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PROPOSED PLAN SITES 3 AND 10 OPERABLE UNIT 6 (OU6) NWS EARLE NJ
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TETRA TECH

PROPOSED PLAN
for
SITES 3 AND 10 (OU-6)

NAVAL WEAPONS STATION EARLE
Colts Neck, New Jersey

Northern Division
Naval Facilities Engineering Command

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TETRA TECH NUS, INC.

Department of the Navy

Proposed Remedial Action Plan for OU-6

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

MAY 2001

NAVY ANNOUNCES PROPOSED REMEDIAL ACTION PLAN

The Department of the Navy has completed a **feasibility study** (FS) for OU-6 to address contamination associated with Sites 3 and 10 at Naval Weapons Station (NWS) Earle in Colts Neck, New Jersey.

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 (OU's) comprising sites with similar site characteristics. The Navy is then able to save time and money by processing similar sites simultaneously. OU-6 consists of Sites 3 and 10.

Site 3 is a former landfill that was used from 1960 to 1968 for the disposal of domestic and industrial wastes. Site 10 is a 2-acre site that was used from 1953 to 1965 for the disposal of demilitarized metals from munitions and spent munitions cases.

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 3 and 10.

This Proposed Plan summarizes the findings of the OU-6 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-6.

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 3 and 10.

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-6, based on the FS. The Proposed Plan also summarizes information that can be found in greater detail in the RI report for OU-6 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.

PUBLIC MEETING

A public meeting to discuss this Proposed Plan will be held on Thursday, May 10, 2001 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.*

The Navy, with EPA, may modify the selected remedy presented in this Proposed Plan for OU-6 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 1 shows the Mainside Area, where OU-6 sites are located.

Commissioned in 1943, the facility's primary mission is to supply ammunition to the naval fleet. An estimated 2,500 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 6,500 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 3 and 10 are located in the Mainside area (Figure 1). A brief description of each site follows.

Site 3 - Landfill Southwest of "F" Group

The landfill southwest of "F" group (Site 3) is a 5-acre site that was used from 1960 to 1968 for the disposal of domestic and industrial wastes (Figure 2). Industrial wastes disposed at Site 3 consisted of paints and paint thinners, solvents, varnishes, shellac, acids, alcohols, caustics, pesticide containers and rinse water, wood, and small amounts of asbestos. Navy records, reviewed for the **Initial Assessment Study (IAS)** in 1982 indicated that the industrial wastes comprise only a small portion of the approximately 4,800 tons of waste. Test pits performed at Site 3 in 1995 confirmed the IAS findings, encountering aged municipal trash consisting of plastic, wood, old newspaper, rusted tin cans, oil filters, empty antifreeze bottles, and glass bottles. Trash was found within two feet of the ground surface. Sandy soil was the only cover material.

Scant evidence has been found on the surface of the property indicating that sportsmen used the area for shotgun target practice at some unknown time period in the past. Lead values in surface soil or sediment samples indicate no significant impact from past skeet shooting practices.

Site 10 - Scrap Metal Landfill

The scrap metal landfill (Site 10) is a 2-acre site that was used from 1953 to 1965 for the disposal of demilitarized munitions and spent munitions cases (Figure 3). There is no known evidence that any live ammunition is interred at the site. Only certified-inert (i.e., no energetic potential remaining) materials were reported to have been disposed here. An estimated 65,000 cubic yards, which includes cover material, were disposed at the site. The disposed material consisted primarily of aluminum and steel containers. Spent grit and paint chips from the ammunition re-work operations were also buried. The landfill is primarily covered with a sandy soil and is not covered with an impermeable cap. The site is vegetated with grasses and scrub pines, except for the access road and an open, disturbed, vehicle turn-around area, where no vegetation exists. Since cessation of disposal at this site, the sandy soil cover material has eroded and 40-mm shell cases have been uncovered.

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 1982, 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-6 site investigations are discussed below.

Site 3

IAS Results

The 1983 IAS consisted of interviews and on-site observations. Based on the potential for groundwater impacts to the Kirkwood Aquifer, the site was recommended for further investigation.

SI Results

A Confirmation Study in 1986 (now known as a Site Investigation) included the installation and sampling of three monitoring wells, MW3-01 through MW3-03. Groundwater samples were found to have a relatively low pH, but no compounds were found at concentrations above regulatory limits at that time. No other Site 3 media were sampled in the confirmation study.

Phase I RI/FS Results

Phase I RI/FS activities were conducted by the Navy in 1993 at NWS Earle. During the RI/FS, seven test pits were excavated to obtain a physical description of the waste materials and surrounding soils, and four additional monitoring wells were installed at Site 3 to monitor groundwater quality. Two representative samples of "soil" in contact with the waste were taken from the test pits to obtain a representative characterization of the status of soils in the area.

Based on visual inspection of test pit excavations, the landfill contains typical municipal waste. The two soil samples collected from the test pits were analyzed for **Target Compound Lst (TCL)** organics and **Target Analyte List (TAL)** inorganics and **total petroleum hydrocarbons (TPH).** Three semivolatile compounds, fluoranthene, pyrene, and bis(2-ethylhexyl)phthalate, were detected at concentrations below the method detection limit. Barium was detected at a concentration of 1,320 mg/kg, TPH was detected at a concentration of 110 mg/kg, and trace levels of pesticides were encountered in one sample.

Groundwater from all seven wells was collected and analyzed for full TCL/TAL analytes. Later rounds of groundwater samples were analyzed for **volatile organic compounds (VOCs)**, drinking water metals, and inorganic landfill indicator parameters at a limited number of wells.

In groundwater samples, an elevated level of arsenic (0.37 ppm) was found in one downgradient well MW3-01. This high level of arsenic in groundwater was not reproduced in later sampling events. Since subsequent sampling events in all media (including groundwater) at Site 3 encountered arsenic at levels near or below the corresponding

background arsenic concentration for that medium, this high arsenic reading was not used for the risk assessment calculations.

Elevated levels of VOCs and **semivolatile organic compounds (SVOCs)** were found in some wells (particularly monitoring well MW3-04). Wells MW3-04 and MW3-05 had low levels of several pesticide compounds.

Monitoring wells downgradient of the landfill contained higher levels of the landfill indicator parameters [chemical oxygen demand (COD) (235 to 1,960 mg/l), and sulfate (64.9 to 74.6 mg/l)] than were found in the upgradient well (COD, 96.8 mg/l; sulfate, 14.3). Subsequent analysis in the final RI report concluded that although this former landfill has some impact on shallow groundwater quality, it is not indicative of a concentrated leachate that would be in itself an ecological or human health risk.

Phase II Remedial Investigation

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

- Soil gas survey and analysis at 25 locations.
- Excavation of two test pits.
- Drilling and installation of one shallow permanent monitoring well.
- Sampling and analysis of groundwater from monitoring wells.
- Measurement of static water levels in monitoring wells.
- Sampling and analysis of one surface soil in the wetlands southeast of the landfill (03SDWET3A-1).

Regional mapping places Site 3 within the outcrop area of the Kirkwood Formation. The Kirkwood Formation ranges between 60 and 100 feet in thickness. The lithology of the sediments encountered in the on-site borings generally agrees with the published description of the Kirkwood and Vincentown Formations. Assuming a portion of the Kirkwood Formation was removed by erosion, it is possible that at least one of the soil borings penetrated the underlying Vincentown Formation.

Tables 1 through 5 compare the results of background samples to samples collected at Site 3. Concentrations of most metals in site-related sediment samples were similar to the range associated with background samples. Antimony (1.3 mg/kg) was found in sediment sample (03SDWET3A-1) at low concentrations near the instrument detection limit but was not detected in the background samples. **Polycyclic aromatic hydrocarbons (PAHs)**, including benz(a)anthracene, benzo(a)pyrene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, fluoranthene, fluorene, and pyrene, were detected in 03SDWET3A-1 at concentrations two to three times above background concentrations. 4-4'-DDT was detected in sediment samples at concentrations ranging from 3 to 4 ug/kg;; however, background concentrations as high as 19 ug/kg were detected. Alpha-BHC and heptachlor epoxide were detected in sample 03SDWET3A-1 at 0.082 ug/kg and 2.2 ug/kg respectively. With the exception of beryllium, the site-related samples also showed the presence of all the metals found in background, in addition to arsenic and thallium. The highest concentrations of metals in Site 3 groundwater samples were detected in the sample collected at 03 GW 01. This well and one other (03 GW 03) required sample filtering in the field. The filtered sample from the downgradient location, 03 GW 01, exhibited fairly high aluminum levels (5,520 ug/L) and also displayed concentrations greater than background ranges for antimony and cadmium. Other metals, such as iron, zinc, and barium,

were present at considerably lower levels in the filtered sample. Sample 03 GW 05, collected from a well cross-gradient from the landfill, displayed an elevated level of manganese, and sample 03 GW 06 (an upgradient location) exhibited thallium at a low level. VOCs detected above the New Jersey Department of Environmental protection (NJDEP) Groundwater Quality Standards (GWQS) in MW3-04 were acetone (970 ug/L) and xylene (470 ug/L). 2-Butanone (5 ug/L) and gamma-chlordane (0.0081 ug/L) were each detected in one groundwater sample collected at Site 3. Neither of these compounds was detected in background groundwater samples.

Figure 4 shows sample locations and concentrations of compounds that exceed **applicable or relevant and appropriate requirements (ARARs)** and other guidance to be considered.

RI Addendum Investigation

Based on the results of previous investigations and the 1995 RI, it was concluded that further sampling to delineate the extent of contamination in the wetlands adjacent to the site, particularly in the drainage pathway southeast of the site, was required to evaluate potential impacts on ecological receptors.

On October 29 and 30, 1996, the Navy conducted the following field activities at site 3:

- Sampling and analysis of surface soil
- Sampling and analysis of sediment

Concentrations of metals in surface soils were similar to the range found in background samples. Concentrations of PAHs in the three new sediment samples collected for the RI Addendum were found within the range of background concentrations [benz(a)anthracene, 68.0 to 93.0 ug/kg; benzo(a)pyrene, 81.0 to 97.0 ug/kg; benzo(b)fluoranthene, 110 to 120 ug/kg; benzo(k)fluoranthene, 50 ug/kg; chrysene, 130 to 140 ug/kg; fluoranthene, 160 to 190 ug/kg; phenanthrene, 180 to 220 ug/kg; and pyrene, 190 to 230 ug/kg]. One pesticide was detected in sediments at a low level (4-4'-DDT, 3.0 ug/kg).

Site 10

IAS Results

An IAS in 1983, consisting of a document search, interviews, and on-site observations, concluded that materials (mostly metals) present in the landfill were not leaching into the environment, probably due to the moderate range of pH values in the environment. Erosion of the very thin cover material was noted, along with the exposed corroded shell casings. Although the site was not initially recommended for a confirmation study in the IAS, additional remedial investigation followed at the request of the EPA and the New Jersey Department of Environmental Protection.

SI Results

During the 1986 SI, three monitoring wells were installed, and surface water and groundwater samples were analyzed. Methylene chloride (a probable error or artifact from the laboratory performing the analysis of the SI samples) was detected at MW10-01, MW10-02, and MW10-03. Silver, at a concentration of 4 ug/l, and mercury, at a concentration of 0.3 ug/l, were found in surface water samples. Two semivolatile organic compounds, n-nitrosodiphenylamine (30 to 31 ug/l) and di-n-butyl phthalate (2 to 70 ug/l), were also detected in the SI surface water samples.

The presence of the compounds found in groundwater was the basis for subsequent investigation.

Phase I Remedial Investigation

During the 1993 RI, four test pits were excavated and four monitoring wells were installed.

Groundwater samples were collected from all seven wells and analyzed for TCL/TAL analytes, VOCs, drinking water metals, and landfill parameters. Elevated levels of metals were detected in several wells, but no consistent distinction was found between upgradient and downgradient wells. Analysis of landfill parameters showed no distinction between downgradient wells and the upgradient wells. VOCs were detected in groundwater samples, but these compounds were considered a result of common laboratory error in preparing or handling the RI samples.

Waste was encountered in two of the four test pits. One test pit sample was analyzed for TCL/TAL analytes and TPH (two test pit samples were planned to have been obtained to provide a representative sampling, but apparent field error resulted in only one sample being analyzed). Bis(2-ethylhexyl) phthalate at an estimated concentration of 86 ug/kg (possibly an artifact from field sampling error since this compound is often present in disposable gloves) and a low level of TPH were detected in the test pit sample.

Additionally, three surface water and sediment samples were collected. Surface water samples were analyzed for VOCs and TPH. The sediment samples were analyzed for VOCs, TCL organic compounds, TAL metals, **polychlorinated biphenyl (PCB)** compounds, and pesticides. Low levels of SVOCs and inorganics were detected in the sediment samples. It was considered likely that the SVOCs were associated with runoff from the adjacent railroad bed. Metals concentrations were relatively low, and no PCB or pesticide compounds were detected. Several VOCs typically associated with laboratory contaminants were detected in surface water samples. TPH was not detected in surface water.

Phase II Remedial Investigation

Between July and October 1995, the Navy conducted the following field investigation activities at Site 10:

- Sampling and analysis of groundwater samples from the seven existing monitoring wells.
- Measurement of static water levels in the seven existing wells to clarify the direction of groundwater flow.

Regional mapping places Site 10 within the outcrop area of the Kirkwood Formation; upper colluvium may be present at the site. Groundwater in the upper colluvium, Kirkwood, and Vincentown aquifer beneath the site occurs under unconfined conditions and the geologic units are interpreted to be hydraulically interconnected. The direction of shallow groundwater flow in the aquifer is toward the northwest, north, and north-northeast.

Seven site-related groundwater samples (10 GW 01 through 10 GW 07) were collected at Site 10. Table 6 compares the results of background samples to samples collected at Site 10. Figure 5 shows sample locations and concentrations of compounds that exceed ARARs and TBCs.

Metals in groundwater were concluded to be the only compounds of concern at this (former metals landfill) site. Concentrations of most

metals in Site 10 groundwater were within the range of background results. Arsenic (4.7 ug/l), silver (1.5 ug/l), and thallium (3.7 ug/l), were encountered, in addition to the metals found in background groundwater samples. Iron was detected at an elevated concentration, 16,000 ug/l, in one groundwater sample.

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 3 and 10. An addendum ecological risk assessment was performed for Site 3 after the RI addendum investigation.

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-6 sites. Results of this assessment are discussed for each site.

Site 3

The potential receptors considered for this site were future industrial, residential, and recreational receptors exposed to surface soil, sediments and groundwater. The **reasonable maximum exposure (RME)** cancer risks associated with future residential and future industrial (groundwater, surface soil and sediments) exposure scenarios did not exceed the upper end

of the conservative EPA guidance target risk range. Arsenic (via ingestion of groundwater and dermal contact with groundwater) is the principal **chemical of potential concern (COPC)** that contributed to the cancer risks for these exposure scenarios.

Risk assessment calculations were not performed for the contents of the landfill ("subsurface soil").

RME estimates for noncarcinogenic HI's associated with future industrial, residential, and recreational receptors exposed to surface soil, and sediments did not exceeded 1.0, the cutoff point below which adverse noncarcinogenic effects are not expected to occur. RME estimates for noncarcinogenic HI's associated with the future residential groundwater exposure scenario exceeded 1.0. Arsenic is 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.

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

Site 10

The potential receptors considered for this site were future industrial, residential, and recreational receptors. The RME cancer risks associated with future recreational, residential and future industrial (groundwater) exposure scenarios did not exceed the upper end of the conservative EPA guidance target risk range.

The RME estimates for noncarcinogenic HIs associated with future residential (groundwater) exposure scenario exceeded 1.0, the cutoff point below which adverse noncarcinogenic effects are not expected to occur. Arsenic is the COPC that exceeded 1.0 for this exposure scenario.

Lead groundwater 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).

Human health risk assessment calculations did not include data from field sampling prior to the 1995 RI. Only groundwater scenarios were considered in this risk assessment. Conclusions from previous investigations indicated that Site 10 surface water or sediment pathways were not contributing a significant human health risk to potential receptors. However, a surface or subsurface soil sample taken in an area of exposed corroded shell casings would almost certainly show high metals concentrations. Risk related to these metals concentrations were not calculated because it was assumed some remedial action would be performed to eliminate this exposure pathway.

Ecological Risks

Site 3

The assessment for Site 3 focused on protection of the adjacent wetland area. The study concluded that impacts to the wetlands appear to be minor and potential ecological risks to wetland receptors appear to be insignificant.

Therefore, no remedial action based on potential risks to ecological receptors or additional ecological study was recommended at Site 3.

Site 10

No sensitive habitats, other than the wetlands, and no threatened or endangered species are known to occur in the area. Aquatic migration pathways and exposure routes were the main concern for Site 10.

The study concluded that potential risks to ecological receptors at Site 10 and contaminant contributions to the Hockhockson Brook Watershed appear insignificant, and further study or remediation at the site based on ecological concerns is considered unwarranted.

REMEDIAL ACTION OBJECTIVES (RAOs)

The overall objective for the remedy at Sites 3 and 10 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 contaminated environmental media at Sites 3 and 10.

Site 3 RAOs

The following remedial action objectives have been selected for Site 3:

Protection of Human Health RAO

- Prevent potential human exposure to metals in groundwater
- Prevent potential contact with landfill contents

Prevention of metals and landfill contents from leaching into groundwater was not selected as a RAO for Site 3 because chemicals detected in groundwater do not conclusively demonstrate groundwater impact from the former landfill.

Protection of the Environment RAO

- Minimize migration of landfill contaminants to the adjacent wetlands.
- Prevent potential contact with landfill contents.

Site 10 RAOs

The following remedial action objectives have been selected for Site 10:

Protection of Human Health RAO

- Prevent potential human exposure to contaminated landfill materials.

Prevention of metals and landfill contents from leaching into groundwater was not selected as a RAO for Site 10 because groundwater metals concentrations were generally in the range of background. There does not appear to be a significant impact to groundwater from the site.

Protection of the Environment RAO

- Minimize exposure to exposed corroded metal wastes.

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. 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)** which will document the selection of remedial action for OU-6 following the receipt of public comments.

Based on the nature of contamination and site conditions, 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. Tables 7 and 8 present the considered alternatives and the results of screening.

Detailed Summary of Alternatives

Summaries of the remedial alternatives that passed the screening step for Sites 3 and 10 are presented in the following sections.

Site 3 Remedial Alternatives

Alternative 1: No Action

The no-action alternative is required by the NCP to be used as a baseline to which other alternatives may be compared. No remedial actions would be taken to protect human health or the environment. The purpose of this alternative is to evaluate the overall human health and environmental protection provided by the site in its present state. No measures would be implemented to remove or contain the suspected contaminant source (the landfill), to prevent potential human exposure to site groundwater, or to mitigate contaminant migration in the environment. Periodic reviews of site conditions, typically every 5 years, and long-term monitoring of groundwater would be conducted under this alternative.

Cost

Capital costs for the no-action alternative total $41,400. The average annual operational and maintenance (O&M) cost for long-term monitoring is $17,500, and 5-year reviews are $15,500 per event. Over a 30-year period, the net present-worth cost is $291,000.

(Note: A discount rate of 7 percent was used in all alternative cost calculations).

Alternative 2: Limited Action

Alternative 2 relies on containment and institutional controls to achieve RAOs. After limited removal of protruding landfill materials, scarred or bare areas would receive additional soil cover, regrading, and revegetation to prevent potential human and animal contact with contaminants in the landfill materials. The perimeter of the landfill would be fenced and warning signs would be posted to limit access to the covered area.

Access restrictions would be placed to limit future uses of the site that may result in disturbance of the soil cover or direct contact with contaminated media. Future construction in or over the area would be prohibited unless effective measure were taken to ensure an equal level of protection provided by the soil cover could be maintained during and after construction. A Classification Exception Area (CEA) pursuant to N.J.A.C 7:9-6 would be established to prohibit the use of untreated groundwater as drinking water. NJDEP administers the CEA program to ensure groundwater that temporarily does not meet GWQS guidelines is not inadvertently used for a potable water source. Long-term, periodic monitoring and 5-year reviews would assess contaminant status and potential threats to human health and the environment.

Cost

The capital costs for Alternative 2 total $627,600. The average annual O&M costs are $17,500, and 5-year reviews cost $15,500 per event. Over a 30-year period, the net present-worth cost is $878,000 (at a 7 percent discount rate).

Alternative 3: Capping, Institutional Controls, and Long-Term Monitoring

Alternative 3 relies on containment and institutional controls to achieve RAOs. A low-permeability cover system would be used to prevent potential human and animal contact with contaminants in the landfill materials, limit contaminant leaching to groundwater, and minimize contaminant migration via surface runoff and erosion. The perimeter of the landfill would be fenced and warning signs would be posted to limit access to the covered area. Access restrictions would be placed to limit future uses of the site that may result in disturbance of the soil cover or direct contact with contaminated media and to prohibit the use of untreated groundwater as drinking water. Over time, as a result of reduced leaching of contaminants from the landfill, groundwater contamination is expected to gradually decrease by chemical and physical mechanisms. Long-term, periodic monitoring and 5-year reviews would assess contaminant status and potential threats to human health and the environment.

Cost

The capital costs for Alternative 3 total $4,962,100. The average annual O&M costs are $20,400, and 5-year reviews cost $15,500 per event. Over a 30-year period, the net present-worth cost is $5,249,000 (at a 7 percent discount rate).

Site 10 Remedial Alternatives

Alternative 1: No Action

The no-action alternative was developed as a baseline to which other alternatives may be compared, as required by the NCP. No remedial actions would be taken to protect human health or the environment. The purpose of this alternative is to evaluate the overall human health and environmental protection provided by the site in its present state. No measures would be implemented to remove or contain the suspected contaminant source (the landfill), to prevent potential human exposure to site groundwater, or to mitigate contaminant migration in the environment.

Cost

There are no costs associated with the no-action alternative.

Alternative 2: Limited Action

Alternative 2, Limited Action, consisting of institutional controls and access restrictions, provides little additional protectiveness to human health and the environment through fencing and institutional controls. This alternative would not impede the migration of landfill contents to the environment.

This alternative was not retained.

Cost

No cost is estimated for Alternative 2 because the alternative was not retained.

Alternative 3: Capping, Institutional Controls, and Long-Term Monitoring

Alternative 3 relies on containment and institutional controls to achieve RAOs. A cover system would be installed over the area of former active landfill operations to prevent potential human and animal contact with contaminants in the landfill contents, reduce contaminant leaching to groundwater, and minimize contaminant migration via surface runoff and erosion. Access restrictions would be employed to limit future uses of the site that may result in direct contact with contaminated media and to prohibit the use of untreated groundwater as drinking water.

Routine inspection and maintenance of the entire landfill surface would be conducted to ensure the integrity of the existing and new cover systems.

Note: Details of this proposed alternative vary slightly from the Alternative 3 presented in the FS (vegetative cover system versus a proposed asphalt cap); however, the overall protection of human health and the environment remains equivalent.

Cost

The capital costs for Alternative 3 total $1,072,063. The average annual O&M costs are $20,000 and 5-year reviews cost $15,000 per event. Over a 30-year period, the net present-worth cost is $1,347,000 (at a 7 percent discount rate).

EVALUATION OF ALTERNATIVES

The 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

Site 3

Overall Protection 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 to contain contaminants or prevent deterioration of the landfill surface, health risks and adverse impacts to the environment are expected to remain the same or increase over time.

Alternative 2 is protective of human health and the environment. The institutional controls would reduce human health risks posed by contact with landfill contents and would provide assurance that untreated contaminated groundwater is not used as a potable water source in the future.

Alternative 3 is most protective of human health and the environment. The soil cover system would reduce human health and ecological risks posed by contact with landfill contents and would reduce infiltration through landfill materials and leaching of contaminants to groundwater, thereby reducing contaminant migration into the environment. Routine maintenance of the landfill cover would ensure its long-term protectiveness. Institutional controls would provide assurance that untreated contaminated groundwater is not used as a potable water source in the future.

Compliance with ARARs.

Because Alternative 1 does not include any remedial actions, it would not comply with state and federal ARARs pertaining to post-closure of municipal landfills [40 CFR 258.60 and 258.61 and N.J.A.C. 7:26-2A.9]. Alternative 2 would comply with some of these requirements. Alternative 3 would comply with these requirements since a cover system would be installed and a long-term maintenance and repair program would be implemented.

All three alternatives would comply with federal and state long-term monitoring requirements through periodic monitoring and evaluation of groundwater, surface water, and sediments.

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

Long-Term Effectiveness and Permanence.

Alternatives 2 and 3 offer substantial long-term protection of human health and the environment.

Under Alternative 1, risks would remain the same or increase over time as the landfill surface erodes because no additional actions would be taken to contain wastes and limit deterioration of the landfill surface. 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 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. Regrading and revegetation would slightly reduce infiltration of rainwater through the fill material.

Alternative 3 would reduce human and ecological risks due to direct exposure to landfill contents by eliminating the potential for exposure. Long-term risks due to ingestion of site groundwater would be mitigated by significantly reducing contaminant leaching into groundwater and 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.

Alternative 3 would reduce the mobility of landfill contaminants by significantly reducing precipitation infiltration.

Short-Term Effectiveness

The short-term effectiveness of the three alternatives would be similar since the use of appropriate engineering controls and personal protective equipment (PPE) is expected to minimize adverse impacts to station residents and personnel, the local community, and workers during implementation.

Long-term monitoring, which would provide little opportunity for short-term impact, is the only on-site action proposed under Alternative 1.

Alternatives 2 and 3 would present a greater opportunity for short-term impact due to site preparation and grading and construction of the soil cover system (Alternative 3 only).

Impacts to the environment are not anticipated under Alternative 1 since minimal activities would be conducted. Impacts to the environment would be minimized under Alternative 2 and 3 by use of erosion and stormwater control measures during site work.

Alternative 1 would not achieve any of the RAOs. Alternative 2 would achieve some of the RAOs within approximately 1 year, which would be the time to perform limited removal of protruding landfill contents, place, grade, and revegetate additional soil cover, install the

fencing, and implement the CEA. Alternative 3 would achieve all RAOs within approximately 1.5 years, which would be the time to design and install the proposed cover and to implement the CEA.

Implementability

Alternative 1 is the most easily implemented since the only activities proposed are long-term monitoring and 5-year reviews. Alternative 2 would be more difficult to implement since it would involve removal of protruding landfill contents, placement, grading, and revegetating additional soil cover, the installation of fencing, and implementation of the CEA; 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 the construction of an enhanced cover system over several acres of land; however, no difficulties are anticipated, since common construction techniques are required and cover materials are available from several vendors.

If additional actions are warranted, they could be easily implemented under Alternatives 1 and 2. Additional actions could be implemented under Alternative 3; however, opening the cover system would be required to access landfill contents.

Cost.

The present-worth cost associated with each alternative is provided below for comparison. Alternative 1, no action, would be the least expensive to implement and Alternative 3 would be the most expensive to implement.

Alternative 1	$291,000
Alternative 2	$878,000
Alternative 3	$ 5,249,000

Site 10

Overall Protection of Human Health and the Environment

Only Alternative 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. Health risks and adverse impacts to the environment are expected to remain the same or increase over time.

Alternative 3 is protective of human health and the environment. The cover system would reduce human health and ecological risks posed by contact with landfill contents. Routine maintenance of the landfill cover system would ensure its long-term protectiveness.

Compliance with ARARs

Because Alternative 1 does not include any remedial actions, it would not comply with state and federal ARARs pertaining to post-closure of

municipal or demolition debris landfills (40 CFR 258.60 and 258.61 and N.J.A.C. 7:26-2A.9].

Alternative 3 would comply with these requirements since a vegetative cover system would be installed and a long-term maintenance and repair program would be implemented, consistent with what would typically be required for a demolition debris landfill.

Long-Term Effectiveness and Permanence

Alternative 3 is the only alternative that offers long-term protection of human health and the environment. Because no additional actions would be taken under Alternative 1 to contain wastes and limit deterioration of the landfill surface, risks would increase over time as the landfill surface erodes. Potential future users of the site may be at risk under Alternative 1 because it lacks features to limit contact with landfill contents. Alternative 3 would reduce human and ecological risks due to direct exposure to landfill contents by eliminating the potential for exposure. Long-term risks due to ingestion of site groundwater would decrease by reducing contaminant leaching into groundwater.

Reduction of Toxicity, Mobility, or Volume through Treatment

Because neither of the alternatives includes treatment, neither would reduce the toxicity, mobility, or volume through treatment. Alternative 3 would reduce the mobility of landfill contaminants by reducing precipitation infiltration into the landfill.

Short-Term Effectiveness

The short-term effectiveness of the two 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. There is no on-site action proposed under Alternative 1. Alternative 3 would present a greater opportunity for short-term impact due to site preparation, grading, and constructing the cover system.

Impacts to the environment are not anticipated under Alternative 1 since no activities would be implemented. Impacts to the environment would be minimized by implementing erosion and storm-water control measures during vegetative cover construction under Alternative 3.

Alternative 1 would not achieve any of the RAOs. Alternative 3 would achieve all RAOs within approximately 1 year, including design and installation of the vegetative cover and implementation of the CEA.

Implementability

Each of the alternatives could be implemented. Alternative 1 is easily implemented since no activities are proposed. Alternative 3 would be more difficult to implement since it involves the construction of a vegetative cover over several acres of land; however, no difficulties are

anticipated, because vegetative covers are a commonly applied technology involving conventional construction methods and cover materials are available from several vendors.

If additional actions are warranted, they could be easily implemented under Alternative 1. Under Alternative 3, additional actions could be easily implemented; however, opening the cover system to would be required to access landfill contents.

Cost

The present-worth cost associated with each alternative is provided below for comparison. Alternative 1, no action, would be the least expensive to implement and Alternative 3 would be the most expensive to implement.

Alternative 1	$0
Alternative 3	$1,347,000

PREFERRED ALTERNATIVE SUMMARY

Site 3

The Navy, with EPA and NJDEP, has selected Alternative 2 - Limited Action, Cover, Grading 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 remote former landfill.

Alternative 2 relies on containment, access restrictions, and institutional controls to limit exposures to site risks.

The site has not been used for many years and is moderately vegetated with grasses and pine trees. Any exposed debris and the remnants of a former skeet range would be removed and additional soil cover material would be placed to grade the site to encourage runoff. Clearing and grubbing of the vegetative growth may be necessary in parts of the site to prepare for soil cover placement. Where possible, the additional cover and grading would be placed around the existing trees.

Grading of the landfill area would be completed without removal of site vegetation, where possible. Compaction of the soils and landfill materials would be performed as needed. The appropriate slopes for the cover (to facilitate drainage) would be determined as part of the soil cover system design.

The final surface slope of landfill soil cover should have a slope of between three percent (3V:1OOH) and five percent (5V:1OOH) to ensure slope stability, control erosion, and allow compaction, seeding, and revegetation of the cover materials. The final slope would also promote precipitation runoff while inhibiting erosion or infiltration.

Restrictions would be attached to the Station Master Plan (access restrictions) to limit future uses of the site to prevent disturbance of the soil cover or direct contact with contaminated media.

A cable-type fence with appropriate warning signs would be erected around the landfill to limit access to the site, to restrict human contact with

contaminated landfill materials, and to protect the integrity of the soil cover. Figure 6 presents a plan view of the Alternative 2 conceptual design.

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 2, access restrictions would be enacted to limit future use of the landfill property. Restrictions would be placed on future activities that could result in increased human exposure to contaminated landfill materials or increased erosion and contaminant migration. Restricted activities would include excavation, vehicular traffic (off-road vehicles and dirt bikes), and 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 10

The Navy, with EPA and NJDEP, has selected Alternative 3 - Cover and Institutional Controls - 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 waste-metals disposal area.

Alternative 3 relies on containment and institutional controls to limit exposure to landfill contents.

Grading of the landfill area, combined with placement of vegetative cover, would prevent potential human and animal contact with landfill materials. The vegetative cover would be installed over all former landfill areas of the site. Access restrictions would be enacted to limit future uses of the site that may result in disturbance of the cover or direct contact with landfill materials. Figure 7 presents a plan view of the conceptual design of the cover.

A topographic survey of the site would be performed to collect accurate elevation and contour data for use in the cover system design.

The site has not been used for many years and is moderately vegetated with grasses and pine trees. Clearing and grubbing of the vegetative growth will be necessary to prepare the site for soil covering and grading. Temporary silt fences or staked hay bales would be required to minimize erosion effects while the site is covered and graded.

Compaction of the soils and landfill materials would be performed as needed. The appropriate slopes for the soil cover (to facilitate drainage) would be determined as part of the cover system design.

The graded and vegetated cover system would be designed to prevent human and animal

exposures to landfill material and to prevent migration of contaminants by wind and surface runoff.

A cable-type fence with appropriate warning signs would be erected around the landfill to limit access to the site, to restrict human contact with contaminated landfill materials, and to protect the integrity of the cover. Figure 8 presents a cross sectional view of the Alternative 3 conceptual design.

After the construction of the cover, access restrictions would be used to limit the future activities that could result in intrusion into, and possible damage of, the cover and accidental exposure to the landfill materials. Restricted activities would include excavation.

To ensure the proper functioning and protectiveness of the cover system, routine maintenance and repairs of the fencing, runoff and drainage systems, and the cover system would be required. Since wastes would be left in place, site conditions and risks would be reviewed every 5 years.

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.

COSTS OF THE PREFERRED ALTERNATIVE

Site 3

The estimated cost for Alternative 2 is $878,000.

Site 10

The estimated cost for Alternative 3 is $1,347,000.

State and Community Acceptance

The state of New Jersey supports the preferred alternatives for Sites 3 and 10. 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-6. The Navy has set a public comment period from **April 23, 2001** through **May 23, 2001** to encourage public participation in the decision process for OU-6.

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 Thursday, May 10, 2001 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-6.

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

Commanding Officer
Naval Weapons Station Earle
Code 043
201 Highway 34 South
Colts Neck, New Jersey 07722-5014

For further information, contact John Kolicius, Remedial Project Manager

Phone: (610) 595-0567 ext. 157

Please note that all comments must be submitted and postmarked on or before May 23, 2001.

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: 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 90th 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.

FIGURES

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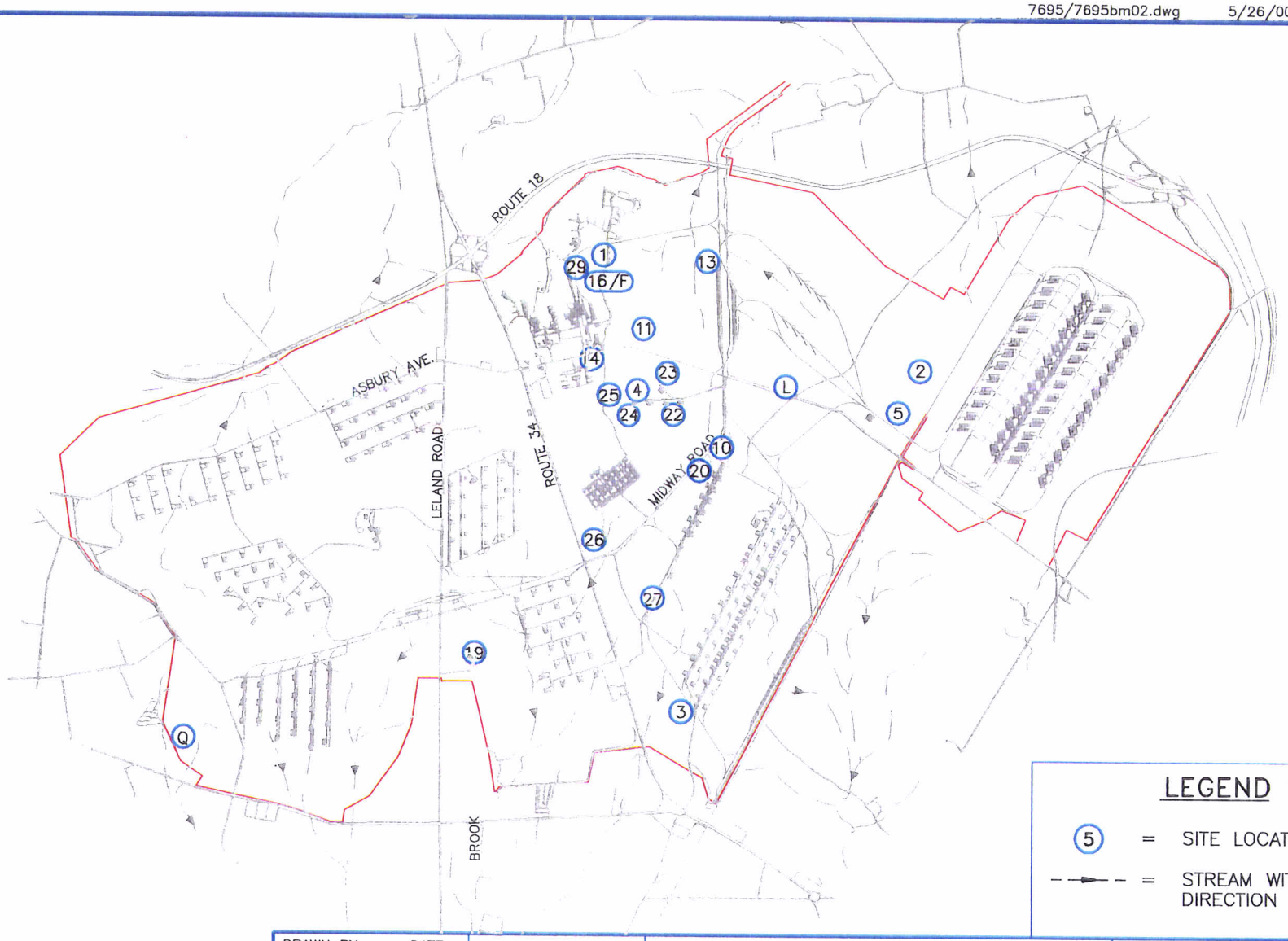

LEGEND

5 = SITE LOCATION

= STREAM WITH FLOW DIRECTION

0 5,000 10,000

SCALE IN FEET

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REVISED BY DATE	
SCALE	AS SHOWN

Tetra Tech NUS, Inc.

MAINSIDE SITE LOCATIONS

NAVAL WEAPONS STATION EARLE

COLTS NECK, NEW JERSEY

CONTRACT NO.	7695
OWNER NO.	0300
APPROVED BY DATE	
DRAWING NO.	FIGURE 1
REV.	

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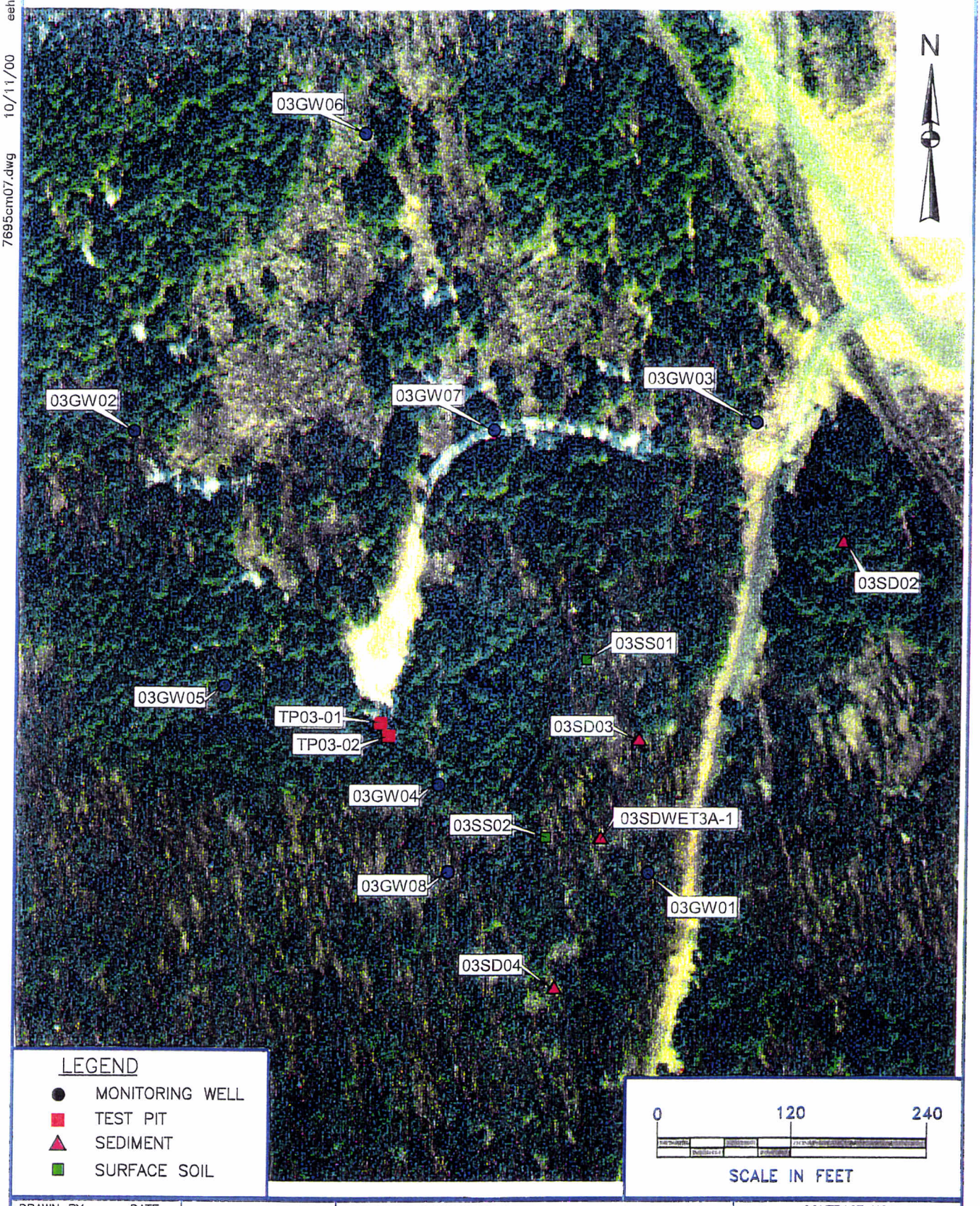

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REVISED BY DATE			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 2 REV.

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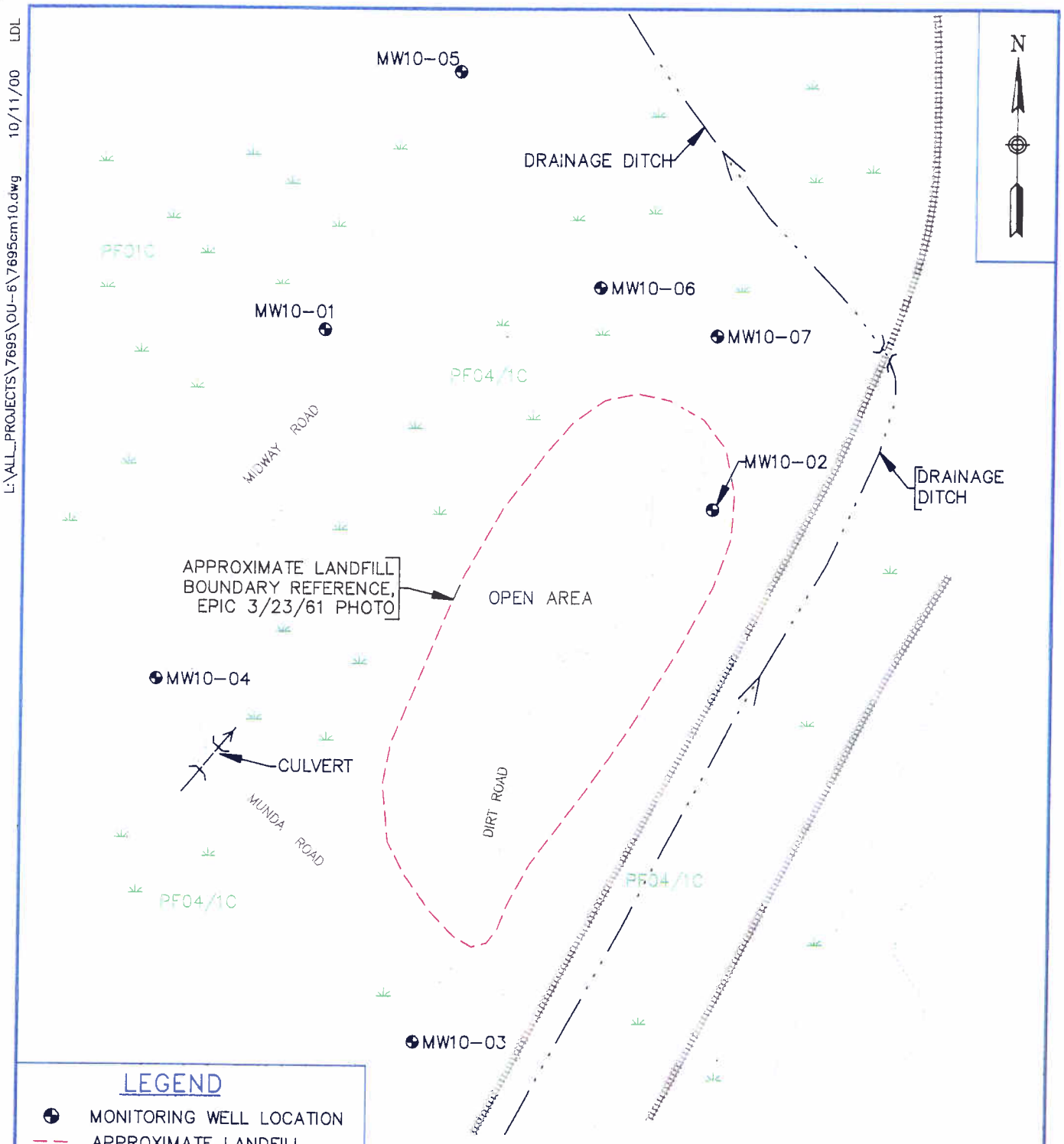

LEGEND

- MONITORING WELL LOCATION
- APPROXIMATE LANDFILL BOUNDRY
- WETLANDS
- WETLANDS DELINEATION SOURCE NJDEP
- DLG STREAM COVERAGE SOURCE: USGS RESTON, VA

0 120 240

SCALE IN FEET

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REVISED BY	DATE
SCALE AS NOTED	

Tetra Tech NUS, Inc.

SAMPLE LOCATIONS
SITE 10
SCRAP METAL LANDFILL
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

CONTRACT NO. 7695	
OWNER NO. OU-6	
APPROVED BY	DATE
DRAWING NO. FIGURE 3	REV.

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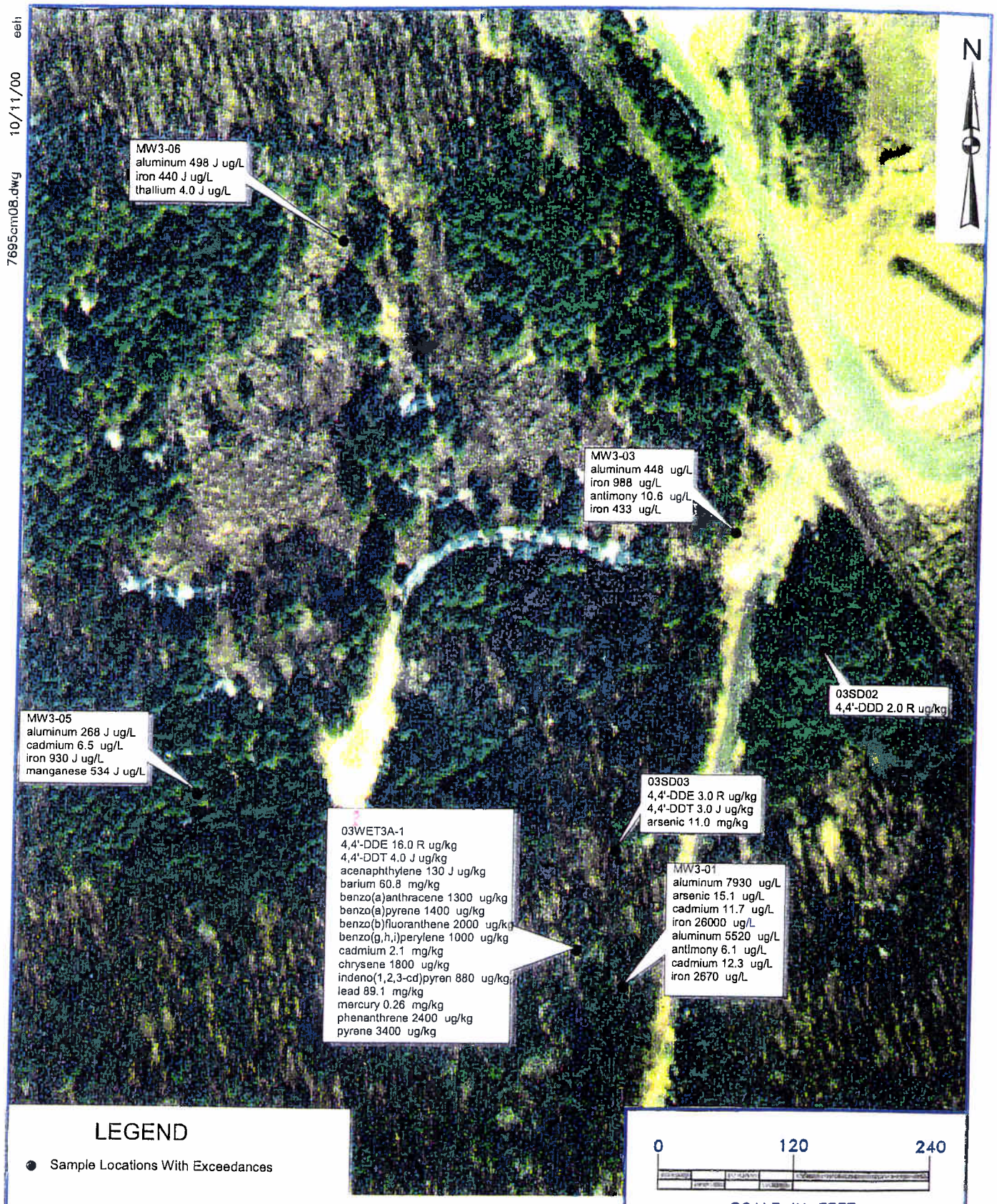

LEGEND

- Sample Locations With Exceedances

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Tetra Tech NUS, Inc.

CONCENTRATIONS ABOVE SCREENING LEVELS
SITE 3 – LANDFILL
SOUTHWEST OF "F" GROUP
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

CONTRACT NO. 7695	
OWNER NO. 0202	
APPROVED BY	DATE
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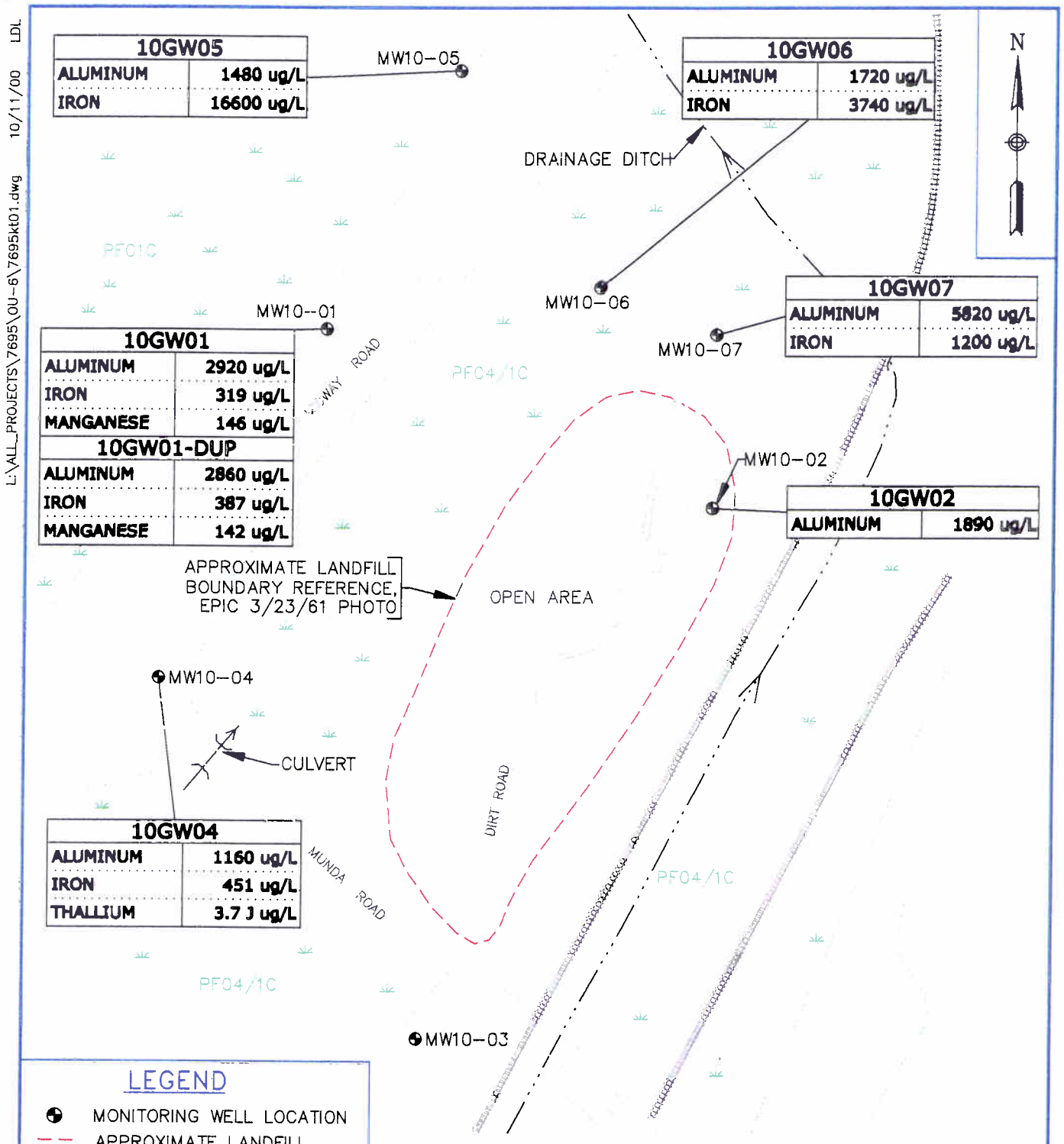

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SCALE	AS NOTED

Tetra Tech NUS, Inc.

CONCENTRATIONS ABOVE SCREENING LEVELS
SITE 10
SCRAP METAL LANDFILL
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

CONTRACT NO.	7695
OWNER NO.	OU-6
APPROVED BY / DATE	
DRAWING NO.	FIGURE 5
REV.	

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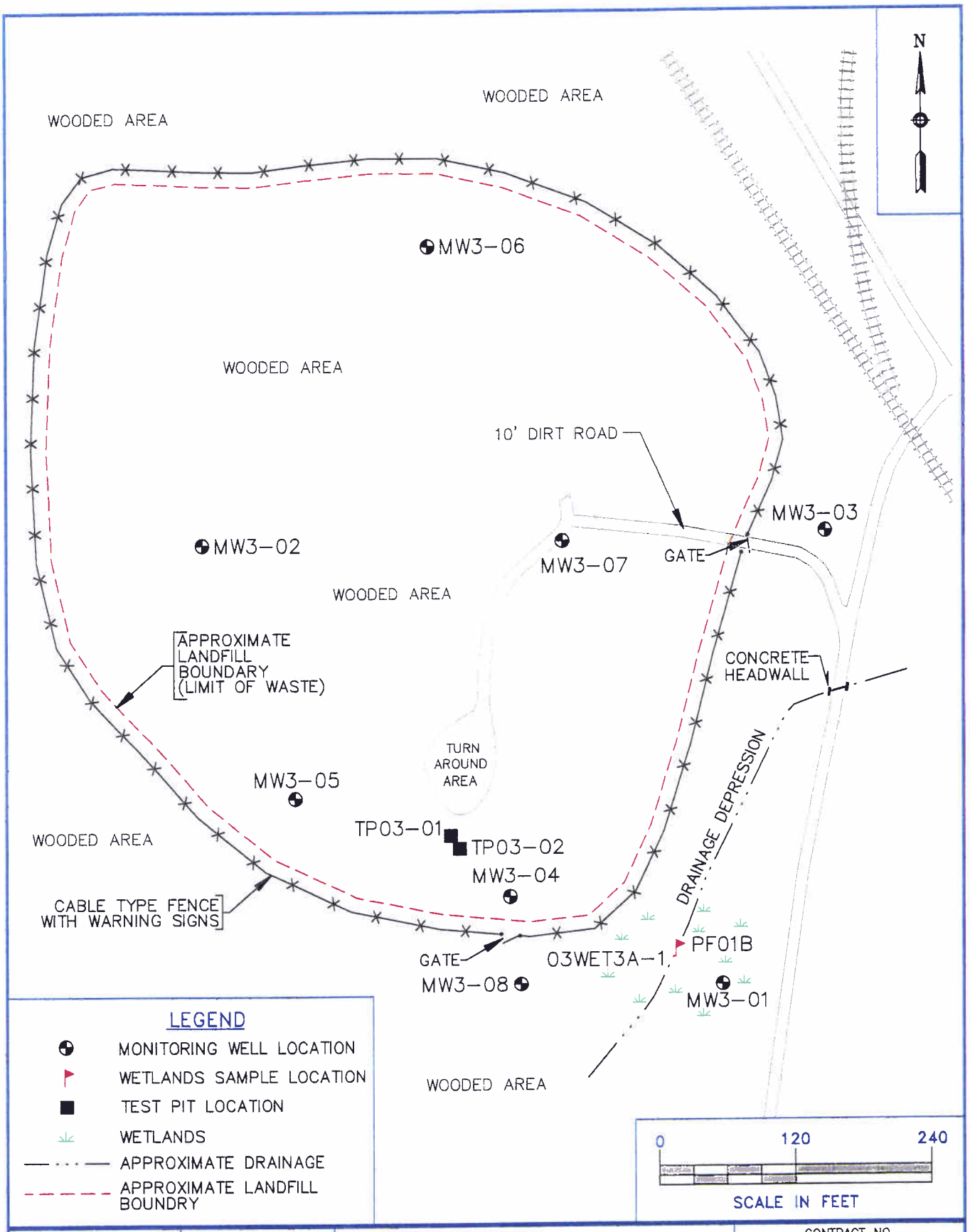

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SCALE	AS NOTED

Tetra Tech NUS, Inc.

ALTERNATIVE 2
SITE 3
LANDFILL SOUTHWEST OF "F" GROUP
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

CONTRACT NO.	7695
OWNER NO.	OU-6
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REV.	

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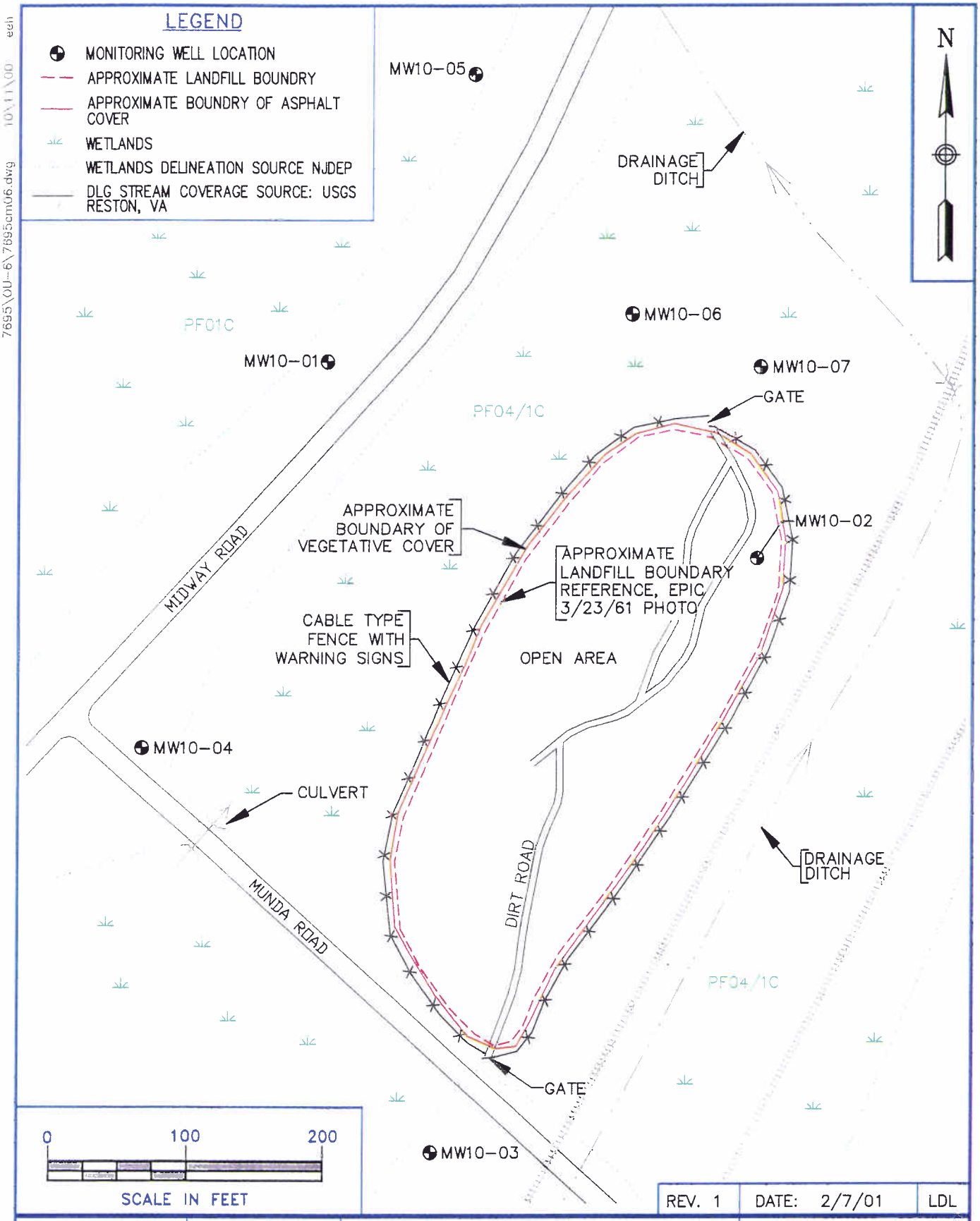

REV. 1	DATE: 2/7/01	LDL

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CHECKED BY DATE		OWNER NO. 0202
REVISED BY DATE		APPROVED BY DATE
SCALE AS NOTED		DRAWING NO. FIGURE 7 REV. 1

ALTERNATIVE 3
SITE 10
SCRAP METAL LANDFILL
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

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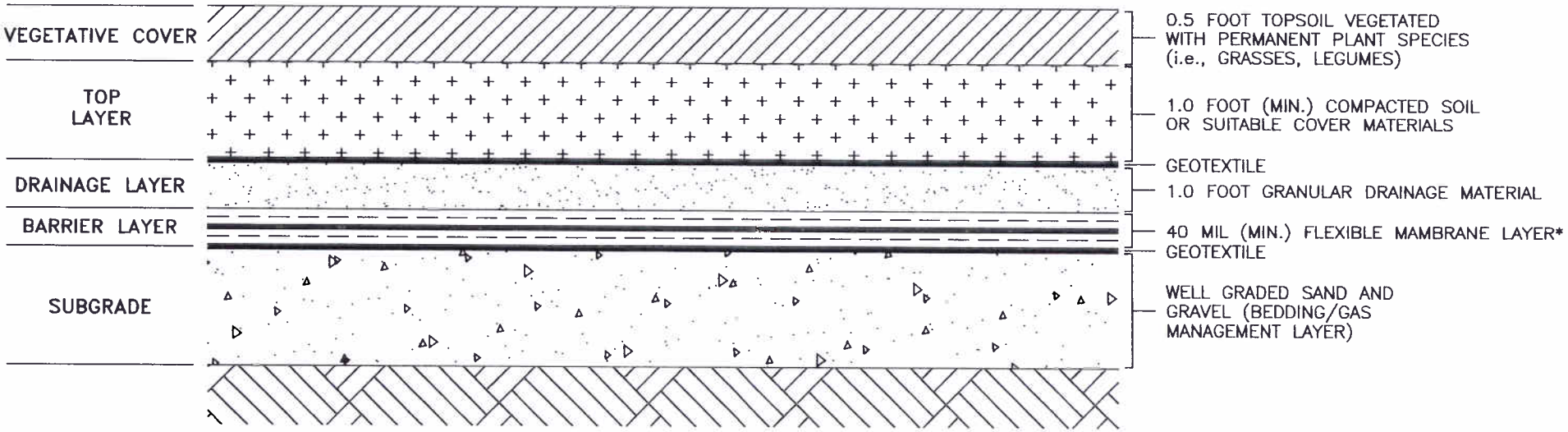

* MAY SUBSTITUTE ONE FOOT OF CLAY OR EQUAL WITH MAX. PERMEABILITY OF 1.0E-07 CM/SEC

CROSS-SECTIONAL VIEW

NOTE:

NOT FOR DESIGN.

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REVISED BY	DATE
SCALE NOT TO SCALE	

Tetra Tech NUS, Inc.

CONCEPTUAL COVER SYSTEM DESIGN
SITE 10 – ALTERNATIVE 3
PROPOSED PLAN OU-6
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

CONTRACT NO. 7695	
OWNER NO. OU-6	
APPROVED BY	DATE
DRAWING NO. FIGURE 8	REV.

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