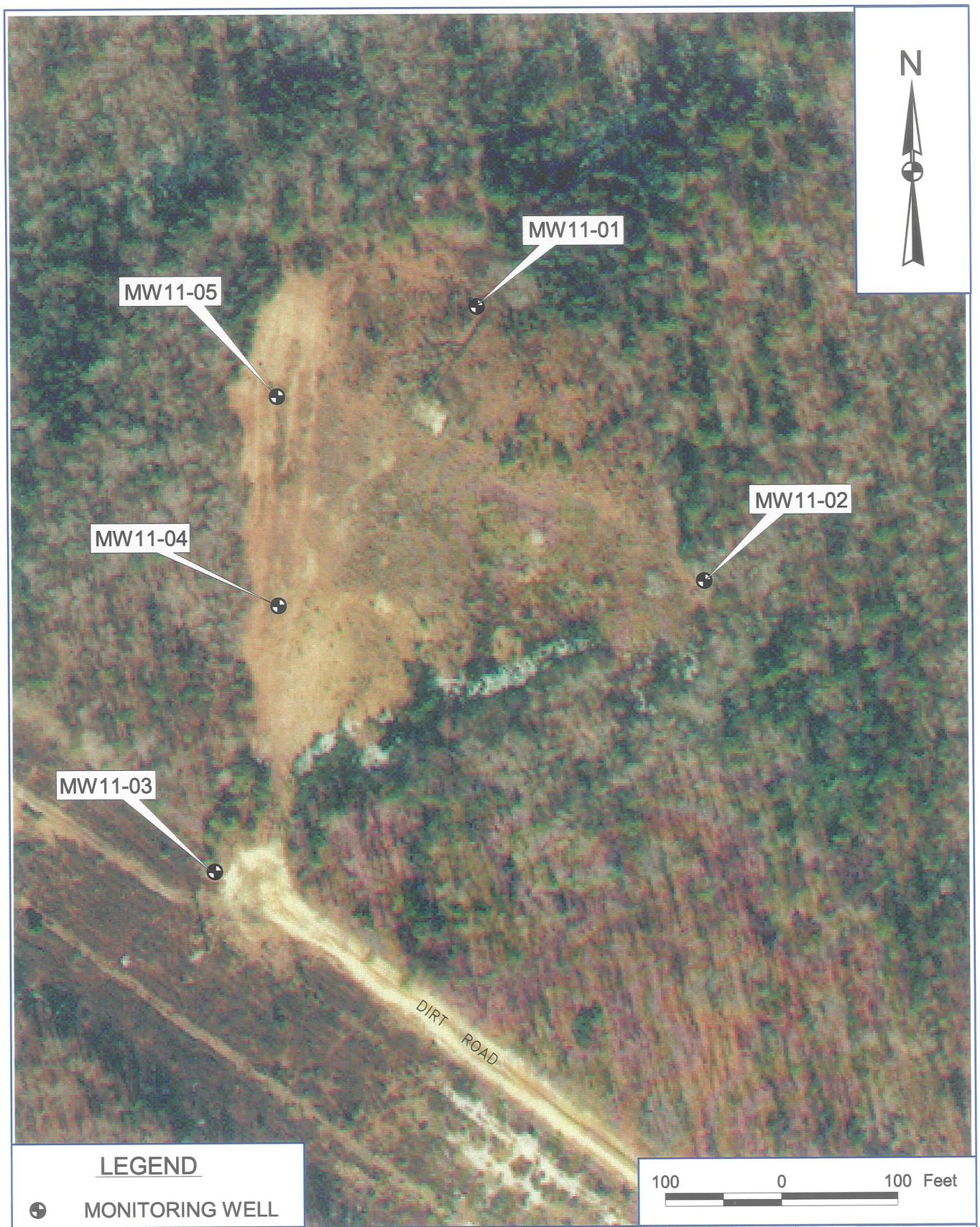
LEGEND

- MONITORING WELL LOCATION
- HYDROPUNCH SAMPLE LOCATION
- SOIL BORING LOCATION
- WETLANDS
- WETLANDS DELINEATION SOURCE NJDEP

TETRA TECH NUS, INC.

SAMPLE LOCATIONS
SITE 1 – ORDNANCE DEMILITARIZATION SITE
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

SCALE	AS NOTED
FILE: 2128cp01.dwg	LDL PHL
REV	DATE 7/2/03
FIGURE NUMBER	FIGURE 3a



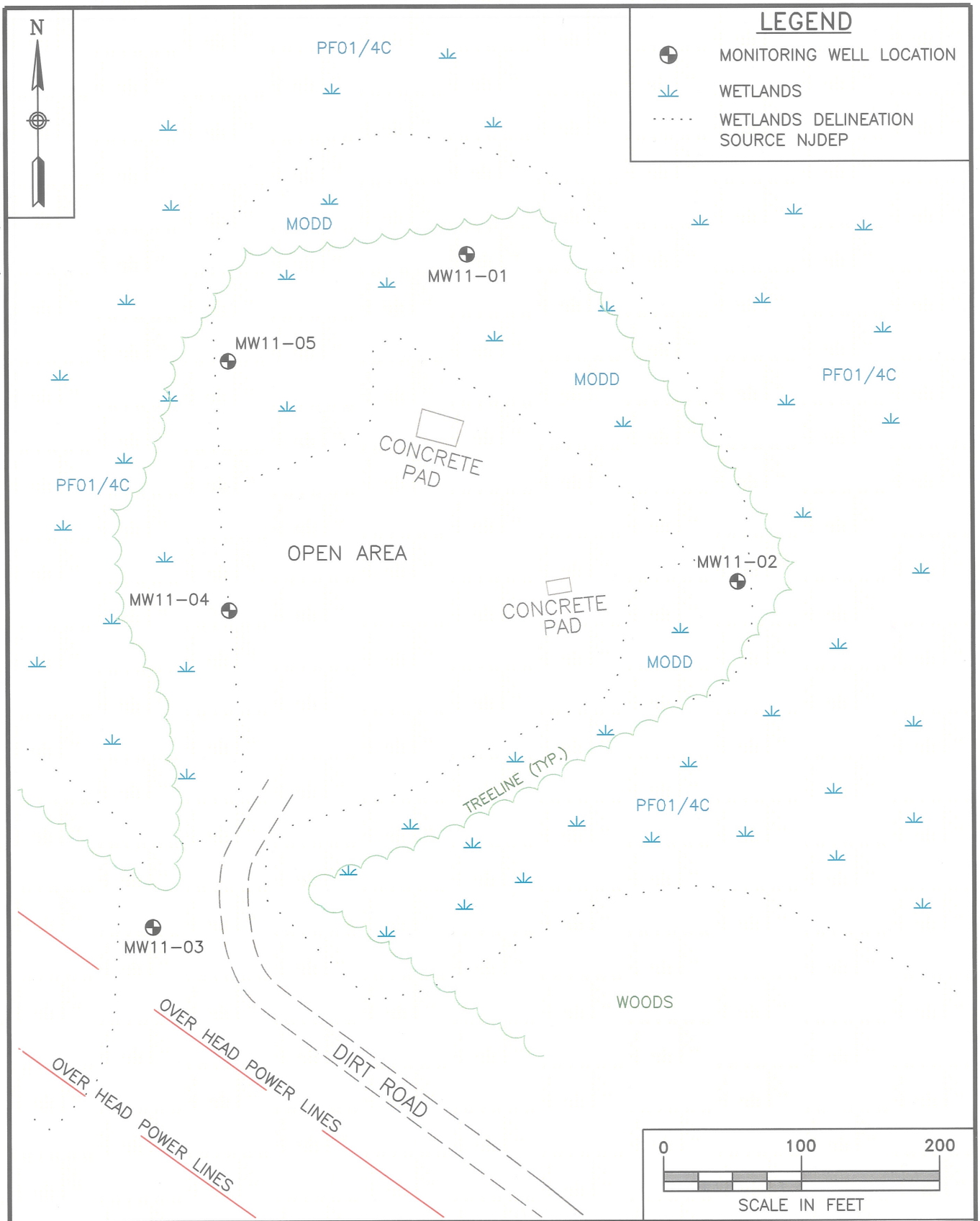
LEGEND

MONITORING WELL

100 0 100 Feet

DRAWN BY: LDL	DATE: 7/2/03	Tetra Tech NUS, Inc.	CONTRACT NUMBER: 2128 / OWNER No.: PRAP OU-8
CHECKED BY: RET	DATE:	SAMPLE LOCATIONS SITE 11 CONTRACT ORDNANCE DISPOSAL AREA NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	PROJECT FILE: NWS-Earle_Sites 1&11-PHL.apr LAYOUT: SITE-11 Sample Locations
COST/SCHEDULE-AREA			APROVED BY / DATE
SCALE: AS NOTED			DRAWING No.: FIGURE 4 / REV

ACAD: 2128-1203/2128cp02-Site11.dwg 7/2/03 LDL



TETRA TECH NUS, INC.

SAMPLE LOCATIONS
SITE 11 - CONTRACT ORDNANCE DISPOSAL AREA
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

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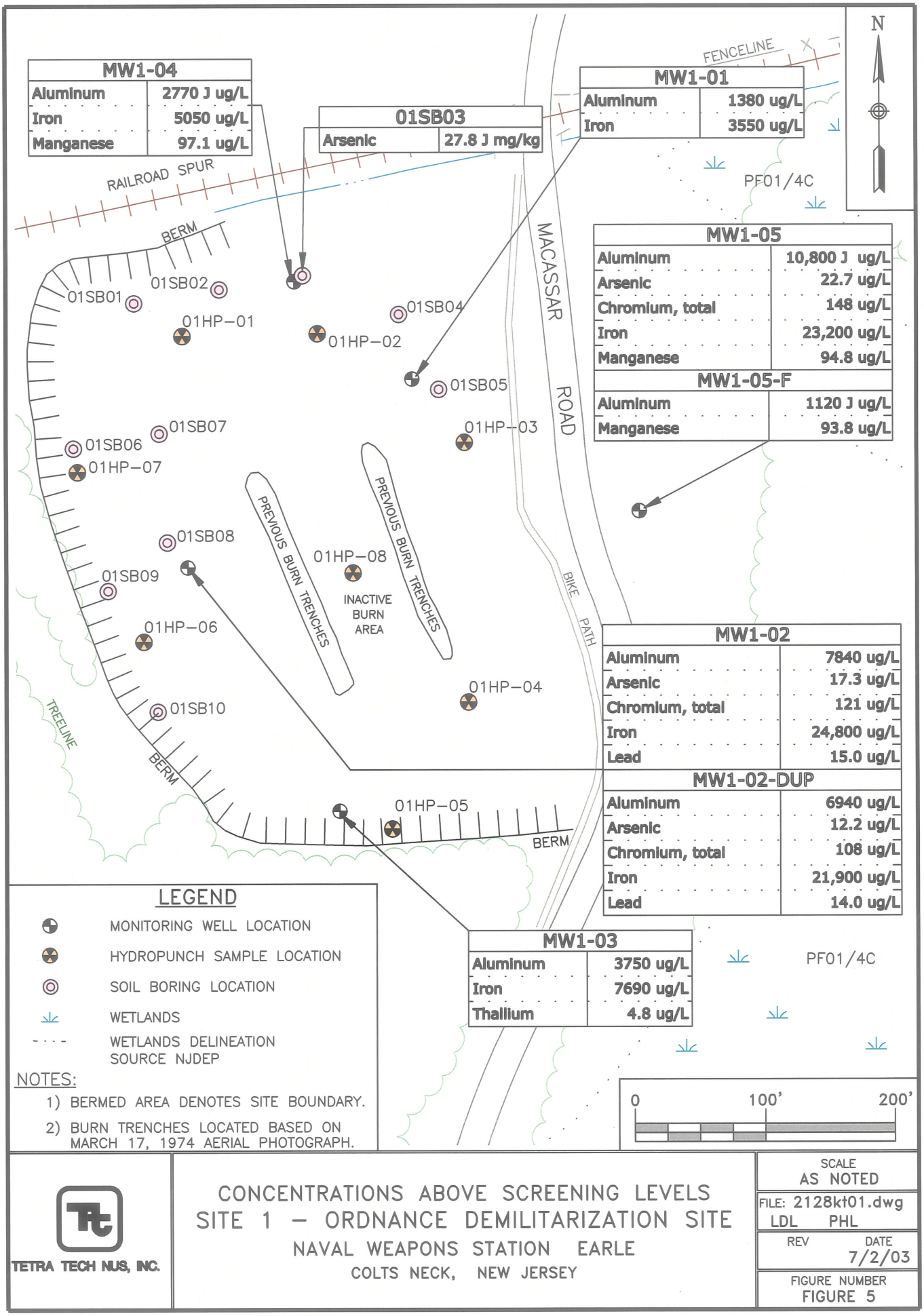
FILE: 2128cp02.dwg	LDL PHL
REV	DATE 7/2/03
FIGURE NUMBER	FIGURE 4a

PRAP OU-8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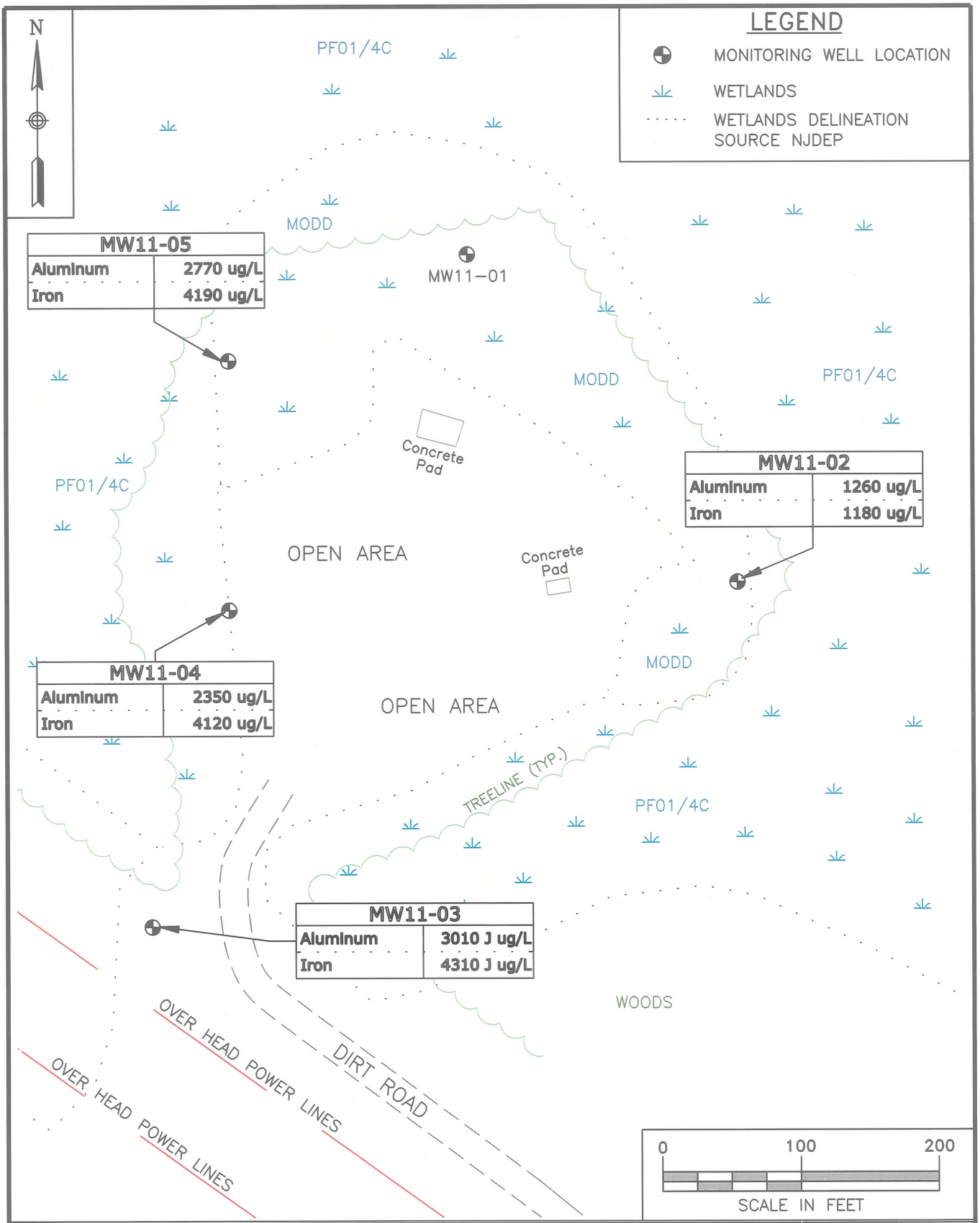
MW1-04
Aluminum 2770 J ug/L
Iron 5050 ug/L
Manganese 97.1 ug/L
01SB03
Arsenic 27.8 J mg/kg
MW1-01
Aluminum 1380 ug/L
Iron 3550 ug/L
FENCELINE
N
RAILROAD SPUR
BERM
01SB01
01SB02
01HP-01
01HP-02
01SB04
01SB05
MACASSAR ROAD
PF01/4C
MW1-05
Aluminum 10,800 J ug/L
Arsenic 22.7 ug/L
Chromium, total 148 ug/L
Iron 23,200 ug/L
Manganese 94.8 ug/L
MW1-05-F
Aluminum 1120 J ug/L
Manganese 93.8 ug/L
01SB06
01SB07
01HP-07
01HP-03
PREVIOUS BURN TRENCHES
PREVIOUS BURN TRENCHES
01SB08
01HP-08
INACTIVE BURN AREA
01SB09
BIKE PATH
01HP-06
MW1-02
Aluminum 7840 ug/L
Arsenic 17.3 ug/L
Chromium, total 121 ug/L
Iron 24,800 ug/L
Lead 15.0 ug/L
01HP-04
TREELINE
01SB10
BERM
MW1-02-DUP
Aluminum 6940 ug/L
Arsenic 12.2 ug/L
Chromium, total 108 ug/L
Iron 21,900 ug/L
Lead 14.0 ug/L
01HP-05
BERM
MW1-03
Aluminum 3750 ug/L
Iron 7690 ug/L
Thallium 4.8 ug/L
PF01/4C
LEGEND
MONITORING WELL LOCATION
HYDROPUNCH SAMPLE LOCATION
SOIL BORING LOCATION
WETLANDS
WETLANDS DELINEATION SOURCE NJDEP
NOTES:
1) BERMED AREA DENOTES SITE BOUNDARY.
2) BURN TRENCHES LOCATED BASED ON MARCH 17, 1974 AERIAL PHOTOGRAPH.
0
100'
200'
TETRA TECH NUS, INC.
CONCENTRATIONS ABOVE SCREENING LEVELS
SITE 1 - ORDNANCE DEMILITARIZATION SITE
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY
SCALE AS NOTED
FILE: 2128kt01.dwg
LDL PHL
REV DATE
7/2/03
FIGURE NUMBER
FIGURE 5



TETRA TECH NUS, INC.

CONCENTRATIONS ABOVE SCREENING LEVELS
SITE 11 – CONTRACT ORDNANCE DISPOSAL AREA
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

SCALE	AS NOTED
FILE:	2128kt02.dwg
	LDL PHL
REV	DATE 7/2/03
FIGURE NUMBER	FIGURE 6

ACAD: 2128-1203/2128kt02-Site11.dwg 7/2/03 LDL

PRAP OU-8

TABLES

TABLE 1

OCCURRENCE AND DISTRIBUTION OF INORGANICS IN SUBSURFACE SOIL AT SITE 1
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	20 / 20	897 - 5180	2556.31	NO	3487.33
ANTIMONY	NOT DETECTED	-	-	2 / 20	1.3 - 5.1	0.00	YES	3.64
ARSENIC	8 / 8	1.35 - 14.4	13.29	20 / 20	2 - 27.8	5.81	NO	12.20
BARIUM*	8 / 8	0.92 - 31	17.92	20 / 20	1.8 - 121	3.72	NO	31.13
BERYLLIUM*	2 / 8	0.12 - 0.28	0.28	10 / 20	0.16 - 0.61	0.25	NO	0.26
CADMIUM*	1 / 8	0.57	0.58	5 / 20	0.1 - 0.61	0.35	NO	0.31
CALCIUM	8 / 8	28.6 - 799	577.55	20 / 20	30.1 - 1710	299.60	NO	312.96
CHROMIUM	8 / 8	4.7 - 59.5	54.73	20 / 20	28.4 - 84.6	71.08	YES	63.02
COBALT	4 / 8	0.75 - 5	2.77	4 / 20	0.19 - 1.1	0.34	NO	0.65
COPPER	8 / 8	0.97 - 8.6	8.66	16 / 20	0.68 - 57.6	3.26	NO	12.82
IRON	8 / 8	3745 - 62500	40871.25	20 / 20	2590 - 18500	9410.47	NO	13481.13
LEAD*	8 / 8	1.4 - 39.4	24.33	20 / 20	1.3 - 62.85	8.39	NO	18.26
MAGNESIUM	8 / 8	18.5 - 619	504.05	20 / 20	121 - 1130	348.20	NO	609.14
MANGANESE	8 / 8	2.6 - 214	92.51	16 / 20	0.53 - 23.3	4.24	NO	5.58
MERCURY*	8 / 8	0.03 - 0.17	0.13	18 / 20	0.025 - 0.2	0.02	NO	0.06
NICKEL	4 / 8	1.8 - 7.2	4.75	5 / 20	0.54 - 1.9	1.13	NO	1.07
POTASSIUM	7 / 8	95 - 792	793.35	20 / 20	214 - 2930	899.52	YES	1690.40
SELENIUM	2 / 8	0.57 - 0.93	0.79	3 / 20	0.56 - 0.61	0.52	NO	0.36
SILVER*	2 / 8	0.37 - 0.67	0.51	4 / 20	0.14 - 2.2	0.25	NO	0.74
SODIUM	8 / 8	17.5 - 94.8	79.35	10 / 20	11.3 - 115	61.72	NO	96.42
THALLIUM	4 / 8	0.7 - 1.9	1.38	7 / 20	0.7 - 1.2	0.64	NO	0.63
VANADIUM	8 / 8	11.05 - 64	64.71	20 / 20	5 - 50.4	40.86	NO	38.09
ZINC*	6 / 8	1.1 - 50.7	31.35	8 / 20	4.7 - 129	6.49	NO	27.14

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

TABLE 2

OCCURRENCE AND DISTRIBUTION OF INORGANICS IN GROUNDWATER AT SITE 1
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/L)

	BACKGROUND			SITE-RELATED				
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	2 X AVERAGE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	AVERAGE CONCENTRATION	MEAN > 2 X BKGD	REPRESENTATIVE CONCENTRATION
ALUMINUM*	11 / 11	287 - 7870	5097.82	5 / 5	1380 - 10800	5218.00	YES	10800
ARSENIC	1 / 11	5.8 - 5.8	4.05	3 / 5	5.8 - 22.7	9.31	YES	22.7
BARIUM	11 / 11	2.6 - 518	229.60	5 / 5	50.1 - 853	489.52	YES	853
BERYLLIUM*	4 / 11	0.21 - 1.6	0.49	4 / 5	0.21 - 0.85	0.375	NO	0.85
CADMIUM	5 / 11	0.6 - 1.9	1.21	5 / 5	1.5 - 3.3	2.53	YES	3.3
CALCIUM	11 / 11	506 - 17200	8306.55	5 / 5	1210 - 5450	3085	NO	5450
CHROMIUM	NOT DETECTED	-	-	5 / 5	19.6 - 148	72	YES	148
COBALT	6 / 11	0.7 - 10.1	4.06	5 / 5	0.7 - 3.4	1.95	NO	3.4
COPPER	9 / 11	0.79 - 13.5	6.53	5 / 5	1.8 - 75.45	25.93	YES	75.45
IRON	11 / 11	153 - 7690	4197.09	5 / 5	3550 - 23350	12568	YES	23350
LEAD	3 / 11	2.1 - 3	2.44	4 / 5	4.7 - 14.5	6.59	YES	14.5
MAGNESIUM	11 / 11	273 - 27400	8449.64	5 / 5	1060 - 2690	1859	NO	2690
MANGANESE	11 / 11	3.3 - 65	46.18	5 / 5	24.2 - 97.1	55.16	YES	90.85
MERCURY	11 / 11	0.005 - 0.12	0.12	5 / 5	0.082 - 0.28	0.1424	YES	0.22
NICKEL*	10 / 11	0.81 - 25.5	11.98	3 / 5	2.3 - 4.6	2.01	NO	4.6
POTASSIUM	11 / 11	350 - 3245	2810.55	5 / 5	2180 - 10700	5056	YES	10700
SILVER	NOT DETECTED	-	-	1 / 5	1.2	0.616	YES	1.09
SODIUM	11 / 11	1850 - 11650	8449.09	5 / 5	1850 - 29500	10335	YES	29500
THALLIUM*	3 / 11	4 - 5.1	5.15	1 / 5	4.8	2.4	NO	4.42
VANADIUM	10 / 11	0.69 - 42.25	16.48	5 / 5	8.2 - 58.4	30.39	YES	58.4
ZINC	9 / 6	3.7 - 348	178.61	5 / 5	131 - 1020	631.4	YES	1020

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

TABLE 3

OCCURRENCE AND DISTRIBUTION OF ORGANICS IN GROUNDWATER AT SITE 01
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
CHLOROFORM	NOT DETECTED		-	1 / 5	3	3
GAMMA-BHC (LINDANE)	NOT DETECTED		-	1 / 5	0.001	0.001
METHYLENE CHLORIDE	NOT DETECTED		-	1 / 5	1	1

Table 4
Summary of Surface Soil Sample Analytical Results
NWS EARLE, Site 11 (Contract Ordnance Disposal Area)

Site I.D. (s) / Compounds	11-001-S001 Soil Sample 11-01	11-002-S001 Soil Sample 11-02	11-003-S001 Soil Sample 11-03	11-003-S101 Soil Sample Duplicate	11-004-S001 Soil Sample 11-04	11-041-S001 Replicate	11-005-S001 Soil Sample 11-05	11-006-S001 Soil Sample 11-06	11-007-S001 Soil Sample 11-07	11-008-S001 Soil Sample 11-08	11-008-S001 Replicate	NJDEP Guidelines
Inorganics (mg/kg)												
Nitrate	1.8	3.0	U	0.84	0.88	0.94	0.58	0.80	0.66	1.0	NR	-
Nitrite	U 0.10	U 0.10	0.66	U 0.10	U 0.10	U0.10	U 0.10	U 0.10	U 0.10	U 0.10	NR	-
% Solids	79.5	83.5	87.2	87.4	89.2	NR	88.1	84.4	85.8	86.2	86.5	-
Petroleum Hydrocarbons (mg/kg)	640	290	15	11	U 4.6	NR	U 4.6	8.2	U 4.7	53	NR	100
Explosives (ug/g) Picric Acid	U 1.23	U 1.23	U 1.11	U 1.19	U 1.11	NR	U 1.11	U 1.15	U 1.15	U 1.15	U 1.15	

Legend: U = Not detected
NR = Not requsted
(a) = Refer to June 90QAPP
Replicate = Lab QA sample

Source: RI Report September 1993 - Roy F. Weston

TABLE 5

OCCURRENCE AND DISTRIBUTION OF INORGANICS IN GROUNDWATER AT SITE 11
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/L)

	BACKGROUND			SITE-RELATED				
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	2 X AVERAGE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	AVERAGE CONCENTRATION	MEAN > 2 X BKGD?	REPRESENTATIVE CONCENTRATION
ALUMINUM*	11 / 11	287 - 7870	5097.82	5 / 5	177 - 3010	1913.40	NO	3010
BARIUM*	11 / 11	2.6 - 518	229.60	5 / 5	27.4 - 518	131.68	NO	337.63
CADMIUM*	5 / 11	0.6 - 1.9	1.21	3 / 5	0.57 - 0.62	0.43	NO	0.62
CALCIUM	11 / 11	506 - 17200	8306.55	5 / 5	274 - 2090	999.60	NO	2090
CHROMIUM	NOT DETECTED	-	-	5 / 5	4.4 - 31	21.34	YES	31.00
COBALT	6 / 11	0.7 - 10.1	4.06	5 / 5	0.63 - 1.8	1.03	NO	1.73
COPPER*	9 / 11	0.79 - 13.5	6.53	5 / 5	0.85 - 13.5	3.57	NO	13.50
IRON	11 / 11	153 - 7690	4197.09	5 / 5	166 - 4310	2793.20	NO	4310
LEAD*	3 / 11	2.1 - 3	2.44	1 / 5	3	1.20	NO	3.00
MAGNESIUM	11 / 11	273 - 27400	8449.64	5 / 5	811 - 2240	1394.20	NO	2240
MANGANESE	11 / 11	3.3 - 65	46.18	5 / 5	5.1 - 18	12.24	NO	18.00
MERCURY*	11 / 11	0.005 - 0.12	0.12	5 / 5	0.013 - 0.12	0.09	NO	0.12
NICKEL	10 / 11	0.81 - 25.5	11.98	5 / 5	1 - 4.7	2.38	NO	4.70
POTASSIUM	11 / 11	350 - 3245	2810.55	5 / 5	1140 - 2160	1578.00	NO	2064.66
SODIUM	11 / 11	1850 - 11650	8449.09	5 / 5	2200 - 3530	2938.00	NO	3530
VANADIUM	10 / 11	0.69 - 42.25	16.48	4 / 5	1.4 - 13.5	7.84	NO	13.50
ZINC*	6 / 9	3.7 - 348	178.61	1 / 5	348	70.27	NO	218.29

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

TABLE 6

OCCURRENCE AND DISTRIBUTION OF ORGANICS IN GROUNDWATER AT SITE 11
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
CHLOROFORM	NOT DETECTED	-	-	3 / 5	1 - 3	3

TABLE 7
SITE 1 - SCREENING OF REMEDIAL ALTERNATIVES
OU-8 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY

	ALTERNATIVE	EFFECTIVENESS	IMPLEMENTABILITY	COST	COMMENTS
1	No Action	Provides no additional protection of human health or the environment.	Readily implementable. No technical or administrative difficulties.	Capital: none O&M: low	Retained as baseline alternative in accordance with NCP.
2	Limited Action (Long-Term Monitoring including 5-year reviews)	Provides some protection of human health through annual monitoring assessment of contaminant status.	Readily implementable. No technical or administrative difficulties.	Capital: low O&M: low	Relative to Alt. 1, provides additional human health protectiveness through ongoing site groundwater monitoring. Retained.
3	Limited Action (Long-Term Monitoring and Institutional Controls, including 5-year reviews)	Protects human health through annual monitoring assessment of contaminant status and establishment of CEA; groundwater use would be restricted. No reduction of toxicity or volume of contaminants.	Readily implementable. No technical or administrative difficulties. Personnel and materials necessary to implement alternative are widely available.	Capital: moderate O&M: moderate	Relative to Alt. 2, prevents exposure to groundwater contaminants. Retained.

TABLE 8
SITE 1- REMEDIAL ALTERNATIVE COMPONENTS
OU-8 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY

	ALTERNATIVE	KEY COMPONENTS OF ALTERNATIVE
1	No Action	• No actions would be taken.
2	Limited Action (Long-Term Monitoring)	• Long-term annual groundwater monitoring • Five-year reviews
3	Limited Action (Long-Term Monitoring and Institutional Controls)	• Long-term annual groundwater monitoring • Institutional controls (CEA*) • 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 9
SITE 1 - COMPARATIVE ANALYSIS OF REMEDIAL ACTION ALTERNATIVES
0U-8 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: LIMITED ACTION (LONG-TERM MONITORING)	ALTERNATIVE 3: LIMITED ACTION (LONG-TERM MONITORING AND INSTITUTIONAL CONTROLS)
OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT			
Prevent Human Exposure to Metals in Groundwater	No action would be taken to prevent human exposure to contaminated groundwater. Non-carcinogenic risks exceeding EPA's target risk range would remain. No institutional controls would be implemented to prohibit use of untreated groundwater.	Same as Alternative 1. In time, a gradual reduction of contaminants in groundwater due to continued dissipation/dilution would occur.	Institutional controls would minimize potential exposure to groundwater by prohibiting access. In time, a gradual reduction of contaminants in groundwater due to continued dissipation/dilution would occur. CEA would preclude use of groundwater for human consumption until GWQSs are met.
Minimize Contaminant Migration	No actions would be taken to reduce infiltration of surface water or precipitation to groundwater. Contaminants would continue to leach into groundwater and migrate.	Same as Alternative 1.	Same as Alternative 1.

TABLE 9
SITE 1 - COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
0U-8 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: LIMITED ACTION (LONG-TERM MONITORING)	ALTERNATIVE 3: LIMITED ACTION (LONG-TERM MONITORING AND INSTITUTIONAL CONTROLS)
COMPLIANCE WITH ARARs			
Chemical-Specific ARARs	Would not comply with state groundwater quality standards.	Same as Alternative 1. Groundwater contaminant concentrations would initially exceed state GWQS. Over time, GWQS would be achieved by dissipation/dilution.	Same as Alternative 2. Groundwater contaminant concentrations would initially exceed state GWQS. Over time, GWQS would be achieved by dissipation/dilution. 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.	Not applicable.	Would comply with federal and state ARARs for floodplains and other sensitive receptors.
Action-Specific ARARs	Not applicable.	Not applicable.	Not applicable.
LONG-TERM EFFECTIVENESS AND PERMANENCE			
Magnitude of Residual Risk	Existing (HI greater than 1) non-carcinogenic risk from exposure to site groundwater would remain.	Same as Alternative 1. Existing risks would remain. Over time, concentrations of metals in groundwater downgradient of the site would be expected to decrease as a result of natural influences.	Same as Alternative 2. Existing risks would remain. Institutional controls would preclude use of groundwater. Over time, concentrations of metals in groundwater downgradient of the site would be expected to decrease as a result of natural influences.

TABLE 9
SITE 1 - COMPARATIVE ANALYSES OF REMEDIAL ALTERNATIVES
OU-8 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: LIMITED ACTION (LONG-TERM MONITORING)	ALTERNATIVE 3: LIMITED ACTION (LONG-TERM MONITORING AND INSTITUTIONAL CONTROLS)
Adequacy and Reliability of Controls	No new controls would be implemented. Existing site features provide limited controls.	Same as Alternative 1.	If implemented and enforced, the CEA could prevent use of contaminated groundwater.
Need for 5-Year Review	Not applicable.	Review would be required since soil and groundwater contaminants would be left in place.	Same as Alternative 2.
REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT			
Reduction of Toxicity, Mobility, or Volume Through Treatment	No reduction, since no treatment would be employed.	Same as Alternative 1.	Same as Alternative 1.
SHORT-TERM EFFECTIVENESS			
Community Protection	No risk to community is anticipated.	No significant risk to community anticipated.	Same as Alternative 2.
Worker Protection	Not applicable.	No risk to workers is anticipated if proper PPE is used during long-term monitoring.	Same as Alternative 2.
Environmental Impacts	No adverse impacts to the environment are anticipated.	Same as Alternative 1.	Same as Alternative 1.
Time Until Action is Complete	Not applicable.	Not applicable.	Approximately 12 months to institute CEA.

TABLE 9
SITE 1 - COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
0U-8 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: LIMITED ACTION (LONG-TERM MONITORING)	ALTERNATIVE 3: LIMITED ACTION (LONG-TERM MONITORING AND INSTITUTIONAL CONTROLS)
IMPLEMENTABILITY			
Ability to Construct and Operate	No construction or operation would be involved.	No difficulties are anticipated. Well installation is a readily implementable technology.	Same as Alternative 2.
Ease of Doing More Action if Needed	Additional actions would be easily implemented if required.	Additional actions, such as establishment of a CEA, would be easily implemented if required.	Additional actions would be easily implemented if required.
Ability to Monitor Effectiveness	No monitoring would be involved.	Monitoring would provide assessment of potential exposures, contaminant presence, migration, or changes in site conditions.	Same as Alternative 2.
Ability to Obtain Approvals and Coordinate with Other Agencies	No coordination would be required.	Coordination for 5-year reviews may be required and would be obtainable.	Same as Alternative 2. 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.	Same as Alternative 1.	Same as Alternative 1.
Availability of Equipment, Specialists, and Materials	None required.	Equipment and personnel are available to perform long-term monitoring and 5-year reviews.	Same as Alternative 2.
Availability of Technology	None required.	None required.	None required.

TABLE 9
SITE 1 - COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
OU-8 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: LIMITED ACTION (LONG-TERM MONITORING)	ALTERNATIVE 3: LIMITED ACTION (LONG-TERM MONITORING AND INSTITUTIONAL CONTROLS)
COST			
Capital Cost	$0	$15,900	$41,900
First-Year Annual O&M Cost	$0	$8,050	$8,050
Five-Year Reviews	$0	$15,500	$15,500
Present Worth Cost*	$0	$149,200	$175,200

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