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FEASIBILITY STUDY
for
SITE 26 PCE PLUME (OU 7)

NAVAL WEAPONS STATION EARLE
Colts Neck, New Jersey

Engineering Field Activity Northeast
Naval Facilities Engineering Command

Contract No. N62467-94-D-0888
Contract Task Order 0843

February 2004

TETRA TECH NUS, INC.

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TETRA TECH NUS, INC.
600 Clark Avenue, Suite 3 • King of Prussia, PA 19406-1433
Tel 610.491.9688 • Fax 610.491.9645 • www.tetratech.com

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PHIL-17796

Project Number 2128

February 6, 2004

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

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

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

Subject: Submission of Final Feasibility Study Report for Site 26 PCE Plume (OU 7)
NWS Earle - Colts Neck, New Jersey

Dear Ms. DiGeambeardino:

Tetra Tech NUS, Incorporated (TtNUS) is pleased to provide copies of the subject document. Three copies have been sent to Jessica Mollin at EPA, Region II, three copies have been sent to Bob Marcolina at NJDEP, two copies have been sent to Larry Burg at NWS Earle, three copies are enclosed for your use and one copy has been sent to the Monmouth County Library, Eastern Branch for inclusion in the Administrative Record.

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

Sincerely,

Russ Turner

Russell E. Turner
Project Manager

RET/vh

Enclosures

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

FEASIBILITY STUDY
for
SITE 26 PCE PLUME (OU 7)

NAVAL WEAPONS STATION EARLE
Colts Neck, New Jersey

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Engineering Field Activity Northeast
Environmental Branch, Code EV2
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop No. 82
Lester, Pennsylvania 19113-2090

Prepared and Submitted by:
Tetra Tech NUS
600 Clark Avenue, Suite 3
King of Prussia, Pennsylvania 19406-1433

Contract No. N62467-94-D-0888
Contract Task Order 0843

February 2004

PREPARED UNDER DIRECTION OF:

RUSSELL E. TURNER
PROJECT MANAGER
TETRA TECH NUS
KING OF PRUSSIA, PENNSYLVANIA

APPROVED BY:

JOHN J. TREPANOWSKI, P.E.
PROGRAM MANAGER
TETRA TECH NUS
KING OF PRUSSIA, PENNSYLVANIA

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EXECUTIVE SUMMARY

Under the Department of Defense's Installation Restoration Program (IRP), the Navy, in agreement with the United States Environmental Protection Agency (EPA) and in consultation with the state of New Jersey Department of Environmental Protection (NJDEP), is in the process of completing the remedial investigation and feasibility study (RI/FS) of 27 former known or suspected waste disposal sites at Naval Weapons Station Earle (NWS Earle), which is located in Colts Neck, New Jersey (Figure ES-1). The Remedial Investigation (RI) report for the 27 NWS Earle Sites was completed in July 1996. Additional remedial investigation was performed on seven of the sites to fill data gaps, and these results were combined with previous RI data and presented in the RI Addendum Report dated January 1998. The RI Addendum Report (Brown & Root Environmental, January 1998) incorporates data from the RI field investigations completed in 1995 as well as the results from the Addendum RI field activities completed in 1997.

There are two operable units (OU's) defined within the solvent plume in Site 26 groundwater southwest of Building GB-1 identified in the RI Addendum report (Figure ES-2). Operable Unit 3 (OU 3) consists of the portion of the solvent plume southwest of Building GB-1 composed primarily of trichloroethene (TCE) and 1,2-dichloroethene (1,2-DCE). A feasibility study (FS) (Brown & Root Environmental, July 1997) and a Record of Decision (ROD) have been completed for OU 3. Active remediation to remove the solvent components of the plume is underway through air sparging/soil vapor extraction (AS/SVE) by the Navy in accordance with the ROD for OU 3. Operable Unit 7 (OU 7) consists of the portion of the solvent plume southwest of Building GB-1 composed primarily of the perchloroethylene (PCE). The estimated OU 7 PCE component of the solvent plume at Site 26 overlaps and partially coincides with the estimated OU 3 solvent plume currently under active remediation. Figure ES-3 provides approximate boundaries for the TCE plume, PCE plume, the existing remediation system coverage area, and other site landmarks.

The FS for OU 3 (completed in 1997) considered a range of remedial alternatives to address potential risks to human health and the environment posed by site-related contaminants identified previously under the RI. This FS report includes a discussion of remedial alternatives for OU 7, the PCE component of the solvent plume in Site 26 groundwater southwest of Building GB-1. Perchloroethylene is also known as tetrachloroethene under the naming conventions of the International Union of Pure and Applied Chemistry (IUPAC).

The remedial options developed in this document will be used by the Navy to select a preferred remedy for Site 26 OU 7. A Proposed Plan will then be prepared to present the preferred remedy for public comment. After the public comment period has concluded, all questions and concerns from the public will be addressed in a Responsiveness Summary, and the selected remedy will be documented in a Record of Decision.

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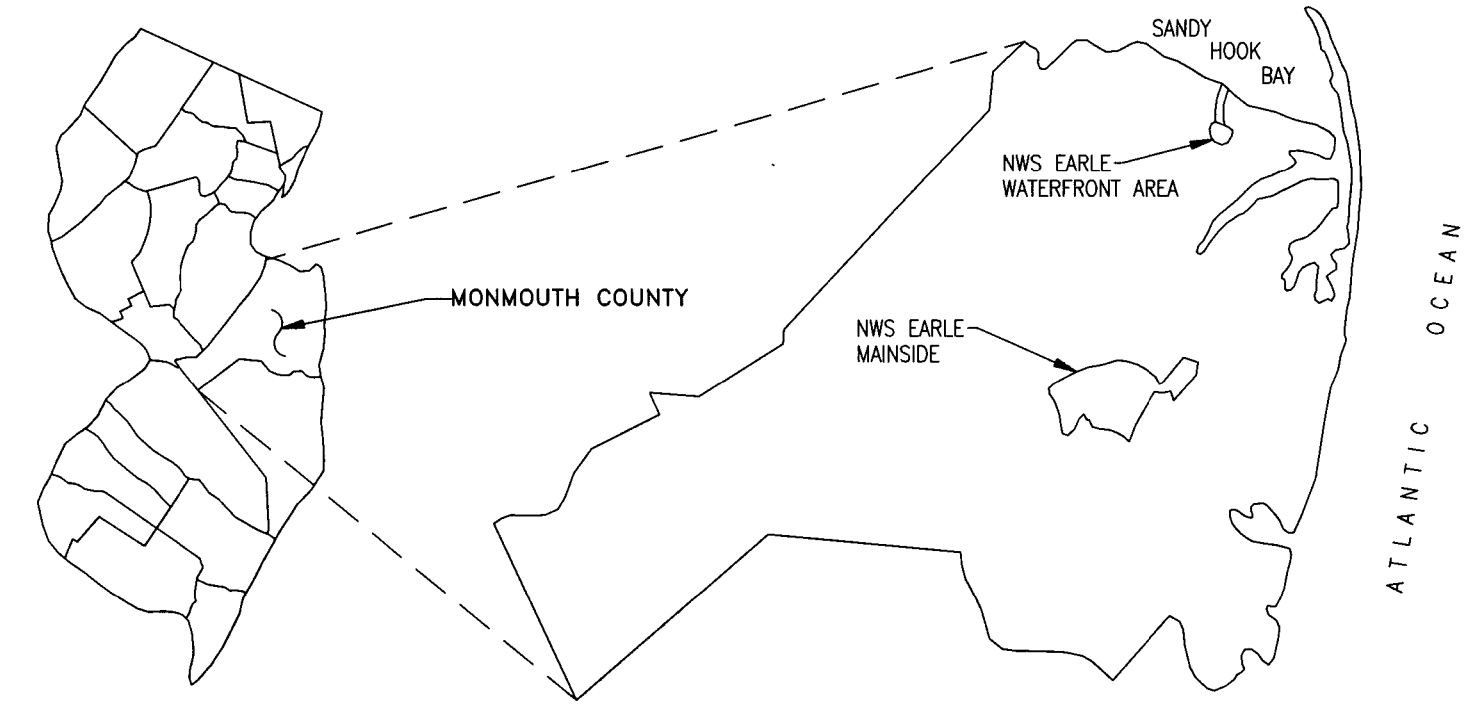

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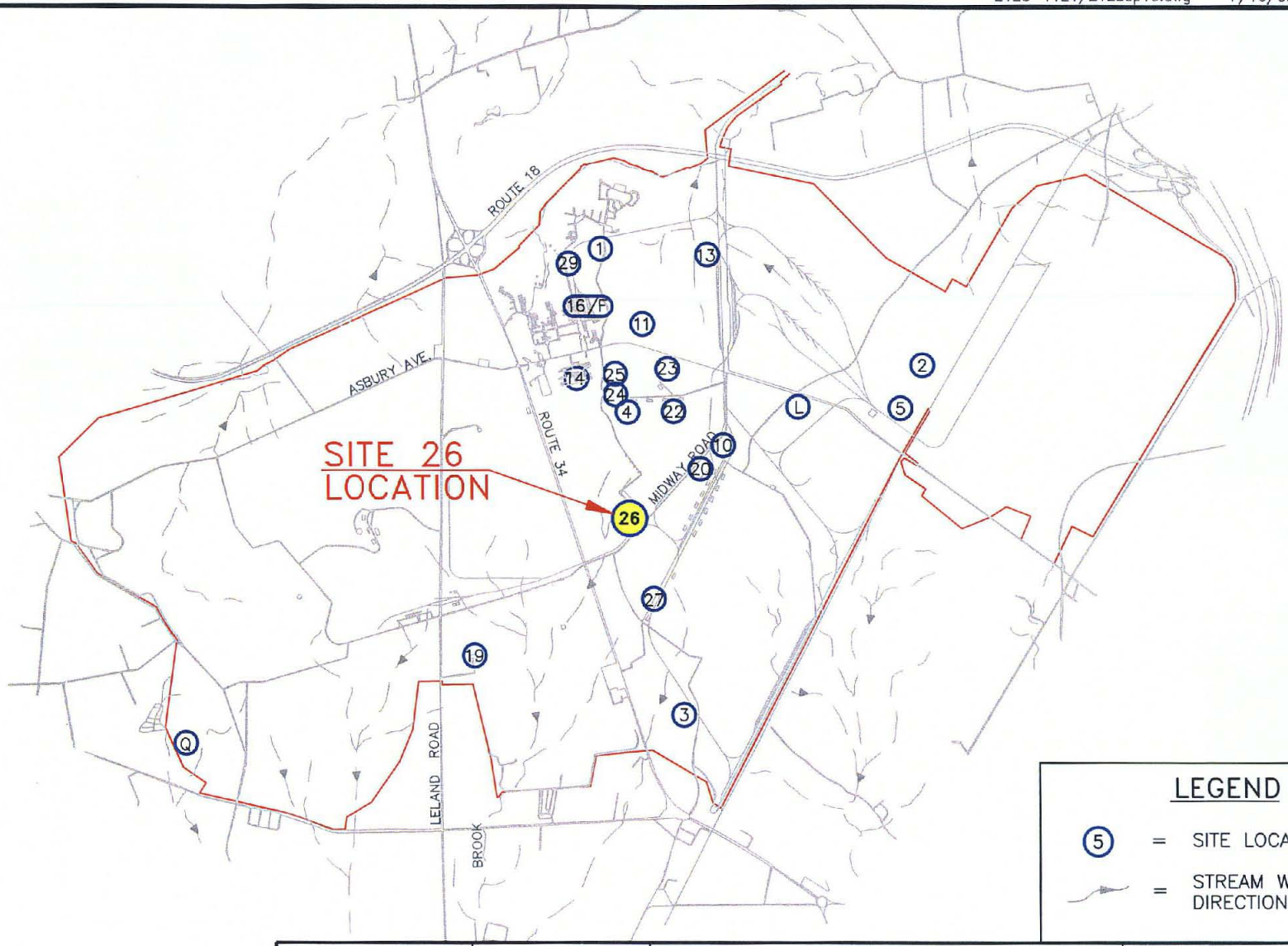

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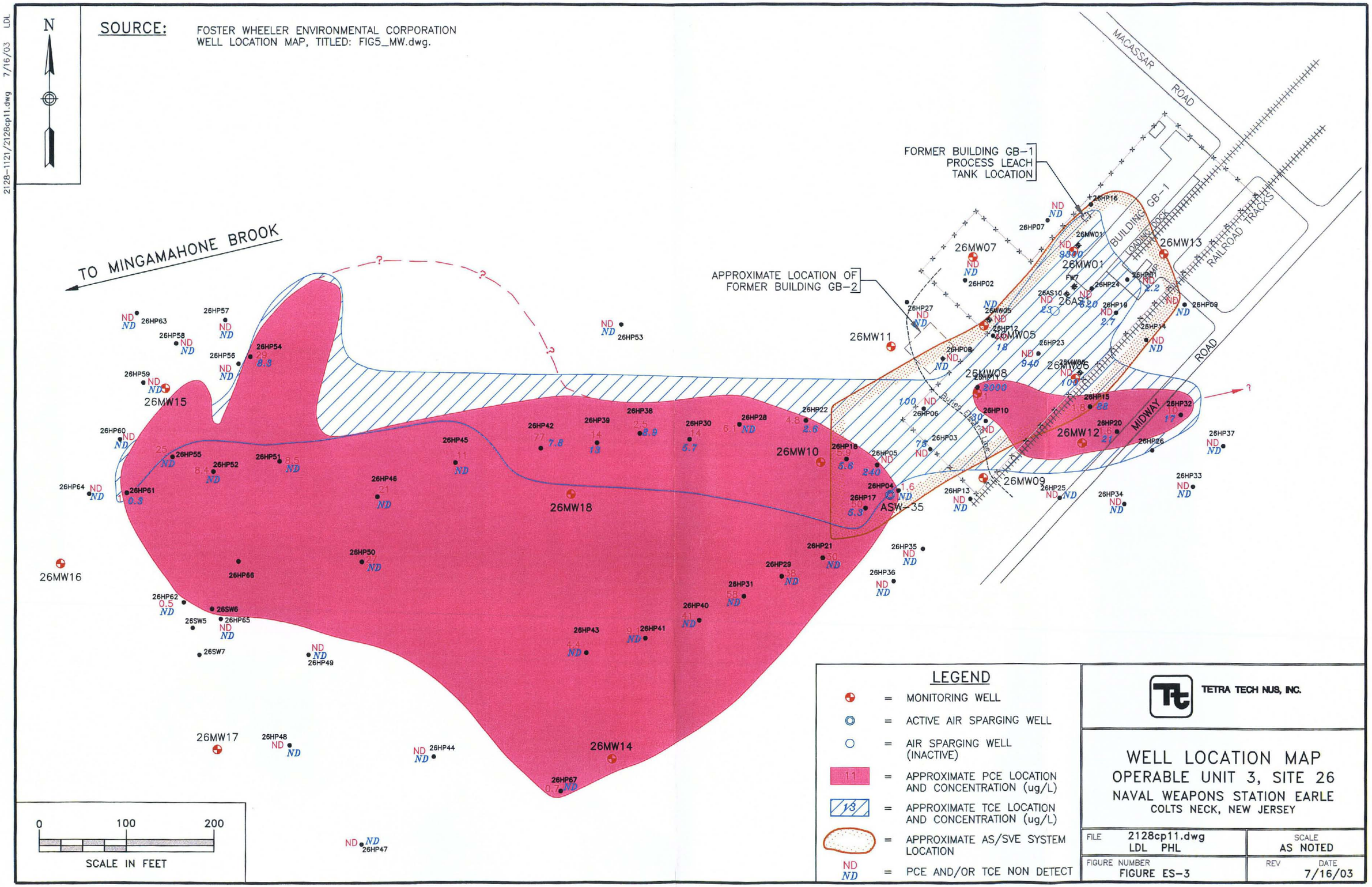


Site Summary

NWS Earle is located in Monmouth County, New Jersey, approximately 47 miles southeast of New York City. This facility was commissioned in 1943 with the primary responsibility of supplying ammunition to the naval fleet. This Station consists of an inland 10,248-acre Main Base and a 706-acre Waterfront Area connected by a right-of-way controlled by the Navy. NWS Earle was included on the National Priorities List (NPL) in October 1990.

Site 26 is situated at the intersection of Macassar and Midway Roads (Figure ES-3). Two railway lines adjacent to the site run toward the northeast. The ground surface at the site is relatively flat, approximately 150 feet above mean sea level. Building GB-1 reportedly was used for the reconditioning of munitions casings/shells. Solvents were used in the reconditioning process. Spent solvents and wash waters were discarded into an unknown receptacle, possibly a collection tray at the formerly used paint spray booth, which drained to the process leaching system. The GB-1 process leaching system appears to have been used for the disposal of TCE, 1,2-DCE and/or related compounds.

Regulatory History

An Initial Assessment Study conducted in 1982 identified 29 waste disposal areas at NWS Earle and led to the further investigation of 11 of those sites. Following the listing of NWS Earle on the National Priorities List (NPL) in 1990, site investigations were initiated at 16 sites. Two of the remaining sites were not included in these investigations because they were permitted to operate under the Resource Conservation and Recovery Act. In 1992, EPA requested that Preliminary Assessments be performed on 17 of the sites. To date, the following investigations have been completed and are documented:

- IRP Phase II Confirmation Study (September 1986)
- Phase II Site Inspection Study (December 1993)
- IRP RI/FS for 11 sites (September 1993)
- IRP RI for 27 sites (July 1996)
- IRP RI Addendum for 7 sites (February 1997)

Summary of Site Risks

The site RI (RI Addendum Report, January 1998) delineated a groundwater plume of chlorinated hydrocarbons that emanated from the former process leach tank at Building GB-1 and extended approximately 350 feet southwest from this source. The major organic constituents were TCE and 1,2-DCE, which is a breakdown product of TCE. The TCE concentrations in the vicinity of the leach tank were as high

as 9,000 ug/L in the groundwater (at 26MW01) and 74.0 ug/kg in the soil. Groundwater samples obtained from permanent and temporary (direct push) monitoring wells exhibited a wide range of chlorinated compounds at concentrations above regulatory guidelines. In addition to the TCE and 1,2-DCE, organic compounds detected at concentrations exceeding regulatory levels included 1,1-DCE, methylene chloride, and PCE. Figure ES-4 (Figure 10-5 of the RI Addendum Report) illustrates the location and concentration of compounds in groundwater exceeding regulatory screening levels in 1997. Therefore, although PCE had not been detected at the leach tank, the presence of PCE within the groundwater in the general vicinity of Building GB-1 was known at the conclusion of the RI. No special note of the PCE was taken at that time, it was selected as a COC (with a corresponding preliminary remediation goal (PRG) of 10 ug/l assigned in the subsequent FS for OU 3) and was interpreted to be one of the VOC components of the site's groundwater plume.

The ROD for OU-3 was signed in September 1998. The selected remedial alternative included source removal, air sparging with soil vapor extraction (AS/SVE), institutional controls, and long-term monitoring.

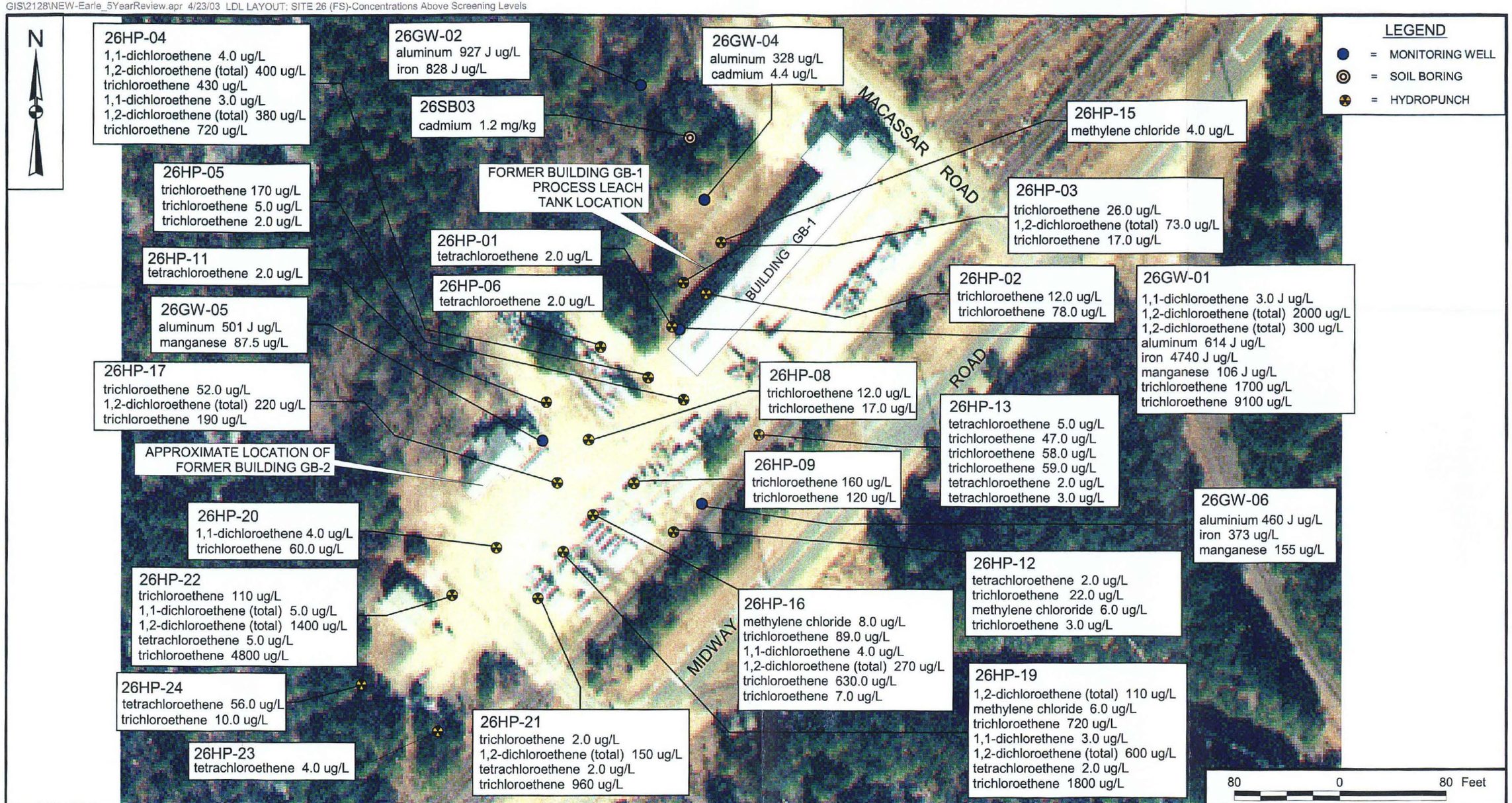
Based on evaluation of remediation activities and investigation results after the ROD for Site 26 OU 3 was signed, the following conclusions and recommendations were developed:

- A VOC plume exists beneath Site 26 and extends from the area of Building GB-1 to the western bank of the Mingamahone Creek. The principal components of the VOC plume are TCE 2, 1,2-DCE and PCE. The concentrations of PCE in the plume were found to be lower than the TCE and 1,2-DCE levels (e.g., TCE concentrations ranged up to 2,000 ug/L, 1,2-DCE concentrations ranged up to 1,700 ug/L and PCE concentrations ranged up to 77 ug/L).

- The components of the plume are postulated to emanate from different source locations, but generally overlap at most locations within the plume. The TCE and 1,2-DCE source is believed to be the former process leach tank located northwest of Building GB-1 (near existing monitoring well 26MW01). The probable source of the PCE in groundwater is thought to be further south, in an area of open land southwest of the former Building GB-2. The PCE component of the plume has a greater lateral extent to the south due to the more southerly location of the postulated PCE source. The downgradient extents of the TCE and PCE are identical.

- The TCE and PCE contaminated groundwater and soil are being remediated by the AS/SVE system. Conceptually, the dissolved-phase plume emanating from these sources should attenuate or retract as the source concentrations are reduced. Very limited available data suggest that this attenuation is occurring, although this attenuation cannot be confirmed without additional data from the proposed periodic monitoring.

GIS\2128\NEW-Earle_5YearReview.apr 4/23/03 LDL LAYOUT: SITE 26 (FS)-Concentrations Above Screening Levels



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Tetra Tech NUS, Inc.

GROUNDWATER
CONCENTRATIONS ABOVE SCREENING LEVELS
SITE 26 - EXPLOSIVE WASHOUT AREA
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

CONTRACT NUMBER 2128
OWNER NUMBER 1121
PROJECT FILE: NWS-Earle_5YearReview.apr
LAYOUT: SITE 26 (FS)-Conc's Above Screening Levels
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Objective of the FS

The overall objective of this FS is to develop and evaluate remedial alternatives that address existing conditions at Site 26 OU 7. In this case, the ongoing remediation program for groundwater at Site 26 OU 3 was considered in the development of remedial alternatives for OU 7. The general FS process is described below:

- Develop remedial action objectives (RAOs) that incorporate clean-up goals protective of human health and the environment. The RAOs specify the contaminants, media of interest, exposure pathways, and preliminary remediation goals. The preliminary remediation goals (numeric criteria) are developed based on chemical-specific applicable or relevant and appropriate requirements (ARARs), when available, and site-specific risk-related factors.

- Develop general response actions to address each medium of interest. Each response action may be implemented singly or in combination with other actions to satisfy the RAOs.

- Identify and screen technologies applicable to each general response action. Technologies and process options that are not technically implementable are eliminated. Representative process options for the remaining technologies are then evaluated for their effectiveness, implementability, and cost.

- Assemble and screen remedial alternatives from the retained technologies.

- Prepare a detailed analysis of individual alternatives following the criteria specified in the National Contingency Plan (NCP) and the RI/FS guidance document. Finally, compare and evaluate the alternatives.

Remedial Action Objectives (RAOs)

Based on the baseline human health risk assessment, the ecological risk assessment, RI results, and the results of OU 3 remediation monitoring to date, RAOs were developed to address the PCE component of the groundwater plume present at Site 26 OU 7.

Protection of Human Health RAO

Prevent potential exposures to contaminated groundwater.

Protection of the Environment RAO

Mitigate migration of VOC contaminants in groundwater and restore the aquifer to applicable standards.

Alternatives Development

Following the technology screening and detailed evaluation, remedial technologies were assembled into alternatives that address contaminated soils and groundwater and the RAOs. These alternatives provide variable levels of protection to human health and the environment, as well as compliance with ARARs. Remedial alternatives for OU 7 included no action; limited action (long-term monitoring), limited action (long-term monitoring and institutional controls) and expansion of the OU-3 AS/SVE system (institutional controls and long-term Monitoring). Summaries of remedial alternatives that passed the initial screening step for OU 7 are presented in the following section. A brief discussion of each alternative is included. A more detailed discussion of each alternative can be found in Section 3.1.2 of this FS.

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 the alternative is to evaluate the overall human health and environmental protection provided by the site in its present state. No five-year reviews or monitoring would be performed under this alternative.

Alternative 2: Limited Action (Long-Term Monitoring)

Alternative 2 includes long-term annual monitoring of site groundwater to assess contaminant status and potential threats to human health and the environment. This alternative does not employ engineered treatment, containment, or institutional controls to address groundwater contamination; however, the groundwater PCE concentrations [which just exceed New Jersey Groundwater Quality Standards (GWQS)] are expected to decline over time because of active remediation of OU 3, and naturally (through dissipation and dilution) because no new disposal has occurred or will be allowed at the site. Since contaminated media (groundwater) would be left in place, site conditions and risks would be reviewed every five years.

Alternative 3: Limited Action (Long-Term Monitoring with CEA)

Alternative 3 includes long-term annual monitoring of site groundwater to assess contaminant status and potential threats to human health and the environment. Because site groundwater does not meet New Jersey groundwater quality standards, a Classification Exception Area (CEA) pursuant to N.J.A.C 7:9-6

would be established after active remediation of Site 26 OU 3 is completed. This alternative does not employ engineered treatment or containment to address groundwater contamination; however, the groundwater contaminant concentrations (which just exceed New Jersey GWQS) are expected to decline over time because of active remediation of OU 3, and naturally (through dissipation and dilution) because no new disposal has occurred or will be allowed at the site. Since contaminated groundwater would be left in place, site conditions and risks would be reviewed every five years.

Alternative 4: Expansion of OU-3 AS/SVE System (Institutional Controls and Long-Term Monitoring)

Under Alternative 4, the PCE present in groundwater and saturated soils would be removed from the aquifer through a combination of AS/SVE, which comprises an active in situ remediation process. Additional sparge points and vapor extraction wells would be added to the current OU 3 remediation system. Institutional controls would be implemented to prevent exposure to contaminated groundwater for the duration of the groundwater treatment period, until GWQS are achieved. Periodic long-term monitoring would be conducted for the duration of the remediation period to assess the effectiveness of the remedial action and to determine when the remediation is complete. Site conditions and risks would be formally reviewed every 5 years until the groundwater remediation is complete.

Individual and Comparative Analysis of Alternatives

Detailed evaluations of remedial alternatives were performed for this FS in accordance with the requirements of the NCP and the EPA RI/FS Guidance Document. As part of the detailed analysis, the remedial alternatives were compared to identify differences and compare how site contaminant threats are addressed. The following seven criteria, as established by the 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 mobility, toxicity, or volume through treatment
- Short-term effectiveness
- Implementability
- Cost

A detailed analysis of each retained alternative with respect to these seven evaluation criteria is provided in Section 4 of this FS. Two other evaluation criteria, state and community acceptance, will be addressed in the Record of Decision following the receipt of comments during the public comment period, after the Proposed Plan has been presented to the public.

Special Conclusions Regarding OU 7 FS Alternatives Comparative Analysis

NJDEP and EPA have requested that any periodic monitoring plan for a combined Site 26 OU 3 and OU 7 plume should include the proposed monitoring wells and surface water sampling locations discussed in the Technical Memorandum: Extent of Groundwater Contamination at Site 26 OU 3 (Tetra Tech NUS, March 2003).

1.0 INTRODUCTION AND BACKGROUND INFORMATION

Tetra Tech NUS (TtNUS) submits this Feasibility Study (FS) report for the Naval Weapons Station Earle in response to Contract Task Order No. 843 under Contract N62467-94-D-0888, Comprehensive Long-Term Environmental Action Navy (CLEAN). This work is part of the Navy's Installation Restoration Program (IRP), which is designed to identify and characterize contamination of Navy and Marine Corps facilities resulting from past operations and to institute corrective measures as appropriate.

This FS report presents an executive summary (preceding this section), a summary of previous investigations and remediation efforts (Section 1.0), identification and screening of remedial technologies for the site (Section 2.0), development and screening of remedial action alternatives (Section 3.0), and a detailed analysis of the alternatives, including a no-action alternative (Section 4.0).

Section 1.0 consists of an overview of NWS Earle operations and regional environmental settings. A summary of previous investigative activities and results and a discussion of human health and ecological risks for the Site 26 has been presented in the Feasibility Study (FS) for Sites 4, 5, 19 and 26 OU 3 (Brown & Root Environmental, July 1997). For a full understanding of site conditions, the Final Remedial Investigation (RI) Report, July 1996, and the Technical Memorandum: Extent of Groundwater Contamination at Site 26 Operable Unit 3 (UO 3), March 2003, must be reviewed. The RI report and the FS for Site 26 OU 3 are essential companion documents to this FS for the perchlorethylene (PCE) plume at Site 26 because they were prepared as part of the prescribed CERCLA RI/FS development procedure.

Section 2.0 provides a discussion on potential chemical-specific, location-specific, and action-specific applicable or relevant and appropriate requirements (ARARs) and other guidance to be considered (TBCs). This section also addresses remedial action objectives (RAOs), preliminary remedial goals (PRGs), and general response actions. RAOs and PRGs are addressed on a site-specific basis for the identification, screening, and evaluation of remedial technologies and process options. Selected site-specific remedial options are also discussed.

The selected remedial alternatives are addressed in Section 3.0. The rationale for selection of the alternatives and a description of each alternative, including a no-action alternative, are presented.

Section 4.0 provides a detailed analysis and comparison of the alternatives discussed in Section 3.0.

1.1 SITE DESCRIPTION AND SETTING

This FS report includes a discussion of remedial alternatives for Operable Unit 7 (OU 7), which consists of the perchlorethyene (PCE) component of the solvent plume in the Site 26 groundwater, southwest of Building GB-1. The OU 7 site is located within the Mainside area of Naval Weapons Station (NWS) Earle.

NWS Earle is located in Monmouth County in east-central New Jersey. It is situated on approximately 11,134 acres and includes a Mainside area, which is approximately 10 miles inland from the Atlantic Ocean at Sandy Hook Bay, and a Waterfront area, which includes an ammunition depot and associated piers. The Mainside and Waterfront areas are linked by a narrow tract of land that serves as a right-of-way for a government road and railroad. Figure 1-1 shows the location of NWS Earle in the region. Figure 1-2 shows the Mainside area IRP sites and highlights the OU 7 site.

The main entrance to NWS Earle is located off State Route 34, and the entrance to the Waterfront area is located adjacent to State Route 36.

An estimated 1,500 people reside and/or work at NWS Earle. The total population of Monmouth County is approximately 550,000. Colts Neck Township, which is the location of the Mainside facility, has a total population of approximately 12,300 people. Middletown Township, which is the location of the Waterfront area, has a total population of approximately 68,200 people.

The majority of the land at the Mainside area is undeveloped land associated with ordnance operations, production, and storage facilities; the undeveloped land is encumbered by explosive safety quantity distance (ESQD) arcs. Land use at the Mainside facility includes residences, office buildings, workshops and warehouses, recreational areas, open space, and undeveloped land. The area around the Mainside facility includes agricultural areas, vacant land, and low-density residential land.

NWS Earle is located in the coastal lowlands of Monmouth County, New Jersey, within the Atlantic Coastal Plain Physiographic Province. The Mainside area, which includes OU 7, lies in the outer Coastal Plain, approximately 10 miles inland from the Atlantic Ocean and is relatively flat, with elevations ranging from approximately 100 to 300 feet above mean sea level (MSL). The most significant topographic relief within the Mainside area is Hominy Hills, a northeast-southwest-trending group of low hills located near the center of the station.

The rivers and streams draining NWS Earle ultimately discharge to the Atlantic Ocean, which is approximately 9 or 10 miles east of the Mainside area. The headwaters and drainage basins of three major Coastal Plain rivers (Swimming, Manasquan, and Shark) originate on the Mainside area. The northern half of Mainside is in the drainage basin of the Swimming River, and tributaries include Mine Brook, Hockhockson Brook, and Pine Brook. The southwestern portion of the Mainside drains to the Manasquan River via either

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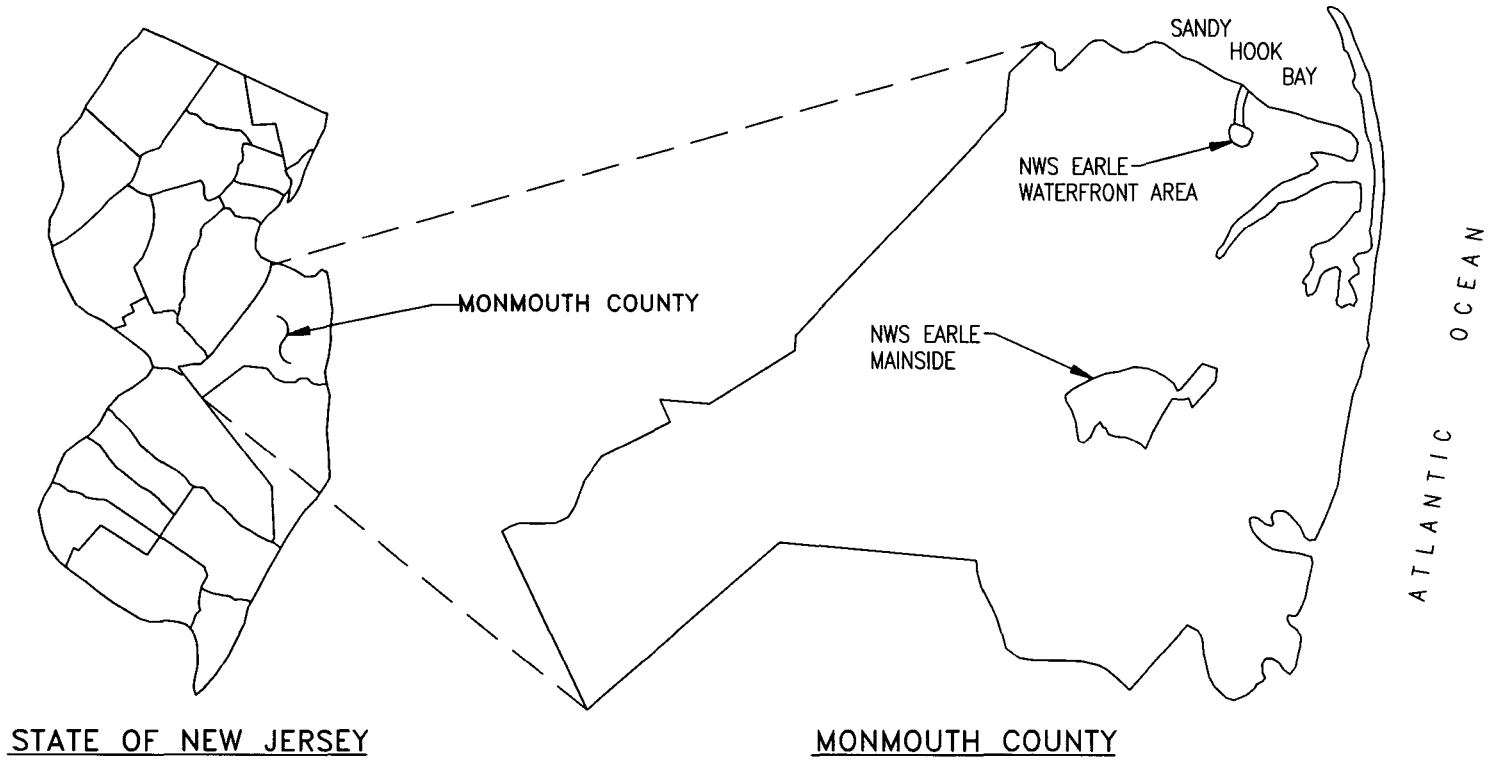

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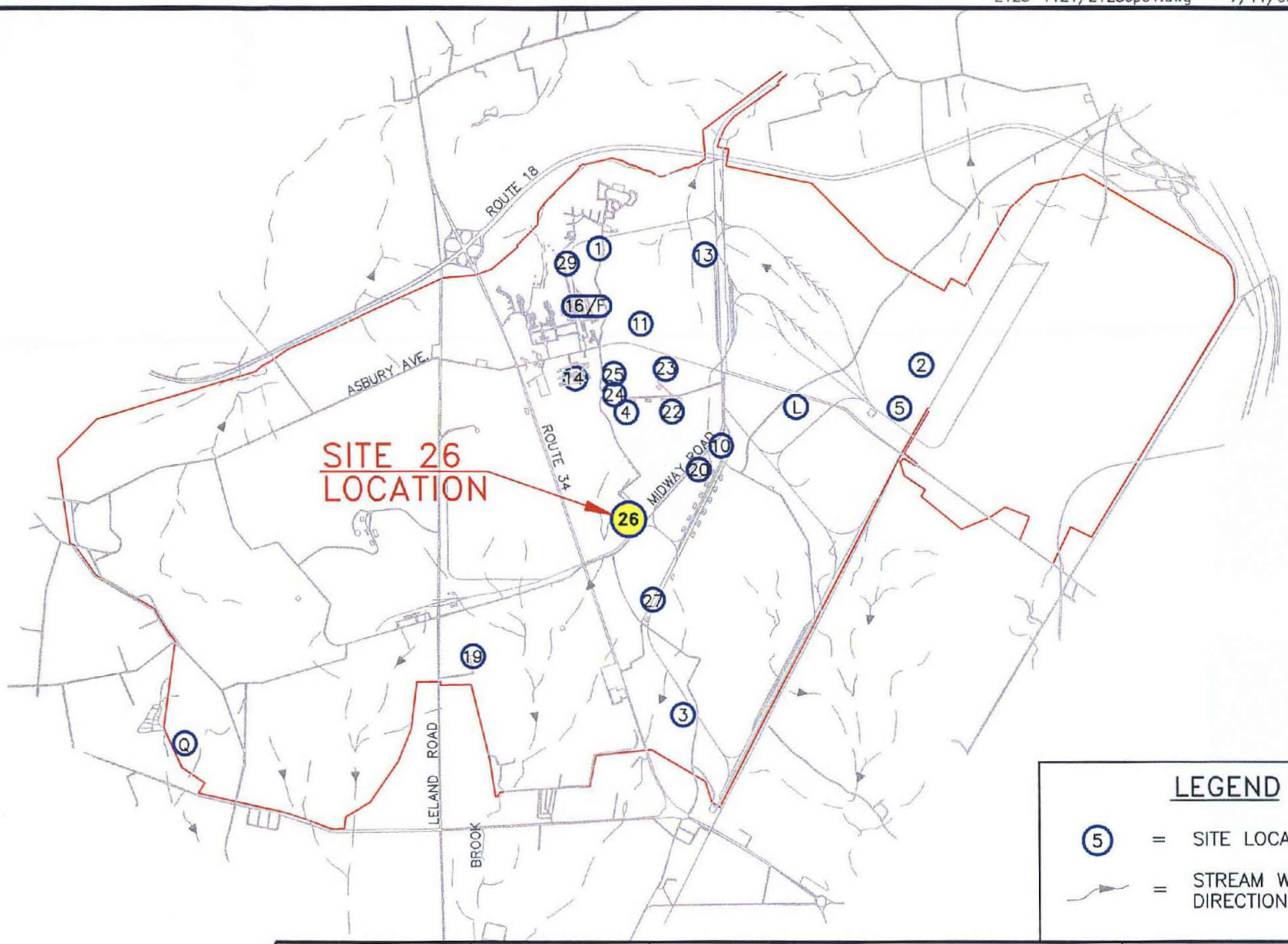

LEGEND

(5) = SITE LOCATION

= STREAM WITH FLOW DIRECTION

0 5,000 10,000

SCALE IN FEET

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PRAP OU 7

Marsh Bog Brook or Mingamahone Brook. The southeastern corner of the Mainside drains to the Shark River. Both the Swimming River and the Shark River supply water to reservoirs used for public water supplies. Site-specific hydrology for each site is discussed in the site summary sections.

NWS Earle is situated in the Coastal Plain Physiographic Province of New Jersey. The New Jersey Coastal Plain is a seaward-dipping wedge of unconsolidated Cretaceous to Quaternary sediments that were deposited on a pre-Cretaceous basement-bedrock complex. The Coastal Plain sediments are primarily composed of clay, silt, sand, and gravel and were deposited in continental, coastal, and marine environments. The sediments generally strike northeast-southwest and dip to the southeast at a rate of 10 to 60 feet per mile. The approximate thickness of these sediments beneath NWS Earle is 900 feet. The pre-Cretaceous complex consists mainly of PreCambrian and lower Paleozoic crystalline rocks and metamorphic schists and gneisses. The Cretaceous to Miocene Coastal Plain Formations are either exposed at the surface or subcrop in a banded pattern that roughly parallels the shoreline. The outcrop pattern is caused by the erosional truncation of the dipping sedimentary wedge. Where these formations are not exposed, they are covered by essentially flat-lying post-Miocene surficial deposits.

Groundwater classification areas were established in New Jersey under New Jersey Department of Environmental Projection (NJDEP) Water Technical Programs Groundwater Quality Standards in New Jersey Administrative Code (N.J.A.C.) 7:9-6. The Mainside area is located in the Class II-A: Groundwater Supporting Potable Water Supply area. Class II-A includes those areas where groundwater is an existing source of potable water with conventional water supply treatment or is a potential source of potable water. In this part of New Jersey, in general, the deeper aquifers are often used for public water supplies and the shallower aquifers may be used for private home owner well domestic supplies.

The Coastal Plain sediments are the most important source of potable water in the Coastal Plain of New Jersey, with wells supplying greater than 75 percent of the potable water supply. Water-supply problems associated with the increased demand for groundwater in the Coastal Plain include decreased groundwater levels and the induced recharge of fresh, brackish, or saline water from surface water or adjacent aquifers. The five principal Coastal Plain aquifers are the:

- Kirkwood-Cohansey aquifer system
- Atlantic City 800-foot sand
- Wenonah-Mount Laurel aquifer system
- Englishtown aquifer
- Potomac-Raritan-Magothy aquifer system

Minor Coastal Plain aquifers include the:

- Piney Point aquifer
- Vincentown aquifer
- Red Bank Sand aquifer

The five principal aquifers are capable of yielding large quantities of water for public supply use. The minor aquifers generally yield small to moderate quantities of water in or near their outcrop areas. All the Coastal Plain aquifers except the Kirkwood-Cohansey aquifer system are confined to semi-confined, except where they crop out or are overlain by permeable surficial deposits. Increased groundwater withdrawals have produced large regional cones of depression in the major artesian aquifers.

The OU 7 site is situated in the recharge area of the Kirkwood-Cohansey aquifer system. The Kirkwood-Cohansey aquifer system is composed of the generally unconfined sediments of the Cohansey Sand and Kirkwood Formation. The Kirkwood-Cohansey aquifer was reported in previous investigations as being used extensively for residential wells in the Mainside area. Along the coast, this aquifer is underlain by thick diatomaceous clay beds of the Kirkwood Formation.

All facilities located in the Mainside Administration area are connected to a public water supply (New Jersey American Water Company). Water for the public supply network comes from surface water intakes, reservoirs, and deep wells. No public water supply wells or surface water intakes are located on the NWS Earle facility. A combination of private wells and public water supply from the New Jersey American Water Company serves businesses and residences in areas surrounding the Mainside facilities. There are a number of private wells located within a 1-mile radius of NWS Earle and several within the NWS Earle boundaries. The majority of these wells are used for potable supplies; previous testing for drinking water parameters indicates these wells have not been adversely impacted.

There is a rich diversity of ecological systems and habitats at NWS Earle. Knieskern's beaked-rush (Rynchospora knieskernii), a sedge species on the federal and New Jersey State endangered lists, has been seen on the station, and the swamp pink (Helonias bullata), also on the federal and New Jersey State endangered lists, may be present. An osprey has visited Mainside and may nest in another area at NWS Earle. The Mingamahone Brook supports bog turtles downstream of the Mainside area and provides an appropriate habitat for them at the Mainside area.

Resources and habitats of the drainage areas potentially impacted by sites investigated in the RI were summarized as follows [Source: National Oceanic and Atmospheric Administration (NOAA) in a letter from EPA Region 2 dated August 19, 1992, signed by Paul G. Ingrisano, Project Manager]:

- Manasquan River - Mingamahone Brook and East Branch of Mingamahone Brook

  - American eel, alewife, white perch, and blueback herring are likely present in the upper reaches of the Manasquan River and may migrate to Mingamahone Brook.

- Swimming River - Pine Brook and Hockhockson Brook

  - Hockhockson and Pine Brooks originate within NWS Earle. Hockhockson Brook joins Pine Brook north of the facility. Pine Brook discharges to the Swimming River about two kilometers below the Swimming River Reservoir. Swimming River is tidally influenced below its confluence with Pine Brook and flows from there about four kilometers to the Navesink River.

  - Alewife and blueback herring are known to migrate in the Swimming River and have been sampled in Pine Brook. Their presence in Hockhockson Brook is expected.

- Navesink River

  - The Navesink River is a tidal embayment. NOAA trust species present in the Navesink River include striped bass, alewife, blueback herring, menhaden, bluefish, American eel, blue crab, and sea lamprey. Resource utilization is believed to be limited to foraging activity, with the exception of winter flounder and blue crab spawning.

- McClees Creek

  - McClees Creek flows about five kilometers to the Navesink River. The creek has not been studied but is free-flowing and could provide habitat for blueback herring, alewife, American eel, white perch, and blue crab.

Ecological risk assessments were performed for the site; results are discussed in Section 1.3.

1.2 SITE OPERATING HISTORY

NWS Earle was commissioned as a Naval Ammunition Depot on December 13, 1943, with the primary responsibility of furnishing ammunition to the Naval fleet. The station's Ordnance Department coordinates all port services and logistic support for home-ported and visiting ships, conducts safety inspections, supervises ammunition loading for the United States Coast Guard, and provides afloat firefighting capability and standby tug services. Other major active divisions include the Ammunition Distribution and Control Division,

responsible for ensuring that a balanced, purified stock of ammunition is maintained in support of Navy, Coast Guard, and Marine Corps programs; the Operations Division, which performs ammunition movement, ship loading, demilitarization of obsolete ammunition, and reclaiming/renovation of various munitions; the Anti-Submarine Warfare (ASW) and Special Weapons Division, which plans and carries out station-level maintenance of air and antisubmarine weapons and provides shore-based support to various commands; and the Port Services Division, responsible for operating the station fireboat, service craft, and oil pollution containment equipment.

Over 90 percent of the acreage at NWS Earle is dedicated to its primary mission of storage and delivery of ordnance. The actual amount of land used for storage and distribution facilities is much less than this, but ESQD arcs are established around each facility. Any development within these arcs is extremely restricted by safety requirements. The formal disestablishment or reclassification of a facility is required before any development can occur within an ESQD arc.

Two areas of NWS Earle, the Mainside Administration and Housing area and the Waterfront Administrative area are not encumbered by ESQD arcs. These areas are used for offices, base support, housing, and recreational facilities. Any future development would be expected to occur in one of these areas unless the development had an ordnance-specific use. Site 26 is located at least partially within ESQD arcs. Therefore, future development at this site is severely restricted.

Site 26 is situated at the intersection of Macassar and Midway Roads (Figure 1-3). Two railway lines adjacent to the site run toward the northeast. The ground surface at the site is relatively flat, approximately 150 feet above MSL. Building GB-1 reportedly was used for the reconditioning of munitions casings/shells. Solvents were used in the reconditioning process. Spent solvents and wash waters were discarded into an unknown receptacle, possibly a collection tray at the formerly used paint spray booth, which drained to the process leaching system. The GB-1 process leaching system appears to have been used for the disposal of trichloroethene (TCE), 1,2-dichloroethene (1,2-DCE), or related compounds.

1.3 SITE INVESTIGATION SUMMARY

Site investigation activities related to areas of potential environmental concern at NWS Earle have been undertaken by the Navy since approximately 1982. Early work included an Initial Assessment Study (IAS) conducted by Fred C. Heart and Associates; the results are included in a report prepared in 1982. Studies and field investigation efforts continued under the Installation Restoration Program (IRP) by Roy F. Weston, Incorporated. Several documents prepared by Weston were submitted to the Navy, NJDEP, and the EPA. These documents include the Draft Report for Naval Weapons Station Earle, Colts Neck, New Jersey, IRP

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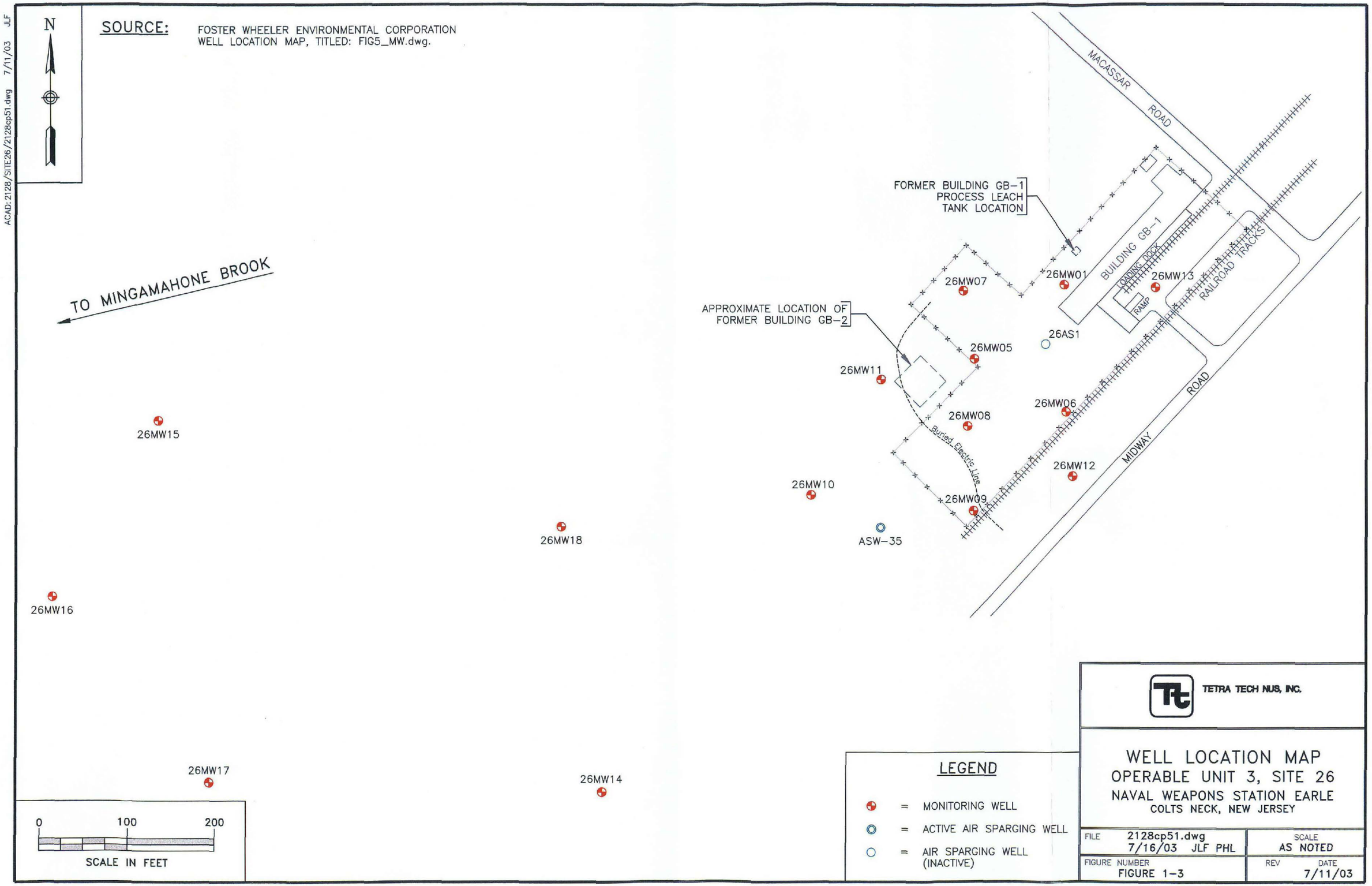
SOURCE: FOSTER WHEELER ENVIRONMENTAL CORPORATION WELL LOCATION MAP, TITLED: FIG5_MW.dwg.



Phase II Confirmation Study, dated September 1986; the Draft Report of Current Situation and Draft Plan of Action, dated December 1988; an IRP Phase II Site Inspection Work Plan dated September 1991; a Draft Phase II Site Inspection Study for Naval Weapons Station Earle, Colts Neck, New Jersey, dated February 1993; and a final version of the Site Inspection (SI) report, dated December 1993. In addition, in September 1993, Weston submitted the Installation Restoration Program Remedial Investigations/Feasibility Study for 11 Sites at NWS Earle, Colts Neck, New Jersey, Volumes 1 to 3.

In 1995-96, Brown & Root Environmental (B&R Environmental) conducted a RI for 27 sites at NWS Earle. The RI included field investigations performed in 1995 and a review of data generated during previous investigations. The final RI report was prepared in July 1996. Results of the RI indicated that further RI data collection activities were required at seven sites. The combined results of the additional RI data collection activities at Site 26 are presented in the draft RI Addendum Report, dated January 1998. The RI determined that there were no sensitive habitats at Site 26.

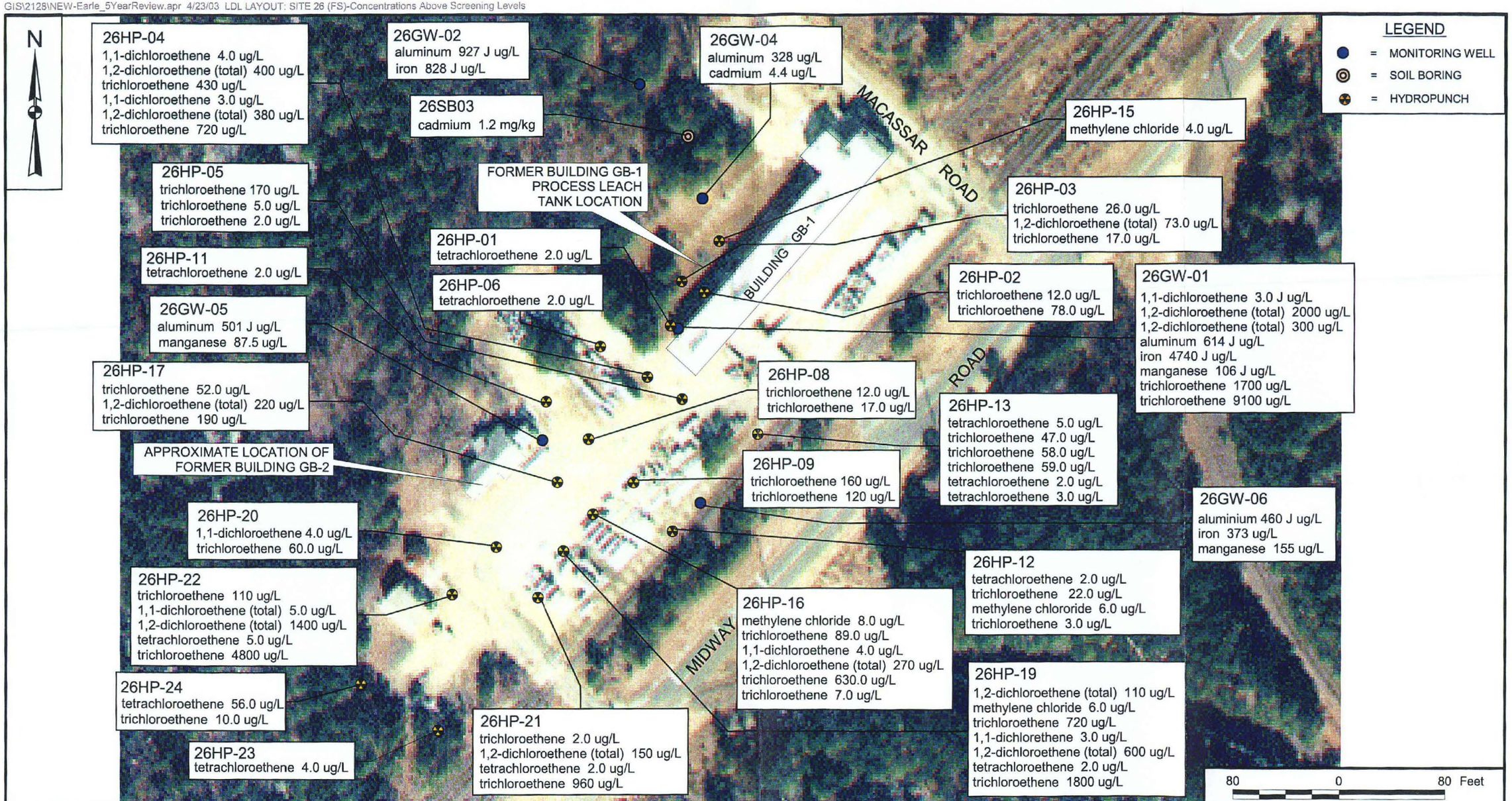
Detailed results of the previous investigations for OU 7, including human health and ecological risk assessment, are discussed in the FS for Sites 4, 5, 19 and 26 (Brown & Root Environmental, July 1997). Recent (post FS, Proposed Plan and Record of Decision (ROD)) sampling and laboratory analysis results are summarized below.

1.4 RECENT SITE 26 INVESTIGATION AND REMEDIATION SUMMARY AND CONCLUSIONS

1.4.1 Overview

The site RI (RI Addendum Report, January 1998) delineated a groundwater plume of chlorinated hydrocarbons that emanated from the former process leach tank at Building GB-1 and extended approximately 350 feet southwest from this source. The major organic constituents were TCE and 1,2-DCE, which is a breakdown product of TCE. The TCE concentrations in the vicinity of the leach tank were as high as 9,000 ug/L in the groundwater (at 26MW01) and 74.0 ug/kg in the soil. Groundwater samples obtained from permanent and temporary (direct push) monitoring wells exhibited a wide range of chlorinated compounds at concentrations above regulatory guidelines. In addition to the TCE and 1,2-DCE, organic compounds detected at concentrations exceeding regulatory levels included 1,1-DCE, methylene chloride, and PCE. Figure 1-4 (Figure 10-5 of the RI Addendum Report) illustrates the location and concentration of compounds in groundwater exceeding regulatory screening levels in 1997. Therefore, although PCE had not been detected at the leach tank, the presence of PCE within the groundwater in the general vicinity of Building GB-1 was known at the conclusion of the RI. No special note of the PCE was taken at this time, as it simply was interpreted to be one of the VOC components of the site's groundwater plume.

GIS\2128\NEW-Earle_5YearReview.apr 4/23/03 LDL LAYOUT: SITE 26 (FS)-Concentrations Above Screening Levels



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

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Tetra Tech NUS, Inc.

GROUNDWATER
CONCENTRATIONS ABOVE SCREENING LEVELS
SITE 26 - EXPLOSIVE WASHOUT AREA
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

CONTRACT NUMBER 2128
OWNER NUMBER 1121
PROJECT FILE: NWS-Earle_5YearReview.apr
LAYOUT: SITE 26 (FS)-Conc's Above Screening Levels
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The ROD for OU-3 was signed in September 1998. The selected remedial alternative included air sparging with soil vapor extraction (AS/SVE), source removal, institutional controls, and long-term monitoring. Foster Wheeler Environmental Corporation (FWENC) was selected to perform pre-design studies and the design and construction of the selected remedy.

1.4.2 Post-RI Activities

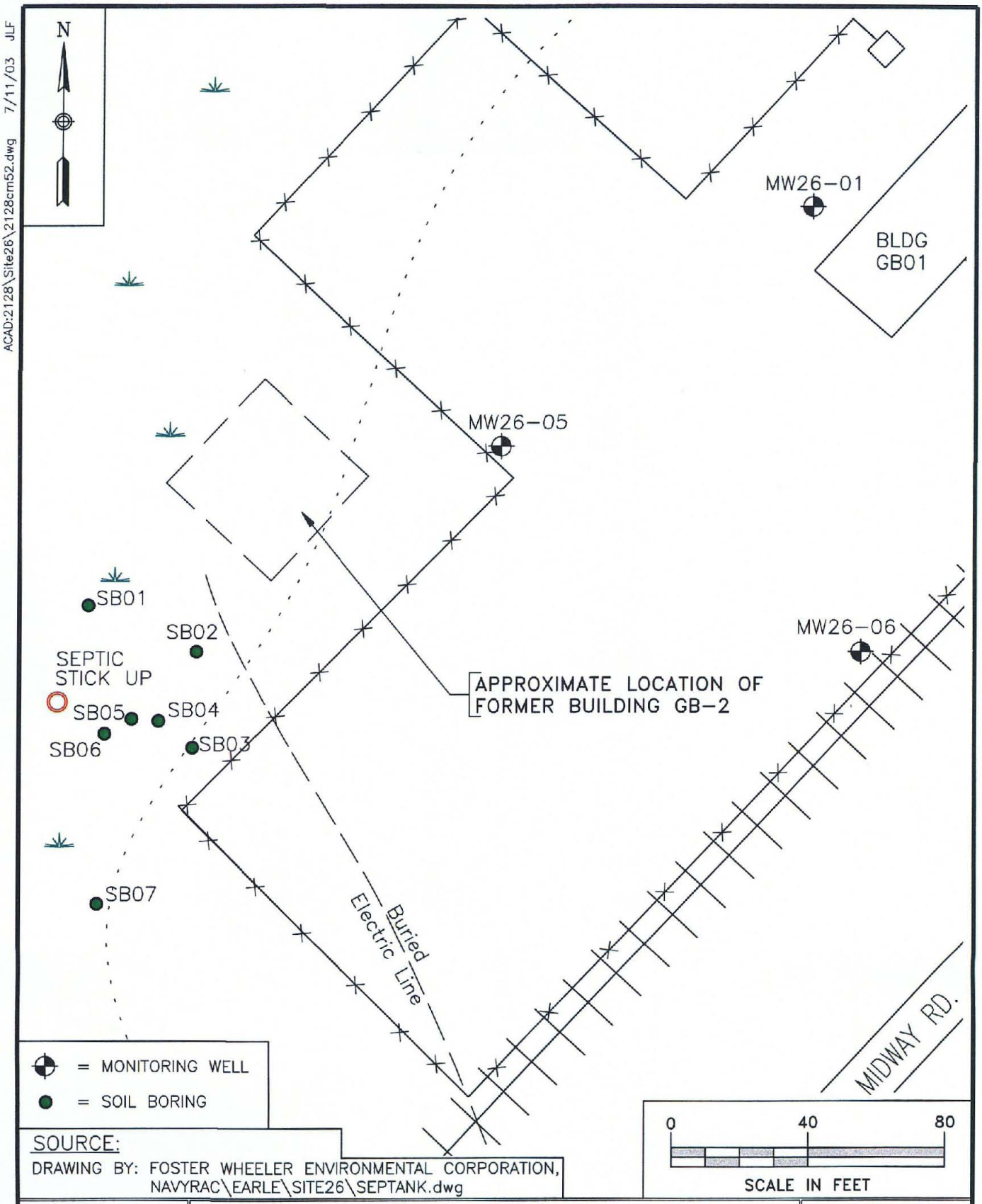
As part of their pre-design studies, FWENC was tasked to investigate the septic tank and leaching system of former Building GB-2, which was located to the southwest of Building GB-1 and which had been demolished in 1998. The former septic system for GB-2 was similar to the process leaching system for GB-1, and unverified suspicions indicated that the GB-2 septic system may have been used for disposal in a manner similar to the GB-1 system. FWENC obtained the following environmental samples between August 1999 and March 2000:

- Five soil samples from six borings (SB01 - SB06) in close proximity to the septic tank at the former Building GB-2 and one soil sample from a soil boring (SB07) located beneath a nearby abandoned painting equipment area. The soil boring locations are illustrated in Figure 1-5. Samples were submitted for TCL VOC analysis. All samples were non-detect for all VOCs except for 2-butanone, a common laboratory solvent that is not a compound of concern at this site (2-butanone was also found in the trip blank).

- One aqueous liquid sample from the septic tank at the former Building GB-2. There was no appreciable amount of sludge in the tank. The sample was submitted for TCL VOC analysis. No VOCs were detected.

- One surface water sample (26SW01) upstream and one surface water sample (26SW02) and sediment sample (26SD02) downstream from Site 26 in the Mingamahone Brook. Two surface water (26SW03 and 26SW04) and one sediment sample (26SD01) were collected in the Mingamhone Brook southwest of Site 26 and in the projected path of groundwater migrating from the Site 26 area. The locations of the surface water and sediment samples are illustrated in Figure 1-6. Samples were submitted for TCL VOC analysis. No VOCs were detected in any surface water or sediment samples.

- Groundwater samples from 4 monitoring wells and 72 direct-push (hydropunch) temporary well screening locations. The coverage area for the screening wells was far greater than that of the permanent wells, and eventually extended to the western banks of Mingamahone Brook. All samples were analyzed for VOCs and selected monitoring well samples were analyzed for metals for AS/SVE system design purposes. The analytical results from the monitoring wells were very similar to those from the RI, with the highest concentration of TCE detected at monitoring well 26MW01 (9,300 ug/L). The



SOURCE:
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TETRA TECH NUS, INC.

SITE 26
SEPTIC TANK ORIENTATION AND SOIL BORINGS
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

SCALE	AS NOTED
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REV	DATE 7/11/03
FIGURE NUMBER	FIGURE 1-5

GIS\2128\NWS Earle-SITE26.apr 4/22/03 LDL PHL / LAYOUT: SW/SD Sample Locations

SOURCE:
BASEMAP PREPARED BY: FOSTER WHEELER ENVIRONMENTAL CORPORATION

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COST/SCHEDULE-AREA	
SCALE AS NOTED	

Tetra Tech NUS, Inc.

SURFACE WATER/SEDIMENT SAMPLE LOCATIONS
SITE 26
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

CONTRACT NUMBER 2128	OWNER NUMBER 1121
PROJECT FILE: NWS Earle-SITE 26.apr	
LAYOUT: SW/SD Sample Locations	
APPROVED BY RET	DATE 7/14/03
DRAWING NO. FIGURE 1-6	REV

groundwater samples from the screening wells contained TCE at concentrations ranging up to 2,000 ug/L, 1,2-DCE at concentrations ranging up to 1,700 ug/L, and PCE at concentrations ranging up to 77 ug/L. The analytical results from this sampling effort are illustrated in Figure 1-7.

The analytical results from the screening wells indicated that the VOC plume extended farther downgradient from the source (to the vicinity of Mingamahone Brook) than was possible to interpret or depict with the then-existing monitoring well network, and that PCE was a fairly consistent component of the plume, in addition to the primary components of TCE and 1,2-DCE. The screening results also indicated that the PCE component of the plume extended further to the south than the multi-component segment of the plume (also beyond the existing monitoring well network), resulting in the delineation of a plume segment containing only the PCE component. Similar to the mixed-component portion of the plume, the VOC plume segment containing only PCE extended downgradient to the vicinity of Mingamahone Brook. The historical VOC concentrations through time in the monitoring wells (consistent VOC concentrations) and the lateral distribution of VOCs as delineated in the screening wells (VOC concentrations are highest upgradient near the source and decrease in the downgradient direction to eventual non-detections) are consistent with the existence of a steady-state plume emanating from a residual source(s), but it is impossible to prove this hypothesis because the screening well data represent a single "snapshot" in time that does not permit an evaluation of the temporal variability (or consistency) of the VOC plume.

OU-7 was established as a result of the FWENC investigations. OU-7 is defined as the PCE component of the VOC plume.

During the construction of the AS/SVE system, the Navy installed 7 additional monitoring wells (26MW07 through 26MW-13, see Figure 1-3) to aid in the evaluation of the progress of the groundwater remediation. As a result of the expanded VOC plume that was delineated through the temporary well program, the Navy installed an additional 5 monitoring wells (26MW14 through 26 MW18, see Figure 1-3) downgradient (or beyond) the delineated plume. Because it was not known whether the plume was at a steady-state condition or was continuing to migrate, these wells were intentionally installed downgradient of the plume to serve as "sentry" wells that would indicate if the plume continued to migrate beyond its extent as delineated by the screening wells.

1.4.3 Groundwater Flow Conditions

Borings drilled during the RI and post-RI activities consistently detected a semi-confining clay layer underlying the entire site at variable depths of up to 25 feet below ground surface, depending on the surface elevation of the boring. This clay is interpreted to effectively limit the vertical migration of groundwater and the VOC plume to the portion of the aquifer overlying the clay.

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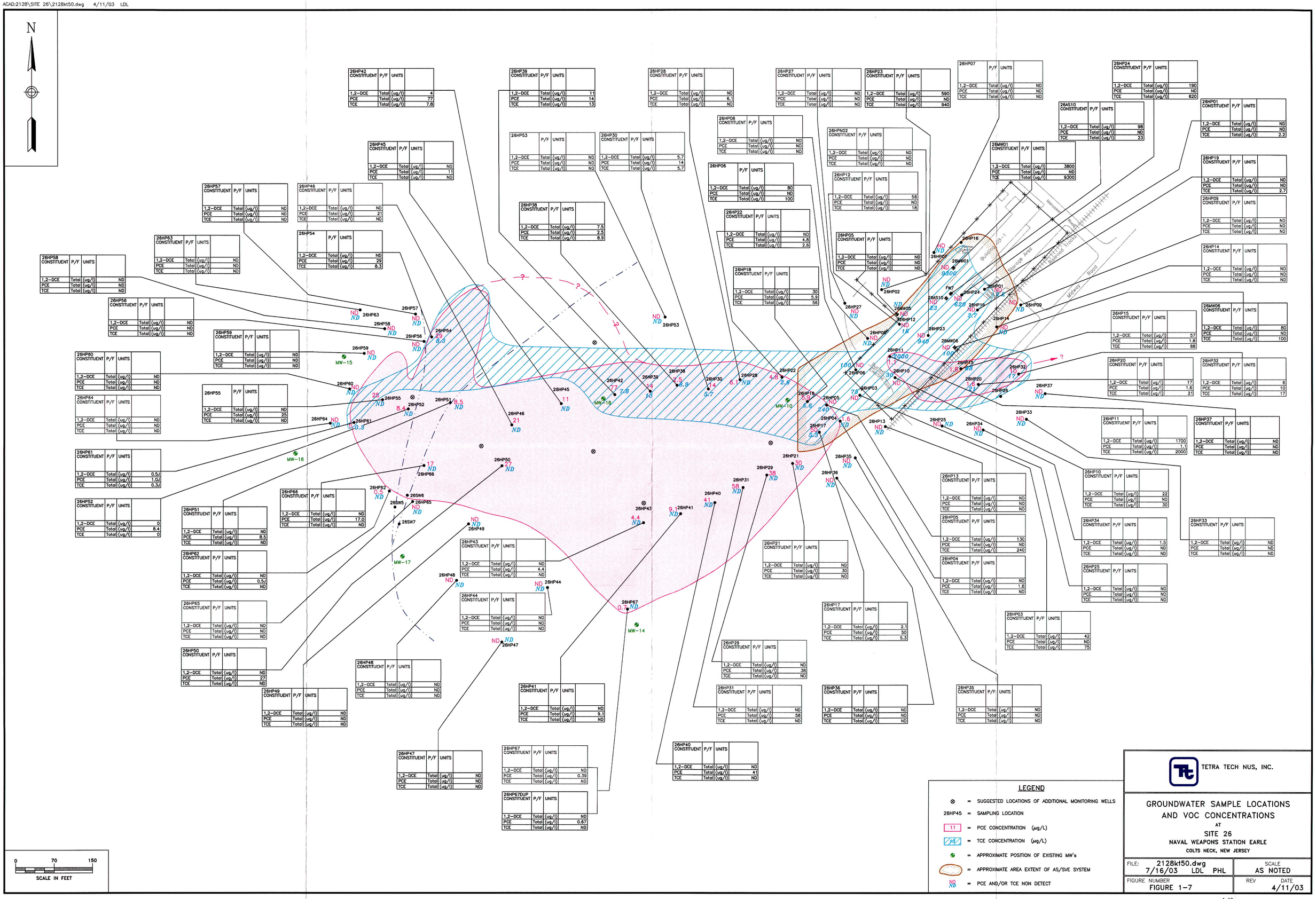

In shallow, unconfined aquifers, the horizontal direction of groundwater flow under ambient conditions typically mimics the overlying surface topography. The RI and post-RI groundwater investigations have determined that the groundwater flow direction in the vicinity of buildings GB-1 and GB-2 is to the southwest. This flow direction is based on numerous direct measurements of hydraulic head from multiple monitoring wells, and agrees well with the local topography (see the topographic map illustrated on Figure 1-8).

Groundwater flow directions downgradient of buildings GB-1 and GB-2 have not been precisely determined due to the far less-dense well control (fewer monitoring wells covering a much larger geographic area). However, assuming that the groundwater flow direction here can similarly be predicted by the surface topography, the groundwater migrating from the GB-1 and GB-2 area is expected to continue to flow to the southwest through sampling points 26HP04 and 26HP17, to turn westward in the vicinity of 26HP21, and then flow in a basically westward direction toward Mingamahone Brook and its tributary. Although no surface drainage (even intermittent) is noted on the topographic map (Figure 1-8), a fairly well-defined topographic low is depicted as extending from the area of 26HP21 downgradient to the vicinity of 26HP65. It is reasonable to assume that the dominant groundwater flow path is along this topographic trend.

1.4.4 Discussion of Groundwater Conditions Prior to Startup of Remediation System

Analytical data obtained during the RI and post-RI activities were evaluated to determine the nature and extent of the impacted groundwater prior to the startup of the AS/SVE system. The post-RI groundwater concentrations of TCE and PCE obtained by FWENC were contoured on the same map to investigate:

- Whether there are 2 distinctly different and separate VOC plumes at Site 26, or whether the groundwater problem at this site may be considered one VOC plume comprised of several chemical components.

- Whether the chemical components (principally TCE and PCE) share a common source and emanate from the same location.

- Whether the existing monitoring well network is sufficient to delineate the extent of all chemical components, support the establishment of a CEA, and monitor the progress of the ongoing remedial action.

1.4.5 Observations Regarding the Nature and Extent of TCE and PCE

The pre-startup concentrations of TCE and PCE are plotted on Figure 1-7. The following observations are drawn from this figure:

GIS\2128\NWS Earle SITE 26.apr 4/23/03 LDL LAYOUT: Topographic Map

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Tetra Tech NUS, Inc.

TOPOGRAPHIC MAP
SITE 26
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

CONTRACT NUMBER 2128	OWNER NUMBER 1121
PROJECT FILE: NWS Earle-SITE 26.apr LAYOUT: Topographic Map	
APPROVED BY R.E.T.	DATE 7/14/03
DRAWING NO. FIGURE 1-8	REV

- There appear to be different sources for the PCE and the TCE groundwater components. The TCE component emanates from the former leach tank at building GB-1. The PCE component emanates near hydropunch sample 26HP17, which is located in the woods, southwest of former building GB-2.

  - There appears to be a smaller, secondary source of PCE within the eastern portion of the VOC plume in the vicinity of sampling point 26HP32. These PCE detections are relatively low (at or less than 10 ug/L), are located upgradient of the higher concentrations detected at the interpreted primary PCE source near 26HP17, and are physically isolated from those higher detections by a series of intervening samples that did not contain PCE.

- The downgradient extents of the TCE and PCE components within the VOC plume are identical, as both components were detected as far downgradient as sampling point 26HP61, which is located on the opposite (western) side of the Mingamahone Brook.

  - The detection of VOCs in the samples located on the western side of the Mingamahone Brook at first appear puzzling, since the inferred direction of groundwater flow at that location is to the east, or toward the tributary. Depending on the hydraulic head relationships, the possibility that groundwater from the east may (at least at times) flow beneath the tributary cannot be ruled out.

- The lateral extents of the TCE and PCE components within the VOC plume are generally similar, especially along the northern border of the plume. The overall lateral extent of the PCE component is greater than the TCE component, as the PCE extends farther to the south. The more southern location of the PCE source (relative to the TCE source) and the position of the PCE source within the dominant groundwater flow axis are believed to be responsible for these small differences in lateral extent of the two dominant components of the VOC plume.

1.4.6 AS/SVE Remedy and Quarterly Groundwater Sampling

The AS/SVE system began operations on January 4, 2001. The AS/SVE system covers and remediates the sources of both the TCE and PCE components of the VOC plume. Quarterly sampling of the groundwater monitoring wells began in April 2001 in order to evaluate the system performance. To date, five rounds of quarterly monitoring have been completed, and the results of these sampling events are summarized in Table 1-1. These results indicate that:

Table 1-1

NWS-Earle, Site 26
5th Quarter - AS/SVE Operation Report
Groundwater Analytical Data
Volatile Organic Compounds

SAMPLE ID	NJDEP	26MW-01		26MW-01-02		26MW-01-03		26MW-01-04		26MW-01-05		26MW-01-06	
LABORATORY ID		O32547		O06		O01		O05		P2414-05		P3468-15	
DATE COLLECTED	Groundwater	08/14/00		04/02/01		10/30/01		01/29/02		04/29/02		07/24/02	
LOCATION	Quality	SITE 26, MW-01		SITE 26, MW-01		SITE 26, MW-01		SITE 26, MW-01		SITE 26, MW-01		SITE 26, MW-01	
MATRIX	Criteria	AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS	
UNITS	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
COMMENTS		Baseline GW		After 1st Qtr of AS/SVE		After 2nd Qtr of AS/SVE		After 3rd Qtr of AS/SVE		After 4TH Qtr of AS/SVE		After 5th Qtr of AS/SVE	
Chloromethane	30	5	U	1	U	1.1	U	1.1	U	1	U	1.4	U
Bromomethane	10	5	UJ	1	U	0.6	U	0.6	U	1	U	1.7	U
Vinyl Chloride	5	5	U	1	U	1	U	1	U	1	U	1.2	U
Chloroethane	NA	5	U	1	U	0.7	U	0.7	U	1	U	1.8	U
Methylene Chloride	2	5	U	1	U	0.4	U	0.4	U	1	U	**1.4**	
Acetone	700	5	R	5	U	2.4	U	2.4	U	NR		NR	
Carbon Disulfide	NA	5	U	1	U	0.3	U	0.3	U	NR		NR	
1,1-Dichlorethene	1	5	U	1	U	0.4	U	0.4	U	1	U	1	U
1,1-Dichlorethane	70	5	U	1	U	0.2	U	0.2	U	1	U	0.6	U
cis - 1,2 -Dichloroethene	10	**1800**	D	**830**	D	**16**		2.4		1	U	1	U
trans - 1,2-Dichlorethene	100	5	U	6.8	U	0.4	U	0.4	U	1	U	1	U
Chloroform	6	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
1,2-Dichlorethane	2	5	U	1	U	0.3	U	0.3	U	1	U	0.6	U
2-Butanone	300	5	U	1	U	2.8	U	2.8	U	NR		NR	
1,1,1-Trichlorethane	30	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
Carbon Tetrachloride	2	5	U	1	U	0.3	U	0.3	U	1	U	0.5	U
Bromodichloromethane	1	5	U	1	U	0.3	U	0.3	U	1	U	0.9	U
1,2-Dichloropropane	1	5	U	1	U	0.4	U	0.4	U	1	U	0.8	U
cis-1,3-Dichloropropene	NA	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
Trichloroethene	1	**3700**	D	**370**	D	**10**		**6**		**1.6**		**1.2**	
Dibromochloromethane	10	5	U	1	U	0.3	U	0.3	U	1	U	1.4	U
1,1,2-Trichloroethane	3	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
Benzene	1	5	U	1	U	0.3	U	0.3	U	1	U	0.6	U
trans-1,3-Dichloropropene	NA	5	U	1	U	0.2	U	0.2	U	1	U	NR	
Bromoform	4	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
4-Methyl-2-pentanone	400	5	U	5	U	1.4	U	1.4	U	NR		NR	
2-Hexanone	NA	5	UJ	5	U	1	U	1	U	NR		NR	
Tetrachloroethene	1	5	UJ	1	U	0.3	U	0.3	U	1	U	1	U
Toluene	1000	5	U	1	U	0.3	U	0.3	U	1	U	1	U
1,1,2,2-Tetrachloroethane	2	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
Chlorobenzene	4	5	U	1	U	0.2	U	0.2	U	1	U	1	U
Ethylbenzene	700	5	U	1	U	0.4	U	0.4	U	1	U	1.2	U
Styrene	100	5	U	1	U	0.2	U	0.2	U	1	U	NR	
Xylenes (total)	40	5	U	1	U	0.9	U	0.9	U	1	U	3.4	U

Notes:
U - Not detected above quantitation limit
NA - No applicable standard
NR - No result
D - Diluted
J - Estimated
UJ - Not detected, quantitation limit is approximate
R - Result rejected (see data validation report)
T - Tentitive Identified Compound
Shaded/Bolded - Exceeds NJDEP GQS
ug/L - microgram per liter

Table 1-1

NWS-Earle, Site 26
5th Quarter - AS/SVE Operation Report
Groundwater Analytical Data
Volatile Organic Compounds

SAMPLE ID	NJDEP	26MW-05		26MW-05-02		26MW-05-03		26MW-05-04		26MW-05-05		26MW-05-06	
LABORATORY ID		O32545		O04		O01				P2414-18		P3468-14	
DATE COLLECTED	Groundwater	08/14/00		04/02/01		10/26/01				04/29/02		07/24/02	
LOCATION	Quality	SITE 26, MW-05		SITE 26, MW-05		SITE 26, MW-05		SITE 26, MW-05		SITE 26, MW-05		SITE 26, MW-05	
MATRIX	Criteria	AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS	
UNITS	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
COMMENTS		Baseline GW		After 1st Qtr of AS/SVE		After 2nd Qtr of AS/SVE		After 3rd Qtr of AS/SVE		After 4TH Qtr of AS/SVE		After 5th Qtr of AS/SVE	
Chloromethane	30	5	U	1	U	1.1	U	NR		1	U	1.4	U
Bromomethane	10	5	UJ	1	U	0.6	U	NR		1	U	1.7	U
Vinyl Chloride	5	5	U	1	U	1	U	NR		1	U	1.2	U
Chloroethane	NA	5	U	1	U	0.7	U	NR		1	U	1.8	U
Methylene Chloride	2	5	U	1	U	0.4	U	NR		1	U	**2.8**	
Acetone	700	5	R	5	U	2.4	U	NR		NR		NR	
Carbon Disulfide	NA	5	U	1	U	0.3	U	NR		NR		NR	
1,1-Dichlorethene	1	5	U	1	U	0.4	U	NR		1	U	1	U
1,1-Dichlorethane	70	5	U	1	U	0.2	U	NR		1	U	0.6	U
cis - 1,2 -Dichloroethene	10	5	U	1	U	1.9		NR		1	U	1	U
trans - 1,2-Dichlorethene	100	5	U	1	U	0.4	U	NR		1	U	1	U
Chloroform	6	5	U	1	U	0.3	U	NR		1	U	0.8	U
1,2-Dichlorethane	2	5	U	1	U	0.3	U	NR		1	U	0.6	U
2-Butanone	300	5	U	5	U	2.8	U	NR		NR	U	NR	
1,1,1-Trichlorethane	30	5	U	1	U	0.3	U	NR		1	U	0.8	U
Carbon Tetrachloride	2	5	U	1	U	0.3	U	NR		1	U	0.5	U
Bromodichloromethane	1	5	U	1	U	0.3	U	NR		1	U	0.9	U
1,2-Dichloropropane	1	5	U	1	U	0.4	U	NR		1	U	0.8	U
cis-1,3-Dichloropropene	NA	5	U	1	U	0.3	U	NR		1	U	1.5	U
Trichloroethene	1	5	U	**1.3**		**1.2**		NR		1	U	0.9	U
Dibromochloromethane	10	5	U	1	U	0.3	U	NR		1	U	1.4	U
1,1,2-Trichloroethane	3	5	U	1	U	0.3	U	NR		1	U	1.5	U
Benzene	1	5	U	1	U	0.3	U	NR		1	U	0.6	U
trans-1,3-Dichloropropene	NA	5	U	1	U	0.2	U	NR		1	U	NR	
Bromoform	4	5	U	1	U	0.3	U	NR		1	U	1.5	U
4-Methyl-2-pentanone	400	5	U	5	U	1.4	U	NR		NR		NR	
2-Hexanone	NA	5	UJ	5	U	1	U	NR		NR		NR	
Tetrachloroethene	1	5	UJ	1	U	0.3	U	NR		1	U	1	U
Toluene	1000	5	U	1	U	0.3	U	NR		1	U	1	U
1,1,2,2-Tetrachloroethane	2	5	U	1	U	0.3	U	NR		1	U	0.8	U
Chlorobenzene	4	5	U	1	U	0.2	U	NR		1	U	1	U
Ethylbenzene	700	5	U	1	U	0.4	U	NR		1	U	1.2	U
Styrene	100	5	U	1	U	0.2	U	NR		1	U	NR	
Xylenes (total)	40	5	U	1	U	0.9	U	NR		1	U	3.4	U

Notes:
U - Not detected above quantitation limit
NA - No applicable standard
NR - No result
D - Diluted
J - Estimated
UJ - Not detected, quantitation limit is approximate
R - Result rejected (see data validation report)
T - Tentitive Identified Compound
Shaded/Bolded - Exceeds NJDEP GQS
ug/L - microgram per liter

Table 1-1

NWS-Earle, Site 26
5th Quarter - AS/SVE Operation Report
Groundwater Analytical Data
Volatile Organic Compounds

SAMPLE ID	NJDEP	26MW-06		26MW-06-02		26MW-06-03		26MW-06-04		26MW-06-05		26MW-06-06	
LABORATORY ID		O32550		O01		O02		O02		P2414-02		P3468-08	
DATE COLLECTED	Groundwater	08/15/00		04/02/01		10/30/01		01/29/02		04/29/02		07/24/02	
LOCATION	Quality	SITE 26, MW-06		SITE 26, MW-06		SITE 26, MW-06		SITE 26, MW-06		SITE 26, MW-06		SITE 26, MW-06	
MATRIX	Criteria	AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS	
UNITS	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
COMMENTS		Baseline GW		After 1st Qtr of AS/SVE		After 2nd Qtr of AS/SVE		After 3rd Qtr of AS/SVE		After 4TH Qtr of AS/SVE		After 5th Qtr of AS/SVE	
Chloromethane	30	5	U	1	U	1.1	U	1.1	U	1	U	1.4	U
Bromomethane	10	5	UJ	1	U	0.6	U	0.6	U	1	U	1.7	U
Vinyl Chloride	5	5	U	1	U	1	U	1	U	1	U	1.2	U
Chloroethane	NA	5	U	1	U	0.7	U	0.7	U	1	U	1.8	U
Methylene Chloride	2	5	U	1	U	0.4	U	0.4	U	1	U	1.2	U
Acetone	700	5	R	5	U	2.4	U	2.4	U	NR		NR	
Carbon Disulfide	NA	5	U	1	U	0.3	U	0.3	U	NR		NR	
1,1-Dichlorethene	1	5	U	1	U	0.4	U	0.4	U	1	U	1	U
1,1-Dichlorethane	70	5	U	1	U	0.2	U	0.2	U	1	U	0.6	U
cis - 1,2 -Dichloroethene	10	5	U	0.8	J	1.6		7.2		1.2	T	1	U
trans - 1,2-Dichlorethene	100	5	U	1	U	0.4	U	0.4	U	1	U	1	U
Chloroform	6	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
1,2-Dichlorethane	2	5	U	1	U	0.3	U	0.3	U	1	U	0.6	U
2-Butanone	300	5	U	5	U	2.8	U	2.8	U	NR		NR	
1,1,1-Trichlorethane	30	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
Carbon Tetrachloride	2	5	U	1	U	0.3	U	0.3	U	1	U	0.5	U
Bromodichloromethane	1	5	U	1	U	0.3	U	0.3	U	1	U	0.9	U
1,2-Dichloropropane	1	5	U	1	U	0.4	U	0.4	U	1	U	0.8	U
cis-1,3-Dichloropropene	NA	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
Trichloroethene	1	5	U	**3**		**4.7**		**12**		**6.9**	U	0.9	U
Dibromochloromethane	10	5	U	1	U	0.3	U	0.3	U	1	U	1.4	U
1,1,2-Trichloroethane	3	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
Benzene	1	5	U	1	U	0.3	U	0.3	U	1	U	0.6	U
trans-1,3-Dichloropropene	NA	5	U	1	U	0.2	U	0.2	U	1	U	NR	
Bromoform	4	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
4-Methyl-2-pentanone	400	5	U	5	U	1.4	U	1.4	U	NR		NR	
2-Hexanone	NA	5	UJ	5	U	1	U	1	U	NR		NR	
Tetrachloroethene	1	5	UJ	1	U	0.3	U	0.3	U	1	U	1	U
Toluene	1000	5	U	1	U	0.3	U	0.3	U	1	U	1	U
1,1,2,2-Tetrachloroethane	2	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
Chlorobenzene	4	5	U	1	U	0.2	U	0.2	U	1	U	1	U
Ethylbenzene	700	5	U	1	U	0.4	U	0.4	U	1	U	1.2	U
Styrene	100	5	U	1	U	0.2	U	0.2	U	1	U	NR	
Xylenes (total)	40	5	U	1	U	0.9	U	0.9	U	1	U	3.4	U

Notes:
U - Not detected above quantitation limit
NA - No applicable standard
NR - No result
D - Diluted
J - Estimated
UJ - Not detected, quantitation limit is approximate
R - Result rejected (see data validation report)
T - Tentitive Identified Compound
Shaded/Bolded - Exceeds NJDEP GQS
ug/L - microgram per liter

Table 1-1

NWS-Earle, Site 26
5th Quarter - AS/SVE Operation Report
Groundwater Analytical Data
Volatile Organic Compounds

SAMPLE ID	NJDEP	26MW-07		26MW-07-02		26MW-07-03		26MW-07-04		26MW-07-05		26MW-07-06	
LABORATORY ID		O32546		O05		O11		O04		P2414-04		P3468-05	
DATE COLLECTED	Groundwater	08/14/00		04/02/01		10/26/01		01/29/02		04/29/02		07/23/02	
LOCATION	Quality	SITE 26, MW-07		SITE 26, MW-07		SITE 26, MW-07		SITE 26, MW-07		SITE 26, MW-07		SITE 26, MW-07	
MATRIX	Criteria	AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS	
UNITS	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
COMMENTS		Baseline GW		After 1st Qtr of AS/SVE		After 2nd Qtr of AS/SVE		After 3rd Qtr of AS/SVE		After 4TH Qtr of AS/SVE		After 5th Qtr of AS/SVE	
Chloromethane	30	5	U	1	U	1.1	U	1.1	U	1	U	1.4	U
Bromomethane	10	5	UJ	1	U	0.6	U	0.6	U	1	U	1.7	U
Vinyl Chloride	5	5	U	1	U	1	U	1	U	1	U	1.2	U
Chloroethane	NA	5	U	1	U	0.7	U	0.7	U	1	U	1.8	U
Methylene Chloride	2	5	U	1	U	0.4	U	0.4	U	1	U	1.2	U
Acetone	700	5	R	5	U	2.4	U	2.4	U	NR	R	NR	
Carbon Disulfide	NA	5	U	1	U	0.3	U	0.3	U	NR		NR	
1,1-Dichlorethene	1	5	U	1	U	0.4	U	0.4	U	1	U	1	U
1,1-Dichlorethane	70	5	U	1	U	0.2	U	0.2	U	1	U	0.6	U
cis - 1,2 -Dichloroethene	10	5	U	1	U	0.3	U	1.4		1	U	1	U
trans - 1,2-Dichlorethene	100	5	U	1	U	0.4	U	0.4	U	1	U	1	U
Chloroform	6	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
1,2-Dichlorethane	2	5	U	1	U	0.3	U	0.3	U	1	U	0.6	U
2-Butanone	300	5	U	5	U	2.8	U	2.8	U	NR		NR	
1,1,1-Trichlorethane	30	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
Carbon Tetrachloride	2	5	U	1	U	0.3	U	0.3	U	1	U	0.5	U
Bromodichloromethane	1	5	U	1	U	0.3	U	0.3	U	1	U	0.9	U
1,2-Dichloropropane	1	5	U	1	U	0.4	U	0.4	U	1	U	0.8	U
cis-1,3-Dichloropropene	NA	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
Trichloroethene	1	5	U	**3**		**3.5**		**7.4**		**9.9**		**7.9**	
Dibromochloromethane	10	5	U	1	U	0.3	U	0.3	U	1	U	1.4	U
1,1,2-Trichloroethane	3	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
Benzene	1	5	U	1	U	0.3	U	0.3	U	1	U	0.6	U
trans-1,3-Dichloropropene	NA	5	U	1	U	0.2	U	0.2	U	1	U	NR	
Bromoform	4	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
4-Methyl-2-pentanone	400	5	U	5	U	1.4	U	1.4	U	NR		NR	
2-Hexanone	NA	5	UJ	5	U	1	U	1	U	NR		NR	
Tetrachloroethene	1	5	UJ	1	U	0.3	U	0.3	U	1	U	1	U
Toluene	1000	5	U	1	U	0.3	U	0.3	U	1	U	1	U
1,1,2,2-Tetrachloroethane	2	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
Chlorobenzene	4	5	U	1	U	0.2	U	0.2	U	1	U	1	U
Ethylbenzene	700	5	U	1	U	0.4	U	0.4	U	1	U	1.2	U
Styrene	100	5	U	1	U	0.2	U	0.2	U	1	U	NR	
Xylenes (total)	40	5	U	1	U	0.9	U	0.9	U	1	U	3.4	U

Notes:
U - Not detected above quantitation limit
NA - No applicable standard
NR - No result
D - Diluted
J - Estimated
UJ - Not detected, quantitation limit is approximate
R - Result rejected (see data validation report)
T - Tentitive Identified Compound
Shaded/Bolded - Exceeds NJDEP GQS
ug/L - microgram per liter

Table 1-1

NWS-Earle, Site 26
5th Quarter - AS/SVE Operation Report
Groundwater Analytical Data
Volatile Organic Compounds

SAMPLE ID	NJDEP	26MW-08		26MW-08-02		26MW-08-03		26MW-08-04		26MW-08-05		26MW-08-06	
LABORATORY ID		O32549		O03		O09		O03		P2414-03		P3468-09	
DATE COLLECTED	Groundwater	08/15/00		04/02/01		10/26/01		01/29/02		04/29/02		07/24/02	
LOCATION	Quality	SITE 26, MW-08		SITE 26, MW-08		SITE 26, MW-08		SITE 26, MW-08		SITE 26, MW-08		SITE 26, MW-08	
MATRIX	Criteria	AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS	
UNITS	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
COMMENTS		Baseline GW		After 1st Qtr of AS/SVE		After 2nd Qtr of AS/SVE		After 3rd Qtr of AS/SVE		After 4TH Qtr of AS/SVE		After 5th Qtr of AS/SVE	
Chloromethane	30	5	U	1	U	1.1	U	1.1	U	1	U	1.4	U
Bromomethane	10	5	UJ	1	U	0.6	U	0.6	U	1	U	1.7	U
Vinyl Chloride	5	5	U	1	U	1	U	1	U	1	U	1.2	U
Chloroethane	NA	5	U	1	U	0.7	U	0.7	U	1	U	1.8	U
Methylene Chloride	2	5	U	1	U	0.4	U	0.4	U	1	U	**2.5**	
Acetone	700	5	R	5	U	2.4	U	2.4	U	NR		NR	
Carbon Disulfide	NA	5	U	1	U	0.3	U	0.3	U	NR		NR	
1,1-Dichlorethene	1	5	U	1	U	0.4	U	0.4	U	1	U	1	U
1,1-Dichlorethane	70	5	U	1	U	0.2	U	0.2	U	1	U	0.6	U
cis - 1,2 -Dichloroethene	10	**28**		**540**	D	**310**	E	**80**		**15**	T	1	U
trans - 1,2-Dichlorethene	100	5	U	3		2.9		0.8		1	U	1	U
Chloroform	6	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
1,2-Dichlorethane	2	5	U	1	U	0.3	U	0.3	U	1	U	0.6	U
2-Butanone	300	5	U	5	U	2.8	U	2.8	U	NR		NR	
1,1,1-Trichlorethane	30	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
Carbon Tetrachloride	2	5	U	1	U	0.3	U	0.3	U	1	U	0.5	U
Bromodichloromethane	1	5	U	1	U	0.3	U	0.3	U	1	U	0.9	U
1,2-Dichloropropane	1	5	U	1	U	0.4	U	0.4	U	1	U	0.8	U
cis-1,3-Dichloropropene	NA	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
Trichloroethene	1	**42**		**440**	D	**97**		**57**		**15**		0.9	U
Dibromochloromethane	10	5	U	1	U	0.3	U	0.3	U	1	U	1.4	U
1,1,2-Trichloroethane	3	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
Benzene	1	5	U	1	U	0.3	U	0.3	U	1	U	0.6	U
trans-1,3-Dichloropropene	NA	5	U	1	U	0.2	U	0.2	U	1	U	NR	
Bromoform	4	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
4-Methyl-2-pentanone	400	5	U	5	U	1.4	U	1.4	U	NR		NR	
2-Hexanone	NA	5	UJ	5	U	1	U	1	U	NR		NR	
Tetrachloroethene	1	5	UJ	1	U	0.3	U	0.3	U	1	U	1	U
Toluene	1000	5	U	1	U	0.3	U	0.3	U	1	U	1	U
1,1,2,2-Tetrachloroethane	2	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
Chlorobenzene	4	5	U	1	U	0.2	U	0.2	U	1	U	1	U
Ethylbenzene	700	5	U	1	U	0.4	U	0.4	U	1	U	1.2	U
Styrene	100	5	U	1	U	0.2	U	0.2	U	1	U	NR	
Xylenes (total)	40	5	U	1	U	0.9	U	0.9	U	1	U	3.4	U

Notes:
U - Not detected above quantitation limit
NA - No applicable standard
NR - No result
D - Diluted
J - Estimated
UJ - Not detected, quantitation limit is approximate
R - Result rejected (see data validation report)
T - Tentitive Identified Compound
Shaded/Bolded - Exceeds NJDEP GQS
ug/L - microgram per liter

Table 1-1

NWS-Earle, Site 26
5th Quarter - AS/SVE Operation Report
Groundwater Analytical Data
Volatile Organic Compounds

SAMPLE ID	NJDEP	26MW-09		26MW-09-02		26MW-09-03		26MW-09-04		26MW-09-05		26MW-09-06	
LABORATORY ID		O32548		O02		O08		O18		P2414-06		P3468-10	
DATE COLLECTED	Groundwater	08/15/00		04/02/01		10/26/01		1/30/02		04/29/02		07/24/02	
LOCATION	Quality	SITE 26, MW-09		SITE 26, MW-09		SITE 26, MW-09		SITE 26, MW-09		SITE 26, MW-09		SITE 26, MW-09	
MATRIX	Criteria	AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS	
UNITS	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
COMMENTS		Baseline GW		After 1st Qtr of AS/SVE		After 2nd Qtr of AS/SVE		After 3rd Qtr of AS/SVE		After 4TH Qtr of AS/SVE		After 5th Qtr of AS/SVE	
Chloromethane	30	5	U	1	U	1.1	U	1.1	U	1	U	1.4	U
Bromomethane	10	5	UJ	1	U	0.6	U	0.6	U	1	U	1.7	U
Vinyl Chloride	5	5	U	1	U	1	U	1	U	1	U	1.2	U
Chloroethane	NA	5	U	1	U	0.7	U	0.7	U	1	U	1.8	U
Methylene Chloride	2	5	U	1	U	0.4	U	0.4	U	1	U	1.2	U
Acetone	700	5	R	3.2	J	2.4	U	2.4	U	NR		NR	
Carbon Disulfide	NA	5	U	1	U	0.3	U	0.3	U	NR		NR	
1,1-Dichlorethene	1	5	U	1	U	0.4	U	0.4	U	1	U	1	U
1,1-Dichlorethane	70	5	U	1	U	0.2	U	0.2	U	1	U	0.6	U
cis - 1,2 -Dichloroethene	10	5	U	1	U	0.3	U	0.3	U	1	U	1	U
trans - 1,2-Dichlorethene	100	5	U	1	U	0.4	U	0.4	U	1	U	1	U
Chloroform	6	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
1,2-Dichlorethane	2	5	U	1	U	0.3	U	0.3	U	1	U	0.6	U
2-Butanone	300	5	U	5	U	2.8	U	2.8	U	NR		NR	
1,1,1-Trichlorethane	30	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
Carbon Tetrachloride	2	5	U	1	U	0.3	U	0.3	U	1	U	0.5	U
Bromodichloromethane	1	5	U	1	U	0.3	U	0.3	U	1	U	0.9	U
1,2-Dichloropropane	1	5	U	1	U	0.4	U	0.4	U	1	U	0.8	U
cis-1,3-Dichloropropene	NA	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
Trichloroethene	1	5	U	**1.1**		0.4	U	0.4	U	1	U	0.9	U
Dibromochloromethane	10	5	U	1	U	0.3	U	0.3	U	1	U	1.4	U
1,1,2-Trichloroethane	3	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
Benzene	1	5	U	1	U	0.3	U	0.3	U	1	U	0.6	U
trans-1,3-Dichloropropene	NA	5	U	1	U	0.2	U	0.2	U	1	U	NR	
Bromoform	4	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
4-Methyl-2-pentanone	400	5	U	5	U	1.4	U	1.4	U	NR		NR	
2-Hexanone	NA	5	UJ	5	U	1	U	1	U	NR		NR	
Tetrachloroethene	1	5	UJ	1	U	0.3	U	0.3	U	1	U	1	U
Toluene	1000	5	U	1	U	0.3	U	0.3	U	1	U	1	U
1,1,2,2-Tetrachloroethane	2	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
Chlorobenzene	4	5	U	1	U	0.2	U	0.2	U	1	U	1	U
Ethylbenzene	700	5	U	1	U	0.4	U	0.4	U	1	U	1.2	U
Styrene	100	5	U	1	U	0.2	U	0.2	U	1	U	NR	
Xylenes (total)	40	5	U	1	U	0.9	U	0.9	U	1	U	3.4	U

Notes:
U - Not detected above quantitation limit
NA - No applicable standard
NR - No result
D - Diluted
J - Estimated
UJ - Not detected, quantitation limit is approximate
R - Result rejected (see data validation report)
T - Tentitive Identified Compound
Shaded/Bolded - Exceeds NJDEP GQS
ug/L - microgram per liter

Table 1-1

NWS-Earle, Site 26

5th Quarter - AS/SVE Operation Report

Groundwater Analytical Data

Volatile Organic Compounds

SAMPLE ID	NJDEP	26MW-10		26MW-10-02		26MW-10-03		26MW-10-04		26MW-10-05		26MW-10-06	
LABORATORY ID		O32553		O08		O07		O14		P2414-07		P3468-12	
DATE COLLECTED	Groundwater	08/15/00		04/02/01		10/26/01		1/30/02		04/29/02		07/24/02	
LOCATION	Quality	SITE 26, MW-10		SITE 26, MW-10		SITE 26, MW-10		SITE 26, MW-10		SITE 26, MW-10		SITE 26, MW-10	
MATRIX	Criteria	AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS	
UNITS	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
COMMENTS		Baseline GW		After 1st Qtr of AS/SVE		After 2nd Qtr of AS/SVE		After 3rd Qtr of AS/SVE		After 4TH Qtr of AS/SVE		After 5th Qtr of AS/SVE	
Chloromethane	30	5	U	1	U	1.1	U	1.1	U	1	U	1.4	U
Bromomethane	10	5	UJ	1	U	0.6	U	0.6	U	1	U	1.7	U
Vinyl Chloride	5	5	U	1	U	1	U	1	U	1	U	1.2	U
Chloroethane	NA	5	U	1	U	0.7	U	0.7	U	1	U	1.8	U
Methylene Chloride	2	5	U	1	U	0.4	U	0.4	U	1	U	1.2	U
Acetone	700	5	R	5	U	2.4	U	2.4	U	NR		NR	
Carbon Disulfide	NA	5	U	1	U	0.3	U	0.3	U	NR		NR	
1,1-Dichlorethene	1	5	U	1	U	0.4	U	0.4	U	1	U	1	U
1,1-Dichlorethane	70	5	U	1	U	0.2	U	0.2	U	1	U	0.6	U
cis - 1,2 -Dichloroethene	10	**10**		1	U	3.8		4.5		1	U	1	U
trans - 1,2-Dichlorethene	100	5	U	1	U	0.4	U	0.4	U	1	U	1	U
Chloroform	6	5	U	2.5		0.3	U	0.3	U	1	U	0.8	U
1,2-Dichlorethane	2	5	U	1	U	0.3	U	0.3	U	1	U	0.6	U
2-Butanone	300	5	U	5	U	2.8	U	2.8	U	NR		NR	
1,1,1-Trichlorethane	30	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
Carbon Tetrachloride	2	5	U	1	U	0.3	U	0.3	U	1	U	0.5	U
Bromodichloromethane	1	5	U	1	U	0.3	U	0.3	U	1	U	0.9	U
1,2-Dichloropropane	1	5	U	1	U	0.4	U	0.4	U	1	U	0.8	U
cis-1,3-Dichloropropene	NA	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
Trichloroethene	1	**10**		**1.7**		**2.9**		**6.3**		**4.6**	U	**1.4**	
Dibromochloromethane	10	5	U	1	U	0.3	U	0.3	U	1	U	1.4	U
1,1,2-Trichloroethane	3	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
Benzene	1	5	U	1	U	0.3	U	0.3	U	1	U	0.6	U
trans-1,3-Dichloropropene	NA	5	U	1	U	0.2	U	0.2	U	1	U	NR	
Bromoform	4	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
4-Methyl-2-pentanone	400	5	U	5	U	1.4	U	1.4	U	NR		NR	
2-Hexanone	NA	5	UJ	5	U	1	U	1	U	NR		NR	
Tetrachloroethene	1	**8.2**	J	1	U	**1.1**		0.8		1	U	1	U
Toluene	1000	5	U	1	U	0.3	U	0.3	U	1	U	1	U
1,1,2,2-Tetrachloroethane	2	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
Chlorobenzene	4	5	U	1	U	0.2	U	0.2	U	1	U	1	U
Ethylbenzene	700	5	U	1	U	0.4	U	0.4	U	1	U	1.2	U
Styrene	100	5	U	1	U	0.2	U	0.2	U	1	U	NR	
Xylenes (total)	40	5	U	1	U	0.9	U	0.9	U	1	U	3.4	U

Notes:

U - Not detected above quantitation limit

NA - No applicable standard

NR - No result

D - Diluted

J - Estimated

UJ - Not detected, quantitation limit is approximate

R - Result rejected (see data validation report)

T - Tentitive Identified Compound

Shaded/Bolded - Exceeds NJDEP GQS

ug/L - microgram per liter

Table 1-1

NWS-Earle, Site 26
5th Quarter - AS/SVE Operation Report
Groundwater Analytical Data
Volatile Organic Compounds

SAMPLE ID	NJDEP	26MW-11		26MW-11-02		26MW-11-03		26MW-11-04		26MW-11-05		26MW-11-06	
LABORATORY ID		O32601		O09		O12		O15		P2414-09		P3468-11	
DATE COLLECTED	Groundwater	08/15/00		04/02/01		10/26/01		1/30/02		04/29/02		07/24/02	
LOCATION	Quality	SITE 26, MW-11		SITE 26, MW-11		SITE 26, MW-11		SITE 26, MW-11		SITE 26, MW-11		SITE 26, MW-11	
MATRIX	Criteria	AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS	
UNITS	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
COMMENTS		Baseline GW		After 1st Qtr of AS/SVE		After 2nd Qtr of AS/SVE		After 3rd Qtr of AS/SVE		After 4TH Qtr of AS/SVE		After 5th Qtr of AS/SVE	
Chloromethane	30	5	U	1	U	1.1	U	1.1	U	1	U	1.4	U
Bromomethane	10	5	UJ	1	U	0.6	U	0.6	U	1	U	1.7	U
Vinyl Chloride	5	5	U	1	U	1	U	1	U	1	U	1.2	U
Chloroethane	NA	5	U	1	U	0.7	U	0.7	U	1	U	1.8	U
Methylene Chloride	2	5	U	1	U	0.4	U	0.4	U	1	U	**2.9**	
Acetone	700	5	R	5	U	2.4	U	2.4	U	NR		NR	
Carbon Disulfide	NA	5	U	1	U	0.3	U	0.3	U	NR		NR	
1,1-Dichlorethene	1	5	U	1	U	0.4	U	0.4	U	1	U	1	U
1,1-Dichlorethane	70	5	U	1	U	0.2	U	0.2	U	1	U	0.6	U
cis - 1,2 -Dichloroethene	10	5	U	1	U	0.3	U	0.3	U	1	U	1	U
trans - 1,2-Dichlorethene	100	5	U	1	U	0.4	U	0.4	U	1	U	1	U
Chloroform	6	5	U	**12**		2		0.6		1	U	0.8	U
1,2-Dichlorethane	2	5	U	1	U	0.3	U	0.3	U	1	U	0.6	U
2-Butanone	300	5	R	5	U	2.8	U	2.8	U	1	U	NR	
1,1,1-Trichlorethane	30	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
Carbon Tetrachloride	2	5	U	1	U	0.3	U	0.3	U	1	U	0.5	U
Bromodichloromethane	1	5	U	1	U	0.3	U	0.3	U	1	U	0.9	U
1,2-Dichloropropane	1	5	U	1	U	0.4	U	0.4	U	1	U	0.8	U
cis-1,3-Dichloropropene	NA	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
Trichloroethene	1	5	U	**1.4**		0.4	U	0.4	U	1	U	0.9	U
Dibromochloromethane	10	5	U	1	U	0.3	U	0.3	U	1	U	1.4	U
1,1,2-Trichloroethane	3	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
Benzene	1	5	U	1	U	0.3	U	0.3	U	1	U	0.6	U
trans-1,3-Dichloropropene	NA	5	U	1	U	0.2	U	0.2	U	1	U	NR	
Bromoform	4	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
4-Methyl-2-pentanone	400	5	U	5	U	1.4	U	1.4	U	NR		NR	
2-Hexanone	NA	5	UJ	5	U	1	U	1	U	NR		NR	
Tetrachloroethene	1	5	UJ	1	U	0.3	U	0.3	U	1	U	1	U
Toluene	1000	5	U	1	U	0.3	U	0.3	U	1	U	1	U
1,1,2,2-Tetrachloroethane	2	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
Chlorobenzene	4	5	U	1	U	0.2	U	0.2	U	1	U	1	U
Ethylbenzene	700	5	U	1	U	0.4	U	0.4	U	1	U	1.2	U
Styrene	100	5	U	1	U	0.2	U	0.2	U	1	U	NR	
Xylenes (total)	40	5	U	1	U	0.9	U	0.9	U	1	U	3.4	U

Notes:
U - Not detected above quantitation limit
NA - No applicable standard
NR - No result
D - Diluted
J - Estimated
UJ - Not detected, quantitation limit is approximate
R - Result rejected (see data validation report)
T - Tentitive Identified Compound
Shaded/Bolded - Exceeds NJDEP GQS
ug/L - microgram per liter

Table 1-1

NWS-Earle, Site 26

5th Quarter - AS/SVE Operation Report

Groundwater Analytical Data

Volatile Organic Compounds

SAMPLE ID	NJDEP	26MW-12		26MW-12-02		26MW-12-03		26MW-12-04		26MWD-04		26MW12-05		26MW12D-05		26MW12-06	
LABORATORY ID		O32600		O07		O05		O10		O11		P2414-10		P2414-14		P3468-16	
DATE COLLECTED	Groundwater	08/15/00		04/02/01		10/30/01		01/29/02		01/29/02		04/29/02		04/29/02		07/24/02	
LOCATION	Quality	SITE 26, MW-12		SITE 26, MW-12		SITE 26, MW-12		SITE 26, MW-12		SITE 26, MW-12		SITE 26, MW-12		SITE 26, MW-12		SITE 26, MW-12	
MATRIX	Criteria	AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS	
UNITS	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
COMMENTS		Baseline GW		After 1st Qtr of AS/SVE		After 2nd Qtr of AS/SVE		After 3rd Qtr of AS/SVE		After 3rd Qtr of AS/SVE		After 4TH Qtr of AS/SVE		After 4th Qtr of AS/SVE		After 5th Qtr of AS/SVE	
Chloromethane	30	5	U	1	U	1.1	U	1.1	U	1.1	U	1	U	1	U	1.4	U
Bromomethane	10	5	UJ	1	U	0.6	U	0.6	U	0.6	U	1	U	1	U	1.7	U
Vinyl Chloride	5	5	U	1	U	1	U	1	U	1	U	1	U	1	U	1.2	U
Chloroethane	NA	5	U	1	U	0.7	U	0.7	U	0.7	U	1	U	1	U	1.8	U
Methylene Chloride	2	5	U	1	U	0.4	U	0.4	U	0.4	U	1	U	1	U	1.2	
Acetone	700	5	R	5	U	2.4	U	2.4	U	2.4	U	NR		NR		NR	
Carbon Disulfide	NA	5	U	1	U	0.3	U	0.3	U	0.3	U	NR		NR		NR	
1,1-Dichlorethene	1	5	U	1	U	0.4	U	0.4	U	0.4	U	1	U	1	U	1	U
1,1-Dichlorethane	70	5	U	1	U	0.2	U	0.2	U	0.2	U	1	U	1	U	0.6	U
cis - 1,2 -Dichloroethene	10	5	U	1	U	0.3	U	0.3	U	0.3	U	1	U	1	U	1	U
trans - 1,2-Dichlorethene	100	5	U	1	U	0.4	U	0.4	U	0.4	U	1	U	1	U	1	U
Chloroform	6	5	U	1	U	0.3	U	0.3	U	0.3	U	1	U	1	U	0.8	U
1,2-Dichlorethane	2	5	U	1	U	0.3	U	0.3	U	0.3	U	1	U	1	U	0.6	U
2-Butanone	300	5	R	5	U	2.8	U	2.8	U	2.8	U	NR		NR		NR	
1,1,1-Trichlorethane	30	5	U	1	U	0.3	U	0.3	U	0.3	U	1	U	1	U	0.8	U
Carbon Tetrachloride	2	5	U	1	U	0.3	U	0.3	U	0.3	U	1	U	1	U	0.5	U
Bromodichloromethane	1	5	U	1	U	0.3	U	0.3	U	0.3	U	1	U	1	U	0.9	U
1,2-Dichloropropane	1	5	U	1	U	0.4	U	0.4	U	0.4	U	1	U	1	U	0.8	U
cis-1,3-Dichloropropene	NA	5	U	1	U	0.3	U	0.3	U	0.3	U	1	U	1	U	1.5	U
Trichloroethene	1	5	U	1	U	0.4	U	0.4	U	0.4	U	1	U	1	U	0.9	
Dibromochloromethane	10	5	U	1	U	0.3	U	0.3	U	0.3	U	1	U	1	U	1.4	U
1,1,2-Trichloroethane	3	5	U	1	U	0.3	U	0.3	U	0.3	U	1	U	1	U	1.5	U
Benzene	1	5	U	1	U	0.3	U	0.3	U	0.3	U	1	U	1	U	0.6	U
trans-1,3-Dichloropropene	NA	5	U	1	U	0.2	U	0.2	U	0.2	U	1	U	1	U	NR	
Bromoform	4	5	U	1	U	0.3	U	0.3	U	0.3	U	1	U	1	U	1.5	U
4-Methyl-2-pentanone	400	5	U	5	U	1.4	U	1.4	U	1.4	U	NR		NR		NR	
2-Hexanone	NA	5	UJ	5	U	1	U	1	U	1	U	NR		NR		NR	
Tetrachloroethene	1	5	UJ	1	U	0.3	U	0.3	U	0.3	U	1	U	1	U	1	U
Toluene	1000	5	U	1	U	0.3	U	0.3	U	0.3	U	1	U	1	U	1	U
1,1,2,2-Tetrachloroethane	2	5	U	1	U	0.3	U	0.3	U	0.3	U	1	U	1	U	0.8	U
Chlorobenzene	4	5	U	1	U	0.2	U	0.2	U	0.2	U	1	U	1	U	1	U
Ethylbenzene	700	5	U	1	U	0.4	U	0.4	U	0.4	U	1	U	1	U	1.2	U
Styrene	100	5	U	1	U	0.2	U	0.2	U	0.2	U	1	U	1	U	NR	
Xylenes (total)	40	5	U	1	U	0.9	U	0.9	U	0.9	U	1	U	1	U	3.4	U

Notes:

U - Not detected above quantitation limit

NA - No applicable standard

NR - No result

D - Diluted

J - Estimated

UJ - Not detected, quantitation limit is approximate

R - Result rejected (see data validation report)

T - Tentitive Identified Compound

Shaded/Bolded - Exceeds NJDEP GQS

ug/L - microgram per liter

Table 1-1

NWS-Earle, Site 26
5th Quarter - AS/SVE Operation Report
Groundwater Analytical Data
Volatile Organic Compounds

SAMPLE ID	NJDEP	26MW12-06D	
LABORATORY ID		P3468-17	
DATE COLLECTED	Groundwater	07/24/02	
LOCATION	Quality	SITE 26, MW-12	
MATRIX	Criteria	AQUEOUS	
UNITS	ug/L	ug/L	
COMMENTS		After 5th Qtr of AS/SVE	
Chloromethane	30	1.4	U
Bromomethane	10	1.7	U
Vinyl Chloride	5	1.2	U
Chloroethane	NA	1.8	U
Methylene Chloride	2	1.2	U
Acetone	700	NR	
Carbon Disulfide	NA	NR	
1,1-Dichlorethene	1	1	U
1,1-Dichlorethane	70	0.6	U
cis - 1,2 -Dichloroethene	10	1	U
trans - 1,2-Dichlorethene	100	1	U
Chloroform	6	0.8	U
1,2-Dichlorethane	2	0.6	U
2-Butanone	300	NR	
1,1,1-Trichlorethane	30	0.8	U
Carbon Tetrachloride	2	0.5	U
Bromodichloromethane	1	0.9	U
1,2-Dichloropropane	1	0.8	U
cis-1,3-Dichloropropene	NA	1.5	U
Trichloroethene	1	0.9	
Dibromochloromethane	10	1.4	U
1,1,2-Trichloroethane	3	1.5	U
Benzene	1	0.6	U
trans-1,3-Dichloropropene	NA	NR	
Bromoform	4	1.5	U
4-Methyl-2-pentanone	400	NR	
2-Hexanone	NA	NR	
Tetrachloroethene	1	1	U
Toluene	1000	1	U
1,1,2,2-Tetrachloroethane	2	0.8	U
Chlorobenzene	4	1	U
Ethylbenzene	700	1.2	U
Styrene	100	NR	
Xylenes (total)	40	3.4	U

Notes:
U - Not detected above quantitation limit
NA - No applicable standard
NR - No result
D - Diluted
J - Estimated
UJ - Not detected, quantitation limit is approximate
R - Result rejected (see data validation report)
T - Tentitive Identified Compound
Shaded/Bolded - Exceeds NJDEP GQS
ug/L - microgram per liter

Table 1-1

NWS-Earle, Site 26
5th Quarter - AS/SVE Operation Report
Groundwater Analytical Data
Volatile Organic Compounds

SAMPLE ID	NJDEP	26MW-13		26MW-13-02		26MW-13-03		26MW-13-04		26MW-13-05		26MW-13-06	
LABORATORY ID		O32599		O07		O04		O01		P2414-01		P3468-07	
DATE COLLECTED	Groundwater	08/15/00		04/03/01		10/30/01		01/29/02		04/29/02		07/24/02	
LOCATION	Quality	SITE 26, MW-13		SITE 26, MW-13		SITE 26, MW-13		SITE 26, MW-13		SITE 26, MW-13		SITE 26, MW-13	
MATRIX	Criteria	AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS	
UNITS	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
COMMENTS		Baseline GW		After 1st Qtr of AS/SVE		After 2nd Qtr of AS/SVE		After 3rd Qtr of AS/SVE		After 4TH Qtr of AS/SVE		After 5th Qtr of AS/SVE	
Chloromethane	30	5	U	1	U	1.1	U	1.1	U	1	U	1.4	U
Bromomethane	10	5	UJ	1	U	0.6	U	0.6	U	1	U	1.7	U
Vinyl Chloride	5	5	U	1	U	1	U	1	U	1	U	1.2	U
Chloroethane	NA	5	U	1	U	0.7	U	0.7	U	1	U	1.8	U
Methylene Chloride	2	5	U	1	U	0.4	U	0.4	U	1	U	**2.7**	
Acetone	700	5	R	5	U	2.4	U	2.4	U	NR		NR	
Carbon Disulfide	NA	5	U	1	U	0.3	U	0.3	U	NR	U	NR	
1,1-Dichlorethene	1	5	U	1	U	0.4	U	0.4	U	1	U	1	U
1,1-Dichlorethane	70	5	U	1	U	0.2	U	0.2	U	1	U	0.6	U
cis - 1,2 -Dichloroethene	10	5	U	1	U	4		3.1		1.2	T	1	U
trans - 1,2-Dichlorethene	100	5	U	1	U	0.4	U	0.4	U	1	U	1	U
Chloroform	6	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
1,2-Dichlorethane	2	5	U	1	U	0.3	U	0.3	U	1	U	0.6	U
2-Butanone	300	5	R	5	U	2.8	U	2.8	U	1	U	NR	
1,1,1-Trichlorethane	30	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
Carbon Tetrachloride	2	5	U	1	U	0.3	U	0.3	U	1	U	0.5	U
Bromodichloromethane	1	5	U	1	U	0.3	U	0.3	U	1	U	0.9	U
1,2-Dichloropropane	1	5	U	1	U	0.4	U	0.4	U	1	U	0.8	U
cis-1,3-Dichloropropene	NA	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
Trichloroethene	1	5	U	**2.3**		**8.7**		**8.4**		**7.7**	U	0.9	U
Dibromochloromethane	10	5	U	1	U	0.3	U	0.3	U	1	U	1.4	U
1,1,2-Trichloroethane	3	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
Benzene	1	5	U	1	U	0.3	U	0.3	U	1	U	0.6	U
trans-1,3-Dichloropropene	NA	5	U	1	U	0.2	U	0.2	U	1	U	NR	
Bromoform	4	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
4-Methyl-2-pentanone	400	5	U	5	U	1.4	U	1.4	U	NR		NR	
2-Hexanone	NA	5	UJ	5	U	1	U	1	U	NR		NR	
Tetrachloroethene	1	5	UJ	1	U	0.3	U	0.3	U	1	U	1	U
Toluene	1000	5	U	1	U	0.3	U	0.3	U	1	U	1	U
1,1,2,2-Tetrachloroethane	2	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
Chlorobenzene	4	5	U	1	U	0.2	U	0.2	U	1	U	1	U
Ethylbenzene	700	5	U	1	U	0.4	U	0.4	U	1	U	1.2	U
Styrene	100	5	U	1	U	0.2	U	0.2	U	1	U	NR	
Xylenes (total)	40	5	U	1	U	0.9	U	0.9	U	1	U	3.4	U

Notes:
U - Not detected above quantitation limit
NA - No applicable standard
NR - No result
D - Diluted
J - Estimated
UJ - Not detected, quantitation limit is approximate
R - Result rejected (see data validation report)
T - Tentitive Identified Compound
Shaded/Bolded - Exceeds NJDEP GQS
ug/L - microgram per liter

Table 1-1

NWS-Earle, Site 26
5th Quarter - AS/SVE Operation Report
Groundwater Analytical Data
Volatile Organic Compounds

SAMPLE ID	NJDEP	26AS-1		26AS-1-02		26AS-1-03		26AS-1-04		26AS-1-05		26AS-1-06	
LABORATORY ID		O32602		O12		O03		O07		P2414-11		P3468-18	
DATE COLLECTED	Groundwater	08/16/00		03/29/01		10/30/01		01/29/02		04/29/02		04/29/02	
LOCATION	Quality	SITE 26, AS-1		SITE 26, AS-1		SITE 26, AS-1		SITE 26, AS-1		SITE 26, AS-1		SITE 26, AS-1	
MATRIX	Criteria	AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS	
UNITS	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
COMMENTS		Baseline GW		After 1st Qtr of AS/SVE		After 2nd Qtr of AS/SVE		After 3rd Qtr of AS/SVE		After 4TH Qtr of AS/SVE		After 5th Qtr of AS/SVE	
Chloromethane	30	5	U	1	U	1.1	U	NR		1	U	1.4	U
Bromomethane	10	5	UJ	1	U	0.6	U	NR		1	U	1.7	U
Vinyl Chloride	5	5	U	1	U	1	U	NR		1	U	1.2	U
Chloroethane	NA	5	U	1	U	0.7	U	NR		1	U	1.8	U
Methylene Chloride	2	5	U	1	U	0.4	U	NR		1	U	1.2	U
Acetone	700	5	R	5	U	2.4	U	NR		NR		NR	
Carbon Disulfide	NA	5	U	1	U	0.3	U	NR		NR		NR	
1,1-Dichlorethene	1	5	U	1	U	0.4	U	NR		1	U	1	U
1,1-Dichlorethane	70	5	U	1	U	0.2	U	NR		1	U	0.6	U
cis - 1,2 -Dichloroethene	10	**6.3**		**38**		**45**		NR		**53**	TD	1	U
trans - 1,2-Dichlorethene	100	5	U	1	U	0.4	U	NR		1	U	1	U
Chloroform	6	5	U	1	U	0.3	U	NR		1	U	0.8	U
1,2-Dichlorethane	2	5	U	1	U	0.3	U	NR		1	U	0.6	U
2-Butanone	300	5	R	5	U	2.8	U	NR		NR		NR	
1,1,1-Trichlorethane	30	5	U	1	U	0.3	U	NR		1	U	0.8	U
Carbon Tetrachloride	2	5	U	1	U	0.3	U	NR		1	U	0.5	U
Bromodichloromethane	1	5	U	1	U	0.3	U	NR		1	U	0.9	U
1,2-Dichloropropane	1	5	U	1	U	0.4	U	NR		1	U	0.8	U
cis-1,3-Dichloropropene	NA	5	U	1	U	0.3	U	NR		1	U	1.5	U
Trichloroethene	1	**7.9**		**120**		**43**		NR		**65**	D	0.9	U
Dibromochloromethane	10	5	U	1	U	0.3	U	NR		1	U	1.4	U
1,1,2-Trichloroethane	3	5	U	1	U	0.3	U	NR		1	U	1.5	U
Benzene	1	5	U	1	U	0.3	U	NR		1	U	0.6	U
trans-1,3-Dichloropropene	NA	5	U	1	U	0.2	U	NR		1	U	NR	
Bromoform	4	5	U	1	U	0.3	U	NR		1	U	1.5	U
4-Methyl-2-pentanone	400	5	U	5	U	1.4	U	NR		NR		NR	
2-Hexanone	NA	5	UJ	5	U	1	U	NR		NR		NR	
Tetrachloroethene	1	5	UJ	1	U	0.3	U	NR		1	U	1	U
Toluene	1000	5	U	1	U	0.3	U	NR		1	U	1	U
1,1,2,2-Tetrachloroethane	2	5	U	1	U	0.3	U	NR		1	U	0.8	U
Chlorobenzene	4	5	U	1	U	0.2	U	NR		1	U	1	U
Ethylbenzene	700	5	U	1	U	0.4	U	NR		1	U	1.2	U
Styrene	100	5	U	1	U	0.2	U	NR		1	U	NR	
Xylenes (total)	40	5	U	1	U	0.9	U	NR		1	U	3.4	U

Notes:
U - Not detected above quantitation limit
NA - No applicable standard
NR - No result
D - Diluted
J - Estimated
UJ - Not detected, quantitation limit is approximate
R - Result rejected (see data validation report)
T - Tentitive Identified Compound
Shaded/Bolded - Exceeds NJDEP GQS
ug/L - microgram per liter

Table 1-1

NWS-Earle, Site 26
5th Quarter - AS/SVE Operation Report
Groundwater Analytical Data
Volatile Organic Compounds

SAMPLE ID	NJDEP	26AS-35		26AS-35-02		26AS-35-03		26AS-35-04		26AS-35-05		26AS-35-06	
LABORATORY ID		O32603		O12		O06		O09		P2414-08		P3468-13	
DATE COLLECTED	Groundwater	08/16/00		04/03/01		10/30/01		1/29/02		04/29/02		07/24/02	
LOCATION	Quality	SITE 26, AS-35		SITE 26, AS-35		SITE 26, AS-35		SITE 26, AS-35		SITE 26, AS-35		SITE 26, AS-35	
MATRIX	Criteria	AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS	
UNITS	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
COMMENTS		Baseline GW		After 1st Qtr of AS/SVE		After 2nd Qtr of AS/SVE		After 3rd Qtr of AS/SVE		After 4TH Qtr of AS/SVE		After 5th Qtr of AS/SVE	
Chloromethane	30	5	UJ	1	U	1.1	U	1.1	U	1	U	1.4	U
Bromomethane	10	5	UJ	1	U	0.6	U	0.6	U	1	U	1.7	U
Vinyl Chloride	5	5	U	1	U	1	U	1	U	1	U	1.2	U
Chloroethane	NA	5	U	1	U	0.7	U	0.7	U	1	U	1.8	U
Methylene Chloride	2	5	U	1	U	0.4	U	0.4	U	1	U	1.7	
Acetone	700	5	R	5	U	2.4	U	2.4	U	NR		NR	
Carbon Disulfide	NA	5	U	1	U	0.3	U	0.3	U	NR		NR	
1,1-Dichlorethene	1	5	U	1	U	0.4	U	0.4	U	1	U	1	U
1,1-Dichlorethane	70	5	U	1	U	0.2	U	0.2	U	1	U	0.6	U
cis - 1,2 -Dichloroethene	10	5	U	5.5		1.2		1.8		2.9	T	1	U
trans - 1,2-Dichlorethene	100	5	U	1	U	0.4	U	0.4	U	1	U	1	U
Chloroform	6	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
1,2-Dichlorethane	2	5	U	1	U	0.3	U	0.3	U	1	U	0.6	U
2-Butanone	300	5	U	5	U	2.8	U	2.8	U	NR		NR	
1,1,1-Trichlorethane	30	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
Carbon Tetrachloride	2	5	UJ	1	U	0.3	U	0.3	U	1	U	0.5	U
Bromodichloromethane	1	5	U	1	U	0.3	U	0.3	U	1	U	0.9	U
1,2-Dichloropropane	1	5	U	1	U	0.4	U	0.4	U	1	U	0.8	U
cis-1,3-Dichloropropene	NA	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
Trichloroethene	1	**5.6**		**6.1**		0.4	U	0.8		**3.1**		0.9	U
Dibromochloromethane	10	5	U	1	U	0.3	U	0.3	U	1	U	1.4	U
1,1,2-Trichloroethane	3	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
Benzene	1	5	U	1	U	0.3	U	0.3	U	1	U	0.6	U
trans-1,3-Dichloropropene	NA	5	U	1	U	0.2	U	0.2	U	1	U	NR	
Bromoform	4	5	U	1	U	0.3	U	0.3	U	1	U	1.5	U
4-Methyl-2-pentanone	400	5	U	5	U	1.4	U	1.4	U	NR		NR	
2-Hexanone	NA	5	UJ	5	U	1	U	1	U	NR		NR	
Tetrachloroethene	1	5	UJ	1	U	0.3	U	0.3	U	1	U	1	U
Toluene	1000	5	U	1	U	0.3	U	0.3	U	1	U	1	U
1,1,2,2-Tetrachloroethane	2	5	U	1	U	0.3	U	0.3	U	1	U	0.8	U
Chlorobenzene	4	5	U	1	U	0.2	U	0.2	U	1	U	1	U
Ethylbenzene	700	5	U	1	U	0.4	U	0.4	U	1	U	1.2	U
Styrene	100	5	U	1	U	0.2	U	0.2	U	1	U	NR	
Xylenes (total)	40	5	U	1	U	0.9	U	0.9	U	1	U	3.4	U

Notes:
U - Not detected above quantitation limit
NA - No applicable standard
NR - No result
D - Diluted
J - Estimated
UJ - Not detected, quantitation limit is approximate
R - Result rejected (see data validation report)
T - Tentitive Identified Compound
Shaded/Bolded - Exceeds NJDEP GQS
ug/L - microgram per liter

Table 1-1

NWS-Earle, Site 26
5th Quarter - AS/SVE Operation Report
Groundwater Analytical Data
Volatile Organic Compounds

SAMPLE ID	NJDEP	26MW-14-02		26MW-14-03		26MW-14-04		26MWDP-04		26MW14-05		26MW14-06	
LABORATORY ID		O01		O03		O16		O17		P2414-12		P3468-03	
DATE COLLECTED	Groundwater	5/16/01		10/26/01		1/30/02		1/30/02		04/30/02		07/23/02	
LOCATION	Quality	SITE 26, MW-14		SITE 26, MW-14		SITE 26, MW-14		SITE 26, MW-14		SITE 26, MW-14		SITE 26, MW-14	
MATRIX	Criteria	AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS	
UNITS	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
COMMENTS		After 1st Qtr of AS/SVE		After 2nd Qtr of AS/SVE		After 3rd Qtr of AS/SVE		After 3rd Qtr of AS/SVE		After 4TH Qtr of AS/SVE		After 5th Qtr of AS/SVE	
Chloromethane	30	1	U	1.1	U	1.1	U	1.1	U	1	U	1.4	U
Bromomethane	10	1	U	0.6	U	0.6	U	0.6	U	1	U	1.7	U
Vinyl Chloride	5	1	U	1	U	1	U	1	U	1	U	1.2	U
Chloroethane	NA	1	U	0.7	U	0.7	U	0.7	U	1	U	1.8	U
Methylene Chloride	2	1	U	0.4	U	0.4	U	0.4	U	1	U	1.2	
Acetone	700	5	U	2.4	U	2.4	U	2.4	U	NR		NR	
Carbon Disulfide	NA	NR		0.3	U	0.3	U	0.3	U	NR		NR	
1,1-Dichlorethene	1	1	U	0.4	U	0.4	U	0.4	U	1	U	1	U
1,1-Dichlorethane	70	1	U	0.2	U	0.2	U	0.2	U	1	U	0.6	U
cis - 1,2 -Dichloroethene	10	1	U	0.3	U	0.3	U	0.3	U	1	U	1	U
trans - 1,2-Dichlorethene	100	NR		0.4	U	0.4	U	0.4	U	1	U	1	U
Chloroform	6	1	U	0.3	U	0.3	U	0.3	U	1	U	0.8	U
1,2-Dichlorethane	2	1	U	0.3	U	0.3	U	0.3	U	1	U	0.6	U
2-Butanone	300	5	U	2.8	U	2.8	U	2.8	U	NR		NR	
1,1,1-Trichlorethane	30	1	U	0.3	U	0.3	U	0.3	U	1	U	0.8	U
Carbon Tetrachloride	2	1	U	0.3	U	0.3	U	0.3	U	1	U	0.5	U
Bromodichloromethane	1	1	U	0.3	U	0.3	U	0.3	U	1	U	0.9	U
1,2-Dichloropropane	1	1	U	0.4	U	0.4	U	0.4	U	1	U	0.8	U
cis-1,3-Dichloropropene	NA	NR		0.3	U	0.3	U	0.3	U	1	U	1.5	U
Trichloroethene	1	1	U	0.4	U	0.4	U	0.4	U	1	U	0.9	U
Dibromochloromethane	10	1	U	0.3	U	0.3	U	0.3	U	1	U	1.4	U
1,1,2-Trichloroethane	3	1	U	0.3	U	0.3	U	0.3	U	1	U	1.5	U
Benzene	1	1	U	0.3	U	0.3	U	0.3	U	1	U	0.6	U
trans-1,3-Dichloropropene	NA		U	0.2	U	0.2	U	0.2	U	1	U	NR	
Bromoform	4	1	U	0.3	U	0.3	U	0.3	U	1	U	1.5	U
4-Methyl-2-pentanone	400	NR		1.4	U	1.4	U	1.4	U	NR		NR	
2-Hexanone	NA	NR		1	U	1	U	1	U	NR		NR	
Tetrachloroethene	1	1	U	0.3	U	0.3	U	0.3	U	1	U	1	U
Toluene	1000	1	U	0.3	U	0.3	U	0.3	U	1	U	1	U
1,1,2,2-Tetrachloroethane	2	1	U	0.3	U	0.3	U	0.3	U	1	U	0.8	U
Chlorobenzene	4	1	U	0.2	U	0.2	U	0.2	U	1	U	1	U
Ethylbenzene	700	1	U	0.4	U	0.4	U	0.4	U	1	U	1.2	U
Styrene	100	1	U	0.2	U	0.2	U	0.2	U	1	U	NR	
Xylenes (total)	40	1	U	0.9	U	0.9	U	0.9	U	1	U	3.4	U

Notes:
U - Not detected above quantitation limit
NA - No applicable standard
NR - No result
D - Diluted
J - Estimated
UJ - Not detected, quantitation limit is approximate
R - Result rejected (see data validation report)
T - Tentitive Identified Compound
Shaded/Bolded - Exceeds NJDEP GQS
ug/L - microgram per liter

Table 1-1

NWS-Earle, Site 26
5th Quarter - AS/SVE Operation Report
Groundwater Analytical Data
Volatile Organic Compounds

SAMPLE ID	NJDEP	26MW-15-02		26MW-15-03		26MW-15-04		26MW-15-05		26MW-15-06	
LABORATORY ID		O02		O01		O06		P2414-16		P3468-02	
DATE COLLECTED	Groundwater	5/16/01		10/26/01		1/29/02		04/30/02		07/23/02	
LOCATION	Quality	SITE 26, MW-15		SITE 26, MW-15		SITE 26, MW-15		SITE 26, MW-15		SITE 26, MW-15	
MATRIX	Criteria	AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS	
UNITS	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L	
COMMENTS		After 1st Qtr of AS/SVE		After 2nd Qtr of AS/SVE		After 3rd Qtr of AS/SVE		After 4TH Qtr of AS/SVE		After 5th Qtr of AS/SVE	
Chloromethane	30	1	U	1.1	U	1.1	U	1	U	1.4	U
Bromomethane	10	1	U	0.6	U	0.6	U	1	U	1.7	U
Vinyl Chloride	5	1	U	1	U	1	U	1	U	1.2	U
Chloroethane	NA	1	U	0.7	U	0.7	U	1	U	1.8	U
Methylene Chloride	2	1	U	0.4	U	0.4	U	1	U	1.2	U
Acetone	700	5	U	2.4	U	2.4	U	NR		NR	
Carbon Disulfide	NA	NR		0.3	U	0.3	U	NR		NR	
1,1-Dichlorethene	1	1	U	0.4	U	0.4	U	1	U	1	U
1,1-Dichlorethane	70	1	U	0.2	U	0.2	U	1	U	1	U
cis - 1,2 -Dichloroethene	10	1	U	0.3	U	0.3	U	1	U	1	U
trans - 1,2-Dichlorethene	100	NR		0.4	U	0.4	U	1	U	1	U
Chloroform	6	1	U	0.3	U	0.3	U	1	U	0.8	U
1,2-Dichlorethane	2	1	U	0.3	U	0.3	U	1	U	0.6	U
2-Butanone	300	5	U	2.8	U	2.8	U	NR		NR	
1,1,1-Trichlorethane	30	1	U	0.3	U	0.3	U	1	U	1	U
Carbon Tetrachloride	2	1	U	0.3	U	0.3	U	1	U	0.5	U
Bromodichloromethane	1	1	U	0.3	U	0.3	U	1	U	0.9	U
1,2-Dichloropropane	1	1	U	0.4	U	0.4	U	1	U	0.8	U
cis-1,3-Dichloropropene	NA	NR		0.3	U	0.3	U	1	U	1.5	U
Trichloroethene	1	1	U	0.4	U	0.4	U	1	U	0.9	U
Dibromochloromethane	10	1	U	0.3	U	0.3	U	1	U	1.4	U
1,1,2-Trichloroethane	3	1	U	0.3	U	0.3	U	1	U	1.5	U
Benzene	1	1	U	0.3	U	0.3	U	1	U	0.6	U
trans-1,3-Dichloropropene	NA		U	0.2	U	0.2	U	1	U	NR	
Bromoform	4	1	U	0.3	U	0.3	U	1	U	1.5	U
4-Methyl-2-pentanone	400	NR		1.4	U	1.4	U	NR		NR	
2-Hexanone	NA	NR		1	U	1	U	NR		NR	
Tetrachloroethene	1	1	U	0.3	U	0.3	U	1	U	1	U
Toluene	1000	1	U	0.3	U	0.3	U	1	U	1	U
1,1,2,2-Tetrachloroethane	2	1	U	0.3	U	0.3	U	1	U	0.8	U
Chlorobenzene	4	1	U	0.2	U	0.2	U	1	U	1	U
Ethylbenzene	700	1	U	0.4	U	0.4	U	1	U	1.2	U
Styrene	100	1	U	0.2	U	0.2	U	1	U	NR	
Xylenes (total)	40	1	U	0.9	U	0.9	U	1	U	3.4	U

Notes:
U - Not detected above quantitation limit
NA - No applicable standard
NR - No result
D - Diluted
J - Estimated
UJ - Not detected, quantitation limit is approximate
R - Result rejected (see data validation report)
T - Tentitive Identified Compound
Shaded/Bolded - Exceeds NJDEP GQS
ug/L - microgram per liter

Table 1-1

NWS-Earle, Site 26
5th Quarter - AS/SVE Operation Report
Groundwater Analytical Data
Volatile Organic Compounds

SAMPLE ID	NJDEP	26MW-16-02		26MW-16-03		26MW-16-04		26MW-16-05		26MW-16-06	
LABORATORY ID		O03		O02		O08		P2414-17		P3468-01	
DATE COLLECTED	Groundwater	5/16/01		10/26/01		1/29/02		04/30/02		07/23/02	
LOCATION	Quality	SITE 26, MW-16		SITE 26, MW-16		SITE 26, MW-16		SITE 26, MW-16		SITE 26, MW-16	
MATRIX	Criteria	AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS	
UNITS	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L	
COMMENTS		After 1st Qtr of AS/SVE		After 2nd Qtr of AS/SVE		After 3rd Qtr of AS/SVE		After 4TH Qtr of AS/SVE		After 5th Qtr of AS/SVE	
Chloromethane	30	1	U	1.1	U	1.1	U	1	U	1.4	U
Bromomethane	10	1	U	0.6	U	0.6	U	1	U	1.7	U
Vinyl Chloride	5	1	U	1	U	1	U	1	U	1.2	U
Chloroethane	NA	1	U	0.7	U	0.7	U	1	U	1.8	U
Methylene Chloride	2	1	U	0.4	U	1.2	B	1	U	1.2	U
Acetone	700	5	U	16		2.4	U	NR		NR	
Carbon Disulfide	NA	NR		0.3	U	1.5		NR		NR	
1,1-Dichlorethene	1	1	U	0.4	U	0.4	U	1	U	1	U
1,1-Dichlorethane	70	1	U	0.2	U	0.2	U	1	U	0.6	U
cis - 1,2 -Dichloroethene	10	1	U	0.3	U	0.3	U	1	U	1	U
trans - 1,2-Dichlorethene	100	NR		0.4	U	0.4	U	1	U	1	U
Chloroform	6	1	U	0.3	U	0.3	U	1	U	0.8	U
1,2-Dichlorethane	2	1	U	0.3	U	0.3	U	1	U	0.6	U
2-Butanone	300	5	U	2.8	U	2.8	U	NR		NR	
1,1,1-Trichlorethane	30	1	U	0.3	U	0.3	U	1	U	0.8	U
Carbon Tetrachloride	2	1	U	0.3	U	0.3	U	1	U	0.5	U
Bromodichloromethane	1	1	U	0.3	U	0.3	U	1	U	0.9	U
1,2-Dichloropropane	1	1	U	0.4	U	0.4	U	1	U	0.8	U
cis-1,3-Dichloropropene	NA	NR		0.3	U	0.3	U	1	U	1.5	U
Trichloroethene	1	1	U	0.4	U	0.4	U	1	U	0.9	U
Dibromochloromethane	10	1	U	0.3	U	0.3	U	1	U	1.4	U
1,1,2-Trichloroethane	3	1	U	0.3	U	0.3	U	1	U	1.5	U
Benzene	1	1	U	0.3	U	0.3	U	1	U	0.6	U
trans-1,3-Dichloropropene	NA		U	0.2	U	0.2	U	1	U	NR	
Bromoform	4	1	U	0.3	U	0.3	U	1	U	1.5	U
4-Methyl-2-pentanone	400	NR		1.4	U	1.4	U	NR		NR	
2-Hexanone	NA	NR		1	U	1	U	NR		NR	
Tetrachloroethene	1	1	U	0.3	U	0.3	U	1	U	1	U
Toluene	1000	1	U	0.3	U	0.3	U	1	U	1	U
1,1,2,2-Tetrachloroethane	2	1	U	0.3	U	0.3	U	1	U	0.8	U
Chlorobenzene	4	1	U	0.2	U	0.2	U	1	U	1	U
Ethylbenzene	700	1	U	0.4	U	0.4	U	1	U	1.2	U
Styrene	100	1	U	0.2	U	0.2	U	1	U	NR	
Xylenes (total)	40	1	U	0.9	U	0.9	U	1	U	3.4	U

Notes:
U - Not detected above quantitation limit
NA - No applicable standard
NR - No result
D - Diluted
J - Estimated
UJ - Not detected, quantitation limit is approximate
R - Result rejected (see data validation report)
T - Tentitive Identified Compound
Shaded/Bolded - Exceeds NJDEP GQS
ug/L - microgram per liter

Table 1-1

NWS-Earle, Site 26
5th Quarter - AS/SVE Operation Report
Groundwater Analytical Data
Volatile Organic Compounds

SAMPLE ID	NJDEP	26MW-17-02		26MW-17-03		26MW-17-04		26MW-17-05		26MW-17-06	
LABORATORY ID		O04		O05		O13		P2414-15		P3468-06	
DATE COLLECTED	Groundwater	5/16/01		10/26/01		1/30/02		04/30/02		07/23/02	
LOCATION	Quality	SITE 26, MW-17		SITE 26, MW-17		SITE 26, MW-17		SITE 26, MW-17		SITE 26, MW-17	
MATRIX	Criteria	AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS	
UNITS	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L	
COMMENTS		After 1st Qtr of AS/SVE		After 2nd Qtr of AS/SVE		After 3rd Qtr of AS/SVE		After 4TH Qtr of AS/SVE		After 5th Qtr of AS/SVE	
Chloromethane	30	1	U	1.1	U	1.1	U	1	U	1.4	U
Bromomethane	10	1	U	0.6	U	0.6	U	1	U	1.7	U
Vinyl Chloride	5	1	U	1	U	1	U	1	U	1.2	U
Chloroethane	NA	1	U	0.7	U	0.7	U	1	U	1.8	U
Methylene Chloride	2	1	U	0.4	U	0.4	U	1	U	1.2	U
Acetone	700	5	U	2.4	U	2.4	U	NR		NR	
Carbon Disulfide	NA	NR		0.3	U	0.3	U	NR		NR	
1,1-Dichlorethene	1	1	U	0.4	U	0.4	U	1	U	1	U
1,1-Dichlorethane	70	1	U	0.2	U	0.2	U	1	U	0.6	U
cis - 1,2 -Dichloroethene	10	1	U	0.3	U	0.3	U	1	U	1	U
trans - 1,2-Dichlorethene	100	NR		0.4	U	0.4	U	1	U	1	U
Chloroform	6	1	U	0.3	U	0.3	U	1	U	0.8	U
1,2-Dichlorethane	2	1	U	0.3	U	0.3	U	1	U	0.6	U
2-Butanone	300	5	U	2.8	U	2.8	U	NR		NR	
1,1,1-Trichlorethane	30	1	U	0.3	U	0.3	U	1	U	0.8	U
Carbon Tetrachloride	2	1	U	0.3	U	0.3	U	1	U	0.5	U
Bromodichloromethane	1	1	U	0.3	U	0.3	U	1	U	0.9	U
1,2-Dichloropropane	1	1	U	0.4	U	0.4	U	1	U	0.8	U
cis-1,3-Dichloropropene	NA	NR		0.3	U	0.3	U	1	U	1.5	U
Trichloroethene	1	1	U	0.4	U	0.4	U	1	U	0.9	U
Dibromochloromethane	10	1	U	0.3	U	0.3	U	1	U	1.4	U
1,1,2-Trichloroethane	3	1	U	0.3	U	0.3	U	1	U	1.5	U
Benzene	1	1	U	0.3	U	0.3	U	1	U	0.6	U
trans-1,3-Dichloropropene	NA	1	U	0.2	U	0.2	U	1	U	NR	
Bromoform	4	1	U	0.3	U	0.3	U	1	U	1.5	U
4-Methyl-2-pentanone	400	NR		1.4	U	1.4	U	NR		NR	
2-Hexanone	NA	NR		1	U	1	U	NR		NR	
Tetrachloroethene	1	1	U	0.3	U	0.3	U	1	U	1	U
Toluene	1000	1	U	0.3	U	0.3	U	1	U	1	U
1,1,2,2-Tetrachloroethane	2	1	U	0.3	U	0.3	U	1	U	0.8	U
Chlorobenzene	4	1	U	0.2	U	0.2	U	1	U	1	U
Ethylbenzene	700	1	U	0.4	U	0.4	U	1	U	1.2	U
Styrene	100	1	U	0.2	U	0.2	U	1	U	NR	
Xylenes (total)	40	1	U	0.9	U	0.9	U	1	U	3.4	U

Notes:
U - Not detected above quantitation limit
NA - No applicable standard
NR - No result
D - Diluted
J - Estimated
UJ - Not detected, quantitation limit is approximate
R - Result rejected (see data validation report)
T - Tentitive Identified Compound
Shaded/Bolded - Exceeds NJDEP GQS
ug/L - microgram per liter

Table 1-1

NWS-Earle, Site 26
5th Quarter - AS/SVE Operation Report
Groundwater Analytical Data
Volatile Organic Compounds

SAMPLE ID	NJDEP	26MW-18-02		26MW-18-03		26MW-18-04		26MW-18-05		26MW-18-06	
LABORATORY ID		O05		O04		O12		p2414-13		p2414-13	
DATE COLLECTED	Groundwater	5/16/01		10/26/01		1/30/02		04/30/02		07/23/02	
LOCATION	Quality	SITE 26, MW-18		SITE 26, MW-18		SITE 26, MW-18		SITE 26, MW-18		SITE 26, MW-18	
MATRIX	Criteria	AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS	
UNITS	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L	
COMMENTS		After 1st Qtr of AS/SVE		After 2nd Qtr of AS/SVE		After 3rd Qtr of AS/SVE		After 4TH Qtr of AS/SVE		After 5th Qtr of AS/SVE	
Chloromethane	30	1	U	1.1	U	1.1	U	1	U	1.4	U
Bromomethane	10	1	U	0.6	U	0.6	U	1	U	1.7	U
Vinyl Chloride	5	1	U	1	U	1	U	1	U	1.2	U
Chloroethane	NA	1	U	0.7	U	0.7	U	1	U	1.8	U
Methylene Chloride	2	1	U	0.4	U	0.4	U	1	U	1.2	U
Acetone	700	5	U	2.4	U	2.4	U	NR		NR	
Carbon Disulfide	NA	NR		0.3	U	0.3	U	NR	U	NR	
1,1-Dichlorethene	1	1	U	0.4	U	0.4	U	1	U	1	U
1,1-Dichlorethane	70	1	U	0.2	U	0.2	U	1	U	0.6	U
cis - 1,2 -Dichloroethene	10	1	U	0.3	U	0.3	U	1	U	1	U
trans - 1,2-Dichlorethene	100	NR		0.4	U	0.4	U	1	U	1	U
Chloroform	6	1	U	**11**		**10**		**12**		**6.8**	
1,2-Dichlorethane	2	1	U	0.3	U	0.3	U	1	U	0.6	U
2-Butanone	300	5	U	2.8	U	2.8	U	NR		NR	
1,1,1-Trichlorethane	30	1	U	0.3	U	0.3	U	1	U	0.8	U
Carbon Tetrachloride	2	1	U	0.3	U	0.3	U	1	U	0.5	U
Bromodichloromethane	1	1	U	0.3	U	0.3	U	1	U	0.9	U
1,2-Dichloropropane	1	1	U	0.4	U	0.4	U	1	U	0.8	U
cis-1,3-Dichloropropene	NA	NR		0.3	U	0.3	U	1	U	1.5	U
Trichloroethene	1	1	U	0.4	U	0.4	U	1	U	0.9	U
Dibromochloromethane	10	1	U	0.3	U	0.3	U	1	U	1.4	U
1,1,2-Trichloroethane	3	1	U	0.3	U	0.3	U	1	U	1.5	U
Benzene	1	1	U	0.3	U	0.3	U	1	U	0.6	U
trans-1,3-Dichloropropene	NA		U	0.2	U	0.2	U	1	U	NR	
Bromoform	4	1	U	0.3	U	0.3	U	1	U	1.5	U
4-Methyl-2-pentanone	400	NR		1.4	U	1.4	U	NR		NR	
2-Hexanone	NA	NR		1	U	1	U	NR		NR	
Tetrachloroethene	1	1	U	**4.6**		**2.9**		**3.8**		**7**	
Toluene	1000	1	U	0.3	U	0.3	U	5	U	1	U
1,1,2,2-Tetrachloroethane	2	1	U	0.3	U	0.3	U	5	U	0.8	U
Chlorobenzene	4	1	U	0.2	U	0.2	U	5	U	1	U
Ethylbenzene	700	1	U	0.4	U	0.4	U	5	U	1.2	U
Styrene	100	1	U	0.2	U	0.2	U	5	U	NR	
Xylenes (total)	40	1	U	0.9	U	0.9	U	5	U	3.4	U

Notes:
U - Not detected above quantitation limit
NA - No applicable standard
NR - No result
D - Diluted
J - Estimated
UJ - Not detected, quantitation limit is approximate
R - Result rejected (see data validation report)
T - Tentitive Identified Compound
Shaded/Bolded - Exceeds NJDEP GQS
ug/L - microgram per liter

Table 1-1

NWS-Earle, Site 26

5th Quarter - AS/SVE Operation Report

Groundwater Analytical Data

Volatile Organic Compounds

SAMPLE ID	NJDEP	26MW-18-02		26MW-18-03		26MW-18-04		26MW-18-05		26MW-18-06	
LABORATORY ID		O05		O04		O12		p2414-13		p2414-13	
DATE COLLECTED	Groundwater	5/16/01		10/26/01		1/30/02		04/30/02		07/23/02	
LOCATION	Quality	SITE 26, MW-18		SITE 26, MW-18		SITE 26, MW-18		SITE 26, MW-18		SITE 26, MW-18	
MATRIX	Criteria	AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS		AQUEOUS	
UNITS	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L	
COMMENTS		After 1st Qtr of AS/SVE		After 2nd Qtr of AS/SVE		After 3rd Qtr of AS/SVE		After 4TH Qtr of AS/SVE		After 5th Qtr of AS/SVE	
Chloromethane	30	1	U	1.1	U	1.1	U	1	U	1.4	U
Bromomethane	10	1	U	0.6	U	0.6	U	1	U	1.7	U
Vinyl Chloride	5	1	U	1	U	1	U	1	U	1.2	U
Chloroethane	NA	1	U	0.7	U	0.7	U	1	U	1.8	U
Methylene Chloride	2	1	U	0.4	U	0.4	U	1	U	1.2	U
Acetone	700	5	U	2.4	U	2.4	U	NR		NR	
Carbon Disulfide	NA	NR		0.3	U	0.3	U	NR	U	NR	
1,1-Dichlorethene	1	1	U	0.4	U	0.4	U	1	U	1	U
1,1-Dichlorethane	70	1	U	0.2	U	0.2	U	1	U	0.6	U
cis - 1,2 -Dichloroethene	10	1	U	0.3	U	0.3	U	1	U	1	U
trans - 1,2-Dichlorethene	100	NR		0.4	U	0.4	U	1	U	1	U
Chloroform	6	1	U	**11**		**10**		**12**		**6.8**	
1,2-Dichlorethane	2	1	U	0.3	U	0.3	U	1	U	0.6	U
2-Butanone	300	5	U	2.8	U	2.8	U	NR		NR	
1,1,1-Trichlorethane	30	1	U	0.3	U	0.3	U	1	U	0.8	U
Carbon Tetrachloride	2	1	U	0.3	U	0.3	U	1	U	0.5	U
Bromodichloromethane	1	1	U	0.3	U	0.3	U	1	U	0.9	U
1,2-Dichloropropane	1	1	U	0.4	U	0.4	U	1	U	0.8	U
cis-1,3-Dichloropropene	NA	NR		0.3	U	0.3	U	1	U	1.5	U
Trichloroethene	1	1	U	0.4	U	0.4	U	1	U	0.9	U
Dibromochloromethane	10	1	U	0.3	U	0.3	U	1	U	1.4	U
1,1,2-Trichloroethane	3	1	U	0.3	U	0.3	U	1	U	1.5	U
Benzene	1	1	U	0.3	U	0.3	U	1	U	0.6	U
trans-1,3-Dichloropropene	NA		U	0.2	U	0.2	U	1	U	NR	
Bromoform	4	1	U	0.3	U	0.3	U	1	U	1.5	U
4-Methyl-2-pentanone	400	NR		1.4	U	1.4	U	NR		NR	
2-Hexanone	NA	NR		1	U	1	U	NR		NR	
Tetrachloroethene	1	1	U	**4.6**		**2.9**		**3.8**		**7**	
Toluene	1000	1	U	0.3	U	0.3	U	5	U	1	U
1,1,2,2-Tetrachloroethane	2	1	U	0.3	U	0.3	U	5	U	0.8	U
Chlorobenzene	4	1	U	0.2	U	0.2	U	5	U	1	U
Ethylbenzene	700	1	U	0.4	U	0.4	U	5	U	1.2	U
Styrene	100	1	U	0.2	U	0.2	U	5	U	NR	
Xylenes (total)	40	1	U	0.9	U	0.9	U	5	U	3.4	U

Notes:

U - Not detected above quantitation limit

NA - No applicable standard

NR - No result

D - Diluted

J - Estimated

UJ - Not detected, quantitation limit is approximate

R - Result rejected (see data validation report)

T - Tentitive Identified Compound

Shaded/Bolded - Exceeds NJDEP GQS

ug/L - microgram per liter

- The AS/SVE system has greatly reduced the TCE concentrations in the vicinity of the TCE source. The TCE concentrations in monitoring well 26MW01 have decreased from a pre-startup (August 2000) concentration of 3,700 ug/L to the most recent (July 2002) concentration of 1.2 ug/L.

- The effect of the AS/SVE system on the PCE component of the plume is difficult to evaluate because only two monitoring wells (26MW10 and 26MW18) are located within that portion of the VOC plume. Monitoring well 26MW10, which is located approximately 60 feet northwest of the interpreted source near sampling location 26HP17, displayed a pre-startup (August 2000) PCE concentration of 6.2 ug/L, and most recently (July 2002) was non-detect for PCE at a detection limit of 1 ug/L. These data suggest that the PCE is being adequately remediated, but it must be noted that monitoring well 26MW10 is not optimally located to monitor and evaluate the effects of the AS/SVE system on the PCE component of the VOC plume.

- There are no detections of VOCs at the outlying "sentry well" locations, indicating that the plume has not migrated to the periphery or outermost-boundary area established by these monitoring wells.

1.4.7 Discussion

The quarterly data collected to date indicate that the AS/SVE system is successfully reducing the volume of the TCE and PCE source material. Conceptually, as these sources are removed, the extent and magnitude of the dissolved-phase VOC plume emanating from these source areas should similarly decrease through processes of natural attenuation (in other words, the plume should begin to retract or "shrink"). At present, however, there are insufficient data to prove this assumption because essentially no analytical data have been acquired downgradient of the source areas since the system start-up. There is only one permanent monitoring point (26MW10) located within the mid-gradient portion of the VOC plume (and it is not optimally located), and there are no permanent monitoring points located downgradient of 26MW10, within the distal portion of the plume.

The continued lack of VOC detections in the sentry wells indicates that even under a "worst-case scenario," the plume continues to exist under steady-state conditions and it is not migrating beyond the boundaries established by the temporary well screening program (Foster Wheeler, 2001). However, a conceptual model consistent with this hydrogeological environment and the system verification data collected to date indicate that it is not unreasonable to expect the VOC plume to contract as the sources are removed. For this reason, TtNUS has recommended the installation of additional permanent monitoring wells within the VOC plume that was delineated by the screening program. These wells would allow the collection of empirical data (VOC concentrations) that would directly indicate the degree and rate of plume attenuation as the sources are removed.

1.4.8 Conclusions and Recommendations

Based on evaluation of remediation activities and investigation results after the ROD for Site 26 (OU 3) was signed, the following conclusions and recommendations were developed:

- A VOC plume exists beneath Site 26 and extends from the area of Building GB-1 to the western bank of the Mingamahone Creek. The principal components of the VOC plume are TCE and PCE. These components emanate from different source locations, but generally overlap at most locations within the plume. The PCE component of the plume has a greater lateral extent to the south due to the more southerly location of the postulated PCE source. The downgradient extents of the TCE and PCE are identical.

- The TCE and PCE sources are being remediated by the AS/SVE system. Conceptually, the dissolved-phase plume emanating from these sources should attenuate or retract as the source concentrations are reduced. Very limited available data suggest that this attenuation is occurring, although this attenuation cannot be confirmed without additional data.

  - It is suggested that additional permanent monitoring wells be installed within the dissolved-phase plume (as defined by the screening well data) downgradient of the TCE and PCE source areas in order to acquire the analytical data needed to prove that the plume is attenuating. Suggested monitoring well locations are indicated in Figure 1-7. It is further suggested that the Mingamahone Creek and its tributary be sampled periodically to assure that the plume is not discharging to surface water and migrating beyond the site through the surface water pathway.

- Remediation of both operable units composing the VOC plume at Site 26 (OU 3 and OU 7) is underway as a result of the regulatory administration of the VOC plume prescribed by the ROD for OU 3. This conclusion is supported by the observations that the PCE and TCE components of the VOC plume overlap throughout much of its area, and that the existing AS/SVE system is already remediating the source areas for both of these plume components.

- The generally overlapping nature of the TCE and PCE components of the VOC plume indicate that a single CEA is needed for the total VOC plume. The existing sentry wells are in favorable locations to both define the outer boundary of the CEA and to indicate if the plume should migrate beyond the CEA, although the existing data indicate that it is very unlikely that the plume will migrate to that extent.

2.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

Remedial alternatives are developed by assembling combinations of technologies and the media to which they would be applied into an appropriate range of alternatives that address site contamination, risks, or threats. This section presents the preliminary phase of the remedial alternatives development process, which consists of the identification and screening of remedial technologies and includes the following:

- Developing remedial action objectives (RAOs) that are protective of human health and the environment with regard to the contaminants and media of concern, exposure pathways, and the preliminary remediation goals (PRGs) and that permit a range of treatment and containment alternatives to be developed.

- Developing general response actions for each medium of interest that define measures that may be taken singly or in combination to satisfy the RAOs for the site.

- Identifying the numbers, volumes, or areas of media to which the general response actions might be applied.

- Identifying and screening the technologies applicable to each general response action.

Section 2.1 presents a preliminary listing of applicable or relevant and appropriate requirements (ARARs) and other guidance to be considered (TBCs) in the development of RAOs for the NWS Earle OU 7 Site. Section 2.2 briefly presents the overall approach used to develop RAOs. Section 2.3 summarizes the overall approach used in development of PRGs. Section 2.4 identifies the general response actions that may be implemented at NWS Earle. Section 2.5 discusses the methods used for identification, screening, and evaluation of remedial alternatives. The site-specific development of RAOs, PRGs, and general response actions and screening of remedial technologies and process options for OU 7 are presented in Section 2.6.

2.1 POTENTIAL ARARs AND TBCs

ARARs are promulgated, enforceable federal and state environmental or public health requirements that are determined to be legally applicable or relevant and appropriate to the hazardous substances, remedial actions, or other circumstances at a CERCLA site. The National Contingency Plan (NCP) Section 300.430 states that on-site remedial actions at CERCLA sites must meet ARARs unless there are grounds for invoking a waiver. A waiver is required if ARARs cannot be achieved. The two classes of ARARs, "applicable" and "relevant and appropriate," are defined below.

- **Applicable Requirements** - Section 300.5 of the NCP defines applicable requirements as those clean-up standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. For example, if a new municipal landfill is being considered, then regulatory requirements that specifically govern its construction, operation, and closure are applicable.

- **Relevant and Appropriate Requirements** - Section 300.5 of the NCP defines relevant and appropriate requirements as those clean-up standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at a CERCLA site that their use is well suited to the particular site. For example, a municipal landfill that was constructed and operated prior to the promulgation of landfill regulations may be closed in accordance with the "relevant and appropriate" requirements of those regulations that identify activities needed to close the landfill.

TBCs (standards and guidance to be considered) are non-promulgated advisories or guidance issued by federal or state governments that are not legally binding but may be considered during development of remedial alternatives. For example, EPA Health Advisories and Reference Doses are non-promulgated criteria that are used to assess health risks from contaminants present on CERCLA sites.

ARARs and TBCs are divided into three categories: chemical-specific, location-specific, and action-specific. In Sections 2.1.1 through 2.1.3, these categories are briefly described and general types of potential ARARs and TBCs that may be applied to the site are identified. The detailed discussions of the potential ARARs and TBCs for specific remedial alternatives are provided in Section 4.0.

2.1.1 Potential Chemical-Specific ARARs and TBCs

Chemical-specific ARARs and TBCs are usually health- or risk-based numerical values that are used to establish the acceptable amount or concentration of a chemical that may remain in or be discharged to the environment. In general, chemical-specific requirements are set for a single chemical or a closely related group of chemicals. These requirements do not consider the mixture of chemicals. Typical chemical-specific ARARs are federal and state drinking water standards. Summaries of the potential federal and state chemical-specific ARARs and TBCs and their consideration in the FS are provided in Tables 2-1 and 2-2, respectively.

The aquifer underlying NWS Earle is classified as Class II-A, a potential source of potable water under New Jersey regulations [N.J.A.C. 7:9-6]. Groundwater at Site 26 is not currently used for drinking water and potable water is provided by a public water supply. Federal chemical-specific ARARs such as the Safe Drinking Water Act (SDWA) Maximum Containment Levels (MCLs) [40 CFR 141] and the Resource Conservation and Recovery Act (RCRA) MCLs and Alternate Concentration Limits (ACLs) [40 CFR 264.94] may be relevant and appropriate requirements in establishing groundwater cleanup levels, or may be used to help derive potential soil remediation levels. Non-zero MCL Goals (MCLGs) are non-promulgated health-based drinking water supply limits that are to be considered during the development of groundwater clean-up goals. EPA reference doses, carcinogen potency factors, and health advisories, when available, are all factors used to assess potential risks and can be used to derive risk-based clean-up limits. The disposal of contaminated soils may be restricted by the RCRA Land Disposal Restrictions [40 CFR 268], which may potentially be applicable.

Chemical-specific ARARs for the NWS Earle Sites include the New Jersey Ground Water Quality Standards (GWQSs) [N.J.A.C. 7:9-6] that regulate groundwater quality. Potential chemical-specific ARARs include the Surface Water Quality Standards [N.J.A.C. 7:9B] that provide guidelines for surface water quality. These state ARARs may potentially be relevant and appropriate and may be used to establish clean-up levels that are protective of human health and the environment.

While there are no specific promulgated soil clean-up standards, OSWER Directive No. 9355.4-12, Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, and the New Jersey Soil Cleanup Criteria may be considered in developing site-specific clean-up levels.

2.1.2 Potential Location-Specific ARARs and TBCs

Location-specific ARARs are restrictions placed on the concentrations of hazardous substances or the conduct of activities solely because the substances or activities are in specific areas. The general types of location-specific ARARs that may be applied to the sites are briefly described below. Summaries of the potential federal and state location-specific ARARs and TBCs and their consideration in this FS are provided in Tables 2-3 and 2-4, respectively.

TABLE 2-1
POTENTIAL FEDERAL CHEMICAL-SPECIFIC ARARs AND TBCs
OU 7 FEASIBILITY STUDY
NAVAL WEAPON STATION EARLE, COLTS NECK, NEW JERSEY

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE FS
Safe Drinking Water Act (SDWA) - Maximum Contaminant Levels (MCLs) (40 CFR 141.11-141.16)	Potentially Relevant and Appropriate	MCLs have been promulgated for a number of common organic and inorganic contaminants to regulate the concentration of contaminants in public drinking water supply systems. MCLs may be relevant and appropriate for groundwater because the aquifer beneath the site is a potential drinking water supply.	MCLs may be used to establish clean-up levels for the portion of the aquifer underlying OU 7. MCLs can be used to derive potential soil clean-up levels.
Resource Conservation and Recovery Act (RCRA) - Groundwater Protection Standard (40 CFR 264.94)	Potentially Relevant and Appropriate	The RCRA groundwater protection standard is established for groundwater monitoring of RCRA-permitted treatment, storage, or disposal facilities. The standard is set at either an existing or proposed RCRA MCL, background concentration, or an alternate concentration limit (ACL) protective of human health and the environment.	RCRA MCLs may be used or ACLs may be developed to identify levels of contamination in the aquifer above which human health and the environment are at risk and to provide an indicator when corrective action is necessary.
RCRA Land Disposal Restrictions (40 CFR 268)	Potentially Applicable	These regulations identify hazardous wastes that are restricted from land disposal and establish waste analysis and recordkeeping requirements and "treatment standards" (concentration levels or methods of treatment) that wastes must meet in order to be eligible for land disposal.	Soil removal is not anticipated for OU 7. However, contaminated soil must be analyzed and disposed in accordance with the requirements of these regulations. If necessary, soils will be treated to attain applicable "treatment standards" prior to placement in a landfill or other land disposal facility. This requirement would be considered for alternatives involving land disposal.
Clean Water Act – Ambient Water Quality Criteria (AWQCs)	To be Considered	AWQCs are non-promulgated health-based surface water quality criteria that have been developed for carcinogenic and non-carcinogenic compounds for the protection of human health. AWQCs have also been developed for the protection of aquatic organisms.	AWQC may be used to assess need for remediation of discharges to surface water or to use as benchmarks during long-term monitoring.

TABLE 2-1
POTENTIAL FEDERAL CHEMICAL-SPECIFIC ARARs AND TBCs
OU 7 FEASIBILITY STUDY
NAVAL WEAPON STATION EARLE, COLTS NECK, NEW JERSEY

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE FS
SDWA Maximum Contaminant Level Goals (MCLGs) (40 CFR 141.50 and 141.51)	To Be Considered	MCLGs are health-based limits for contaminant concentrations in drinking water. MCLGs are established at levels at which no known or anticipated adverse effects on human health are anticipated and that allow for an adequate margin of safety. MCLGs are set without regard for cost or feasibility.	Non-zero MCLGs may be used as clean-up levels if conditions at the site justify setting clean-up levels lower than MCLs.
Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (OSWER Directive No. 9355.4-12) (Jul 1994)	To Be Considered	This OSWER directive recommends a lead soil screening level of 400 ppm for residential land use based on the IEUBK model. The screening value may be used to determine whether sites or portions of sites warrant further evaluation and evaluations of risks.	If the OU 7 site is to be considered for eventual residential use, then the screening value may be used to assess whether site-specific lead levels require further evaluation and possible remediation.
EPA Groundwater Protection Strategy	To Be Considered	Provides classification and restoration goals for groundwater based on its vulnerability, use, and value.	This strategy was considered in conjunction with the federal SDWA and state Groundwater Protection Rules in order to determine groundwater clean-up levels.
EPA Risk Reference Doses (RfDs)	To Be Considered	RfDs are dose levels developed by EPA for use in estimating the non-carcinogenic risk resulting from exposure to toxic substances.	RfDs were used to assess health risks due to exposure to non-carcinogenic contaminants present at the site. RfDs may also be used in the development of acceptable contaminant concentrations.
EPA Carcinogen Assessment Group Potency Factors (CPFs)	To Be Considered	EPA CPFs are used to compute the individual incremental cancer risk resulting from exposure to carcinogens.	CPFs were used to assess health risks from carcinogens present at the site. These factors may also be used in the development of acceptable contaminant concentrations.

TABLE 2-1
POTENTIAL FEDERAL CHEMICAL-SPECIFIC ARARs AND TBCs
OU 7 FEASIBILITY STUDY
NAVAL WEAPON STATION EARLE, COLTS NECK, NEW JERSEY

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE FS
EPA Health Advisories and Acceptable Intake Health Assessment Documents	To Be Considered	Intended for use in qualitative human health evaluation of remedial alternatives.	These advisories and health assessment documents were used in assessing health risks from contaminants present at the site.

TABLE 2-2
POTENTIAL STATE CHEMICAL-SPECIFIC ARARs AND TBCs
OU 7 FEASIBILITY STUDY
NAVAL WEAPON STATION EARLE, COLTS NECK, NEW JERSEY

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE FS
New Jersey Ground Water Quality Standards (GWQS) (N.J.A.C. 7:9-6)	Applicable	This regulation establishes the rules to protect ambient groundwater quality through establishing groundwater protection and clean-up standards and setting numerical criteria limits for discharges to groundwater. The Groundwater Quality Criteria (GWQC) (N.J.A.C. 7:9-6.7) are the maximum allowable pollutant concentrations in groundwater that are protective of human health. This regulation also prohibits the discharges to groundwater that subsequently discharges to surface water that do not comply with the Surface Water Quality Standards (SWQS).	Because contaminated groundwater is present underneath Site 26 in excess of GWQS, these regulations will be considered in determining groundwater action levels. Application for Classification Exception Area (CEA) may be required if GWQS will not be met during the term of proposed remediation. The CEA procedure ensures that designated groundwater uses at remediation sites are suspended for the term of the CEA.
New Jersey Surface Water Quality Standards (SWQS) (N.J.A.C. 7:9B)	Applicable	These standards establish rules to protect and enhance surface water resources, define surface water classifications and uses, and establish water-quality-based criteria and effluent discharge limitations. The Surface Water Quality Criteria (SWQC) (N.J.A.C. 7:9B-14) are the maximum allowable pollutant concentrations in surface water for the designated use.	For alternatives where surface water may be affected, remedial measures may be needed so that the SWQC are attained in the long term. Remedial alternatives shall consider action to mitigate the continued contamination of surface waters.
New Jersey Safe Drinking Water Act (N.J.A.C. 7:10)	Potentially Relevant and Appropriate	These regulations were promulgated to assure the provision of safe drinking water to consumers in public community water systems. Maximum Contaminant Levels (MCLs) (N.J.A.C. 7:10-16) have been established to regulate the concentration of organic and metal contaminants in water supplies. MCLs may be relevant and appropriate for groundwater because the aquifer beneath the site is a potential drinking water supply.	MCLs may be used to establish clean-up levels for groundwater underlying the OU 7 site. MCLs can be used to derive potential soil clean-up levels.

TABLE 2-2
POTENTIAL STATE CHEMICAL-SPECIFIC ARARs AND TBCs
OU 7 FEASIBILITY STUDY
NAVAL WEAPON STATION EARLE, COLTS NECK, NEW JERSEY
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REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE FS
New Jersey Soil Cleanup Criteria	To Be Considered	These are non-promulgated soils clean-up criteria for residential direct contact, non-residential direct contact, and impact to groundwater (through leaching).	These criteria will be considered in the development of soil clean-up goals.

TABLE 2-3
POTENTIAL FEDERAL LOCATION-SPECIFIC ARARs AND TBCs
OU 7 FEASIBILITY STUDY
NAVAL WEAPON STATION EARLE, COLTS NECK, NEW JERSEY

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE FS
Wetlands Executive Order (E.O. 11990) & 40 CFR 6, App. A (Policy on Implementing E.O. 11990)	Potentially Applicable	Federal agencies are required to minimize the destruction, loss, or degradation of wetlands and preserve and enhance natural and beneficial values of wetlands.	Remedial alternatives that involve excavation or deposition of materials will include all practicable means of minimizing harm to the wetlands in the vicinity of Site 26. Wetlands protection consideration will be incorporated into the planning, decision making, and implementation of remedial alternatives.
Floodplains Executive Order (E.O. 11988) & 40 CFR 6, App. A (Policy on Implementing E.O. 11988)	Potentially Applicable	Federal agencies are required to reduce the risk of flood loss, minimize impact of floods, and restore and preserve the natural and beneficial value of floodplains.	The potential effects on floodplains will be considered during the development and evaluation of remedial alternatives. All practicable measures will be taken to minimize adverse effects on floodplains.
Resource Conservation and Recovery Act (RCRA) Location Standards, Floodplains (40 CFR 264.18 (a))	Potentially Applicable	Any RCRA facility that treats, stores, or disposes of hazardous waste, if situated in a 100-year floodplain, must be designed, constructed, operated, and maintained to avoid washout.	Where possible, remedial alternatives that include construction of a treatment, storage, or disposal facility will be sited outside a 100-year floodplain.
Endangered Species Act of 1973 (16 USC 1531 et seq.); (50 CFR Part 200)	Potentially Applicable, if present	Actions shall be taken to conserve endangered or threatened species or to protect critical habitats. Consultation with the Department of the Interior is required.	The RI determined that there were no sensitive habitats at Site 26.
Fish and Wildlife Coordination Act Of 1958 (16 U.S.C. 661) Protection of Wildlife Habitats	Potentially Applicable	This regulation requires that any federal agency that proposes to modify a body of water must consult with the United States Fish and Wildlife Service and requires that actions be taken to avoid adverse effects, minimize potential harm to fish or wildlife, and preserve natural and beneficial uses of the land.	During the evaluation of alternatives, potential remediation effects on the wetlands and floodplains are evaluated. If it is determined that an impact may occur, then the United States Fish and Wildlife Service, NJDEP, and EPA would be consulted.

TABLE 2-3
POTENTIAL FEDERAL LOCATION-SPECIFIC ARARs AND TBCs
OU 7 FEASIBILITY STUDY
NAVAL WEAPON STATION EARLE, COLTS NECK, NEW JERSEY
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REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE FS
National Historic Preservation Act of 1966 Section 106 (16 USC 470 et. seq.)	Potentially Applicable, if present	Action will be taken to recover and to preserve historic artifacts that may be threatened as the result of terrain alteration.	Potential ARAR. If artifacts are encountered during active site remediation (e.g. well installation/sampling) additional investigation would be warranted. To date, no such artifacts have been encountered at Site 26.
National Archeological and Historic Preservation Act of 1974 (132 CFR 229)	Potentially Applicable, if present	Action will be taken to recover and to preserve scientific, prehistoric, historic, or archaeologic artifacts that may be threatened as the result of terrain alteration.	Potential ARAR. If artifacts are encountered during active site remediation, additional investigation would be warranted. To date, no such artifacts have been encountered at Site 26.

TABLE 2-4
POTENTIAL STATE LOCATION-SPECIFIC ARARs AND TBCs
OU 7 FEASIBILITY STUDY
NAVAL WEAPON STATION EARLE, COLTS NECK, NEW JERSEY

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE FS
New Jersey Freshwater Wetlands Protection Act Rules (N.J.A.C. 7:7A)	Potentially Applicable	Regulate activities that result in the disturbance in and around freshwater wetland areas including removing or dredging wetland soils, disturbing the water level or water table, driving piles, placing obstructions, destroying plant life, and discharging dredged or fill materials into open water.	Remedial alternatives will be developed to avoid activities that would be detrimental to any wetlands located in the vicinity of Site 26.
New Jersey Freshwater Wetlands Protection Act Rules, Mitigation (N.J.A.C. 7:7A-14)	Potentially Applicable	This regulation requires mitigation of the disturbed wetlands or filled open water. Generally requires the restoration, creation, or enhancement of area, or donations to the Mitigation Bank, of equal ecological value.	If a remedial alternative action results in the loss of wetlands at Site 26 through dredging, filling, or construction activities, then mitigation measures will need to be incorporated into the alternative's design.
New Jersey Flood Hazard Area Control (N.J.A.C. 7:14)	Potentially Applicable	These regulations control development in floodplains and water courses that may adversely affect the flood-carrying capacity of these features, subject new facilities to flooding, increase storm water runoff, degrade water quality, or result in increased sedimentation, erosion, or environmental damage.	This requirement is applicable to remedial alternative actions that may adversely affect floodplains adjacent to Site 26.

TABLE 2-4
POTENTIAL STATE LOCATION-SPECIFIC ARARs AND TBCs
OU 7 FEASIBILITY STUDY
NAVAL WEAPON STATION EARLE, COLTS NECK, NEW JERSEY
PAGE 2 OF 2

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE FS
New Jersey Siting Criteria for New Major Commercial Hazardous Waste Facilities (N.J.A.C. 7:26-13)	Potentially Relevant and Appropriate	These regulations specify siting requirements and limitations for commercial hazardous waste facilities including protection of nearby residents, surface water, groundwater, air, and environmentally sensitive areas.	Remediation of groundwater is currently underway as part of the remedy selected for OU 3 at Site 26. Remedial alternatives employing on-site or on-base treatment scenarios need to be consistent with these requirements.

Several federal and state regulations govern activities in wetlands and floodplains that may result in their degradation or impairment of their functions. Potential location-specific ARARs include Executive Orders 11990 and 11988 for wetlands and floodplains, respectively; the RCRA Location Standards governing the siting of treatment, storage, and disposal facilities in a 100-year floodplain; the New Jersey Freshwater Wetlands Protection Act Rules; the New Jersey Flood Hazard Area Control regulations; and the State Siting Criteria for New Major Commercial Hazardous Waste Facilities.

The Federal Fish and Wildlife Coordination Act and the Endangered Species Act are potential ARARs promulgated to protect wildlife and endangered species (if present or encountered) during remediation.

If historic or archeological artifacts are encountered during remediation, then the National Historic Preservation Act of 1966 and the National Archeological and Historic Preservation Act of 1974 may be potential ARARs that would be invoked to prevent their loss.

2.1.3 Potential Action-Specific ARARs and TBCs

Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes. These requirements are generally focused on actions taken to remediate, handle, treat, transport, or dispose of hazardous wastes. These action-specific requirements do not in themselves determine the remedial alternative; rather, they indicate how a selected alternative must be achieved. Summaries of the potential action-specific ARARs and TBCs and their consideration in the FS are provided in Tables 2-5 and 2-6, respectively.

If site soils, sediments, or treatment media are determined to be hazardous by characteristic or are listed wastes (per RCRA Identification and Listing of Hazardous Waste [40 CFR 261]), then these action-specific ARARs may potentially be applicable to the how they are treated, stored, or disposed or to the treatment processes considered. These ARARs include federal regulations governing the off-site transport of hazardous wastes [40 CFR 262 and 263], general facility standards [40 CFR 265 Subpart B], preparedness and prevention [40 CFR 265 Subpart C], contingency plan and emergency procedures [40 CFR 265 Subpart D], manifesting and recordkeeping [40 CFR 265 Subpart E], closure and postclosure of municipal landfills [40 CFR 258 Subpart F], land treatment [40 CFR 265 Subpart P], thermal treatment [40 CFR 265 Subpart X], and miscellaneous treatment units [40 CFR 264 Subpart X].

State ARAR regulations that may be applicable to remedial actions for hazardous wastes include off-site transport of hazardous wastes [N.J.A.C. 7:26-7]; general facility standards, preparedness and prevention, contingency, and emergency procedures, record keeping, and closure and post-closure requirements

TABLE 2-5
POTENTIAL FEDERAL ACTION-SPECIFIC ARARs AND TBCs
OU 7 FEASIBILITY STUDY
NAVAL WEAPON STATION EARLE, COLTS NECK, NEW JERSEY

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE FS
Resource Conservation and Recovery Act (RCRA) - Hazardous Waste Generator and Transporter Requirements (40 CFR parts 262 and 263)	Potentially Applicable	These regulations establish the responsibilities of generators and transporters of hazardous waste in the handling, transportation, and management of waste. The regulations specify the packaging, labeling, recordkeeping, and manifest requirements.	Activities performed in connection with off-site transport of hazardous wastes will comply with the requirements of these regulations.
RCRA - General Facility Standards (40 CFR 265 Subpart B)	Potentially Applicable	General facility requirements outline general waste analysis, security measures, inspections, and training requirements.	If a remedial alternative includes the establishment of an on-base treatment facility for hazardous wastes (characteristic or listed), then this regulation will be considered. This regulation specifies TSD facilities construction, fencing, postings, and operations. All workers will be properly trained. Process wastes will be evaluated for the characteristics of hazardous wastes to assess further handling requirements.
RCRA - Preparedness and Prevention (40 CFR 265 Subpart C)	Potentially Applicable	Outlines requirements for safety equipment and spill control.	If a remedial alternative includes treatment, storage, or disposal of hazardous wastes, then this regulation will be considered. Safety and communication equipment will be maintained at the site. Local authorities will be familiarized with the site operations.
RCRA - Contingency Plan and Emergency Procedures (40 CFR 265 Subpart D)	Potentially Applicable	Outlines requirements for emergency procedures to be used following explosions, fires, etc.	If the alternative includes treatment, storage, or disposal of hazardous wastes, then contingency plans will be developed. Copies of the plans will be kept on site.
RCRA - Manifesting Recordkeeping, and Reporting (40 CFR 265 Subpart E)	Potentially Applicable	Specifies the recordkeeping and reporting requirements for RCRA facilities.	If the alternative includes treatment, storage, or disposal of hazardous wastes, then records of facility activities will be developed and maintained during remedial actions.

TABLE 2-5
POTENTIAL FEDERAL ACTION-SPECIFIC ARARs AND TBCs
OU 7 FEASIBILITY STUDY
NAVAL WEAPON STATION EARLE, COLTS NECK, NEW JERSEY

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE FS
RCRA - Land Treatment (40 CFR 265 Subpart M)	Potentially Applicable	These regulations detail the requirements for conducting land treatment of RCRA hazardous waste.	Alternatives that involve on-site treatment of hazardous wastes (contaminated soil or sediments) will comply with these regulations.
RCRA - Thermal Treatment (40 CFR 265 Subpart P)	Potentially Applicable	This regulation details operating requirements and performance standards for thermal treatment of hazardous wastes.	Alternatives that include thermal or catalytic oxidation of offgases would be designed and operated in compliance with this regulation.
RCRA - Miscellaneous Treatment Units (40 CFR 264 Subpart X)	Potentially Applicable	This regulation details design and operating standards for units in which hazardous waste is treated.	Hazardous waste treatment units used for on-site or on-base treatment of contaminated media must meet these requirements.
RCRA - Air Emission Standards for Process Vents (40 CFR 265 Subpart AA)	Potentially Applicable	This regulation contains air pollutant emission standards for process vents, closed-vent systems, and control devices at hazardous waste TSD facilities. This subpart applies to equipment associated with solvent extraction or air/steam stripping operations that treat wastes that are identified or listed RCRA hazardous wastes and have a total organics concentration of 10 parts per million (ppm) or greater.	These standards will be considered during the development and design of alternatives that include treatment of VOC-contaminated soils. Air emissions from treatment units will be monitored to ensure compliance with this ARAR.

TABLE 2-6
POTENTIAL STATE ACTION-SPECIFIC ARARs AND TBCs
OU 7 FEASIBILITY STUDY
NAVAL WEAPON STATION EARLE, COLTS NECK, NEW JERSEY

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	COMMENTS
New Jersey Labeling, Records, and Transportation Requirements (N.J.A.C. 7:26-7)	Potentially Applicable	These regulations establish the responsibilities of generators and transporters of hazardous waste in the handling, transportation, and management of waste. The regulations specify the packaging, labeling, recordkeeping, and manifest requirements.	Activities performed in connection with off-site transport of hazardous wastes will comply with the requirements of these regulations.
New Jersey Requirements for Hazardous Waste Facilities (N.J.A.C. 7:26-9)	Potentially Applicable	These regulations identify requirements for facilities in general, groundwater monitoring, preparedness and prevention, contingency and emergency procedures, and general closure and post-closure.	If a remedial alternative includes the establishment of an on-base treatment facility for contaminated soils and materials, then this regulation will be complied with during implementation.
New Jersey Thermal Treatment Regulations (N.J.A.C. 7:26-11.6)	Potentially Applicable	These regulations detail operating requirements, waste analyses and monitoring of treatment conditions, performance standards, and closure of existing facilities that thermally treat hazardous wastes.	Alternatives that include thermal treatment of contaminated soils, sediments, and materials would be designed and operated in consistent with this regulation.
New Jersey Chemical, Physical, and Biological Treatment Regulations (N.J.A.C. 7:26-11.7)	Potentially Applicable	These regulations detail operating requirements, waste analyses and monitoring of treatment conditions, and closure of existing facilities that physically, chemically, or biologically treat hazardous wastes. Also governs handling and compatibility of wastes in treatment processes.	Alternatives that include physical, chemical, or biological treatment of contaminated groundwater, soils, sediments, and materials would be designed and operated in consistent with this regulation.

TABLE 2-6
POTENTIAL STATE ACTION-SPECIFIC ARARs AND TBCs
OU 7 FEASIBILITY STUDY
NAVAL WEAPON STATION EARLE, COLTS NECK, NEW JERSEY
PAGE 2 OF 2

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	COMMENTS
New Jersey Control and Prohibition of Air Pollution by Toxic Substances (N.J.A.C. 7:27-17)	Potentially Applicable if emissions greater than 45.4 grams per hour (g/hr) (or 0.1 pounds per hour)	These regulations govern the emission of Group I and Group II toxic volatile organic compounds (TXS) to the ambient air. Group I TXS would be addressed through adequate stack height or prevention of aerodynamic downwash. Group II TXS would be addressed through reasonably available control technology.	Alternatives that may result in the release of Group I or Group II TXS to the ambient air, exceeding 0.1 pounds per hour (lb/hr), would incorporate appropriate vapor control measure to comply with these requirements.

[N.J.A.C. 7:26-9]; thermal treatment [N.J.A.C. 7:26-11.6]; and physical, chemical, and biological treatment [N.J.A.C. 7:26-11.7].

2.2 METHOD USED FOR DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES

The development of the medium-specific RAOs for a site is typically based on the risks posed by site-related contaminants to human and ecological receptors, threats or continued degradation of environmental media (groundwater, surface water, and wetlands), and comparison of detected contaminant levels with available regulatory standards.

Generally, human health RAOs are formulated to prevent exposures to site-related contaminants that result in excess carcinogenic and non-carcinogenic health risks or to contaminants that exceed regulatory requirements (e.g., MCLs in potable water).

Ecological RAOs are formulated to reduce or prevent the detrimental effects of site-related contaminants on environmental media (e.g., degradation of habitat quality) or to address contaminant concentrations that exceed regulatory standards (e.g., New Jersey GWQS).

RAO development for Site 26 was performed in the FS for OU 3 and is summarized here.

2.3 METHOD USED FOR DEVELOPMENT OF PRELIMINARY REMEDIATION GOALS

The determination of numerical remediation goals is an iterative process beginning with the development of a range of medium- and chemical-specific contaminant levels that would be protective of human health or the environment if present in site soils and groundwater. Remediation goals that establish acceptable contaminant levels or ranges of levels that must be achieved under the remedial action are ultimately chosen from the range of PRGs when the remedy is selected. In the case of the Site 26 OU 7 PCE plume, the location and hydrological conditions coincide with those of the Site 26 OU 3 groundwater plume. Therefore the RAOs developed for OU 3 are equally applicable to OU 7.

A range of PRGs was developed for groundwater COCs based on the results of the RI, human health risk assessment, and chemical-specific ARARs. Additionally, background concentrations of COCs and analytical detection limits were identified as potential PRGs to ensure selection of clean-up goals that are reasonably attainable and measurable. Each type of PRG is briefly discussed below.

Typically, a promulgated regulated ARAR is selected as the proposed PRG unless background levels or the analytical detection limit is higher. If no ARAR is available, then the higher of either the risk-based value or the maximum background value (inorganic) was selected, assuming that value was higher than the detection limit.

PRG development for Site 26 was performed in the FS for OU 3 and is summarized here.

2.3.1 ARAR/TBC Basis

There are chemical-specific Federal and state groundwater ARARs. Federal maximum contaminant levels (MCLs) are considered applicable. The state GWQS are promulgated under the New Jersey Administrative Code Title 7, Chapter 9-6 (N.J.A.C. 7:9-6) and establish allowable contaminant concentrations in groundwater. The New Jersey surface water quality criteria (SWQCs) are promulgated under N.J.A.C. 7:9B and establish allowable contaminant concentrations in surface water.

2.3.2 Human Health Risk Basis

Human-health-risk-based PRGs were developed for the future industrial worker and resident exposure scenarios, based on carcinogenic risks of 10^{-6} and a Hazard Index (HI) of 0.1. Risk-based concentrations (RBCs) will be considered in the PRGs development. It should be noted that the Navy has no plans to use Site 26 for residential purposes.

2.3.3 Ecological Risk Basis

Ecotox threshold (ET) values were used for screening potential risks to ecological receptors from contaminants detected in the site-related samples. The relatively small size of Site 26, with its industrially developed nature and covering in turf grass does not offer a suitable ecological habitat for terrestrial organisms. The RI noted a lack of wetlands, sensitive habitats, and threatened or endangered species in the vicinity of Site 26.

2.3.4 Protection of Groundwater Basis

The PRGs for protection of groundwater represent soil contaminant concentrations that, when leached into groundwater, would be protective of groundwater. The New Jersey Soil Clean-up Criteria identified a set of non-promulgated soil organic chemical concentrations that would be protective of groundwater if leaching of contaminants occurred.

2.4 METHOD USED FOR DEVELOPMENT OF GENERAL RESPONSE ACTIONS

The RAOs were used to develop general response actions that describe medium-specific measures that will satisfy the RAOs. General response actions presented in OSWER Directive No. 9355.3-01, Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, were evaluated for their

applicability to each site's specific conditions, environmental media, the nature of the contaminants, and how the potential risks would be mitigated. Special consideration was given in this case to the facts presented in the Technical Memorandum: Extent of Groundwater Contamination at Site 26 Operable OU 3 and summarized in Section 1.

General response actions that may be applicable to the Site 26 contaminated groundwater include the following:

- No Action
- Limited Action (Institutional Controls)
- Containment Actions
- Collection and Discharge (clean groundwater only)
- Collection, Treatment, and Discharge Actions
- In-Situ Treatment

General response actions specific to Site 26 OU 7 are presented in Section 2.6 of this FS.

2.5 METHOD USED FOR IDENTIFICATION, SCREENING, AND EVALUATION OF REMEDIAL TECHNOLOGIES

During this phase of alternatives formulation, preliminary screening is performed to reduce the universe of potentially applicable technology types and process options. The purpose of screening is to investigate all available technologies and process options and to eliminate those obviously not applicable to specific conditions at each site, based on the established remedial action objectives and general response actions. The technology identification considers the demonstrated performance of each technology with site conditions and contaminants.

Potential remedial technologies and process options are identified and screened according to their overall applicability (technical implementability) to the media (soils, groundwater, etc.), primary contaminants of concern (metals, volatile organic compounds), and conditions present at each of the sites, including heterogeneous soils, leaching of contaminants to underlying groundwater, erosion and runoff of contaminated materials, vertical hydraulic gradients, etc.

A detailed evaluation of technologies and process options retained in the preliminary screening step is conducted to further focus the alternatives development process. In this step, process options are evaluated with respect to other processes in the same technology category. One representative process option is selected, if possible, for each technology type, to simplify the subsequent development and evaluation of alternatives without limiting flexibility during remedy selection or remedial design. The evaluation of

technologies and process options utilizes three criteria: effectiveness, implementability, and relative cost. The Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (Interim Final), (EPA, 1988) suggests that this evaluation focus on the effectiveness criterion, with less emphasis directed at the implementability and relative cost criteria. Brief definitions of effectiveness, implementability, and relative cost, as they apply to the evaluation process, follow:

- Effectiveness - This criterion focuses on the potential effectiveness of process options in handling the estimated volume of media and meeting the remediation goals; the potential impacts to human health and the environment during construction and implementation; and how proven and reliable the process is with respect to the contaminants and conditions at the site.

- Implementability - The implementability evaluation encompasses both the technical and institutional feasibility of implementing a process. Technical implementability was used in developing general response actions as an initial screen of technology types and process options, to eliminate those that are clearly ineffective or unworkable at a site. Therefore, this subsequent, more detailed evaluation of process options places greater emphasis on the institutional aspects of implementability, such as the ability to obtain permits, availability of treatment, storage, and disposal services, and availability of necessary equipment and resources.

- Cost - Cost plays a limited role in this screening. The cost analysis is based on engineering judgment, and each process is evaluated as to whether costs are high, low, or medium relative to the other options in the same technology type. If there is only one process option, costs are compared to other candidate technologies.

The screening and detailed evaluation of technology types and process options are presented in summary tables for each site.

2.6 SITE 26 OU 7 TECHNOLOGY SCREENING

The selection of viable remedial technologies and process options for assemblage into remedial alternatives for Site 26 OU 7 is presented in this section.

2.6.1 Site 26 OU 7 Remedial Action Objectives

The results of the RI, previous investigations, the human health and ecological risk assessments for Site 26, as well as recent investigations and remediation results were evaluated to determine the remedial action objectives that may be needed to protect human health and the environment.

Human Health Protection Considerations

The Site 26 HHRA results (RI Table 25-19) indicated that exposure to contaminated subsurface soils by a future industrial worker resulted in estimated RME lifetime carcinogenic risks (3.2 E-05) within the acceptable risk range (1 E-04 to 1 E-06), and RME noncarcinogenic HIs were less then 1.0. Therefore, it was concluded that no further remedial actions were warranted to protect a potential future industrial worker from contaminated soils exposures at Site 26.

For potential exposure to contaminated groundwater by the future industrial worker, the RME risk results indicated that total carcinogenic risks were within the acceptable risk range, and noncarcinogenic HIs of greater than 1.0 for several target organs. A review of RI Table 25-14 indicates that TCE and 1,2-DCE were the primary contributors of carcinogenic and non-carcinogenic risks. Therefore it was concluded that further remedial actions may be warranted at Site 26 to protect a potential future industrial worker from potential exposures to contaminants, if groundwater were to be used as a potable water supply.

The Site 26 HHRA results (RI Table 25-19) indicated that exposure to contaminated subsurface soils by a future resident resulted in estimated RME lifetime carcinogenic risks of 1.26 E-04, which slightly exceeds the acceptable risk range (1 E-04 to 1 E-06). The RME noncarcinogenic HIs for the future child resident were less then 1.0. Review of RI Table 25-11 indicated that the primary contributors of carcinogenic risks were arsenic and beryllium. The representative subsurface soil concentrations used in the risk assessment for arsenic and beryllium were 3.1 and 0.2 mg/kg, which are below the maximum detected background concentrations. The risks attributable to Site 26 soil arsenic and beryllium concentrations are not of concern for the future resident since background soil concentrations are higher than the site-specific concentrations. Therefore, it was concluded that no remedial actions were warranted to protect a future resident from contaminated soils exposures at Site 26.

Potential exposures to contaminated groundwater resulted in estimated RME adult total carcinogenic risks of 1.8 E-04 (slightly exceeding the acceptable risk range) attributable primarily to TCE and 1,1-DCE. For the RME child receptor exposure scenarios (RI Table 25-18), both ingestion of and dermal contact with the contaminated Site 26 groundwater posed non-carcinogenic HIs greater than 1.0 for several target organs including the cardiovascular system, the liver, and the central nervous system. TCE and 1,2-DCE, individually or in combination, were the principal contributors of non-carcinogenic risks. Therefore, it was concluded that further remedial actions may be warranted at Site 26 to protect potential future residents and industrial workers from potential exposures to contaminants, if groundwater were to be used as a potable water supply.

The lead concentrations detected in Site 26 soils and groundwater were below EPA guidelines and were not expected to pose significant blood-lead levels based on the IEUBK Lead Model (v0.99).

Several chlorinated VOCs in groundwater posed potential risks to future industrial worker and resident adult and child receptors. While the HHRA included a future residential scenario, there are no current plans for base realignment at NWS Earle and future use of the Site 26 area for residential purposes is not currently planned. It is unknown what changes in the future may occur that may result in different land uses. As discussed previously, the underlying groundwater is not used as a potable water supply. Should base realignment occur in the future that may result in different land use for Site 26, then an Environmental Baseline Survey would be conducted and measures to protect human health from exposures to contaminated groundwater may be warranted.

Ecological Receptors Risk Considerations

The RI concluded that soil contaminant concentrations at Site 26 were relatively low and did not constitute a significant threat to ecological receptors. In addition, the Site 26 area was relatively small, was mostly developed or covered by turfgrass, and did not offer a suitable ecological habitat for terrestrial organisms. The RI results indicated that there are no wetlands, sensitive habitats, or threatened or endangered species present in the vicinity of Site 26. Therefore, it was concluded that no further remedial actions were needed to protect ecological receptors at this Site.

Environmental Media Protection Considerations

RI Groundwater samples obtained from Site 26 contained a number of metals at concentrations generally comparable to the background levels. Aluminum, cadmium, iron, and manganese were detected at concentrations that exceeded the state GWQS. The cadmium concentration at only one groundwater sampling location [26MW04] exceeded the background range. The 26MW04 groundwater cadmium concentration of 4.4 μg/L only slightly exceeded the New Jersey GWQS of 4 μg/L.

The RI identified the presence of TCE and several degradation products at two monitoring well locations. Based on the high TCE concentration and corresponding 1,2-DCE levels detected at 26MW-01, the RI concluded that this location is near where the TCE was released and that the release occurred a number of years ago. 26MW-01 is located near the process leach tank. The VOCs TCE; 1,1,-DCE; and 1,2-DCE detected at 26MW-01 exceeded the state GWQS [ARAR]. VOCs detected at the other location, 26MW06, were present at or below the GWQS.

Based on the results of the October 1996 direct push groundwater sampling and field analyses, a VOC plume [exceeding the GWQS] was identified extending approximately 400 feet in a southwesterly direction from the process leach tank. The interpreted VOC plume configuration was consistent with the direction of groundwater flow. The apparent lack of lateral distribution of either TCE or its degradation byproducts, may indicate that these VOCs may have migrated vertically downward. However, an underlying aquitard (a clay layer varying between 10 to 15 feet thickness at approximately 25 feet below ground surface) was

concluded to have been limiting the vertical migration of these VOCs. Review of available data indicated that the plume appeared to be migrating with groundwater towards the southwest. Watershed samples taken in surface waters downgradient of Site 26 did not show any indication of TCE or DCE.

Review of the RI data and comparison with the State GWQS and background concentrations, and the single detection of slightly higher than GWQS cadmium concentration at 26MW04, indicated that no remedial actions were warranted to address metals in groundwater at Site 26.

The RI data in conjunction with the current (post remediation start-up) groundwater sampling data indicate the presence of a VOC plume at concentrations that continue to exceed the GWQS. However, the Navy's groundwater remediation efforts to date appear to have reduced VOC concentrations considerably. Chlorinated organic compounds resulting from past TCE-related and PCE-related disposal practices appear to be responding equally well to the groundwater remediation program underway at Site 26.

RAOs Selection

For the reasons provided above, the following remedial action objectives have been selected for Site 26:

Protection of Human Health RAO

Prevent potential exposures to contaminated groundwater.

Protection of the Environment RAO

Mitigate migration of VOC contaminants in groundwater and restore the aquifer to applicable standards.

2.6.2 Site 26 OU 7 Preliminary Remediation Goals

Data from the RI and the October 1996 sampling event, the human health risk assessment, and the ARARs were reviewed to identify the Site 26 contaminants of concern (COCs) which would be used to identify and select the appropriate PRGs (Table 2-8). No COCs for soils were identified since site-related contaminants are not present at concentrations that pose human health risks. As part of the remediation of OU 3, the septic tank and associated soils at Building BG-1 were removed and disposed off site.

The summary and basis for selecting groundwater COCs, based on exceedance of regulatory requirements (GWQS and SDWA MCLs) and risks to human health, are presented in Table 2-7. The organics and metal contaminants in groundwater that would contribute to excess human health carcinogenic risk [(greater than 1 E-04 total) or HI greater than 1.0)] were selected as human health risk-based COCs. PRGs for groundwater contaminants used the State GWQS numerical values, risk-based

groundwater concentrations that do not result in carcinogenic risks exceeding 1 E-06 or HI greater than 0.1, analytical detection limits, and maximum detected background concentrations. Table 2-8 presents a set of candidate groundwater PRGs. A set of proposed Site 26 PRGs for groundwater are presented in Table 2-9, along with the basis for their selection. These proposed groundwater PRGs can be used to delineate the volume of contaminated groundwater that may need to be evaluated for potential remedial action, and may be used in establishing Classification Exception Areas (CEAs) as defined under the N.J.A.C. 7:9-6.

2.6.3 Site 26 OU 7 General Response Actions

General response actions were selected based on the RAOs for Site 26 OU 7 and the consideration that the site is an active groundwater remedial action site. General response actions that address potential human exposure to groundwater contaminants associated with the site include:

- No action
- Long-term monitoring (limited action)
- Long-term monitoring with establishment of a CEA (limited action)
- Active groundwater remediation (treatment)

2.6.4 Identification, Screening, and Evaluation of Technologies and Process Options for Site 26

Table 2-10 presents a summary of potential remedial technologies and process options that apply to the Site 26 RAOs and general response actions. Screening of the remedial technologies considered their overall applicability to the media of concern (groundwater), primary contaminants (organic compounds), and current site conditions. During the screening step, process options and entire technology types were eliminated from further consideration on the basis of technical implementability.

Site conditions that were considered include the status of ongoing remediation efforts and the recent PCE plume investigation performed by the Navy.

TABLE 2-7

SITE 26 GROUNDWATER CONTAMINANTS OF CONCERN

OU 7 FEASIBILITY STUDY

NAVAL WEAPONS STATION EARLE, COLTS NECK, NEW JERSEY

Contaminant of Concern	Exceeds NJ GWQS	Exceeds SDWA MCLs	Poses Human Health Risk
Trichloroethene	X	X	X (2)
1,1-Dichloroethene	X	--	X (2)
1,2-Dichloroethene	X	X	X (3)
Benzene	X (1)	X	--
Carbon tetrachloride	X (1)	X	--
Tetrachloroethene	X (1)	X	--
Cadmium	X	--	--

Notes:

- X indicates the basis for selection of the compound or element as a COC.
- The New Jersey State Ground Water Quality Standards (GWQS) are ARARs.
- Safe Drinking Water Act (SDWA) Maximum Contaminant Levels regulate organic and inorganic constituents in public drinking water supplies; included as a TBC for comparison purposes only.
- -- Not a COC; does not exceed GWQS, SWDA MCLs, or pose potential human health risks.
- (1) COC exceeds GWQS, based on direct push sampling and analysis data.
- (2) COC contributes to excess carcinogenic risks for the future residential adult through RME ingestion, dermal and inhalation exposures.
- (3) COC contributes to HI > 1.0 for future industrial worker, adult resident future under RME exposures, or for residential child under RME exposures.

TABLE 2-8
SITE 26 GROUNDWATER PRELIMINARY REMEDIATION GOALS
OU 7 FEASIBILITY STUDY
NAVAL WEAPONS STATION EARLE, COLTS NECK, NEW JERSEY

Contaminant of Concern	NJ GWQS	SDWA MCLs	Human Health Risk [carcinogen]	Human Health Risk [toxicant]	Maximum Background Concentration	CRDL/CRQL	Maximium Detected Site Conc.
Trichloroethene	1	5	3.65	8.45	BDL	10	4800 (1)
1,1-Dichloroethene	10	7	0.11	--	BDL	10	5 (1)
1,2-Dichloroethene (cis/trans)	10/100	70/100	--	13.3	BDL	10	2000
Benzene	0.2	5	--	--	BDL	10	11 (1)
Carbon tetrachloride	0.4	5	--	--	BDL	10	2 (1)
Tetrachloroethene	1	5	--	--	BDL	10	5 (1)
Cadmium	4	5	--	--	1.9	5	4.4

Notes:

- All units in µg/L.
- New Jersey State Ground Water Quality Standards (GWQS) are ARARs.
- Safe Drinking Water Act (SDWA) Maximum Contaminant Levels regulate organic and inorganic constituents in public drinking water supplies, and are presented here only for comparison purposes.
- PRG numerical values for carcinogens and non-carcinogens developed for estimated carcinogenic risk = 1E-06 or HQ = 0.1, respectively, based on exposure scenarios and factors applied in the NWS Earle human health risk assessment.
- CRQLs and CRDLs are the EPA Contract Required Quantitation Limits and Detection Limits for organic compounds and metals, respectively.
- -- not a COC under this parameter.
- BDL Below detection limit.
- (1) Based on direct push sampling with field GC analysis.

TABLE 2-9

SITE 26 PROPOSED GROUNDWATER PRGs

OU 7 FEASIBILITY STUDY

NAVAL WEAPONS STATION EARLE, COLTS NECK, NEW JERSEY

Contaminant of Concern	Proposed PRGs	Basis of Selection
Trichloroethene	10	CRQL
1,1-Dichloroethene	10	CRQL
1,2-Dichloroethene (cis/trans)	10/100	NJ GWQS
Benzene	10	CRQL
Carbon tetrachloride	10	CRQL
Tetrachloroethene	10	CRQL
Cadmium	5	CRDL

Notes:

- All units in µg/L.
- The New Jersey State Ground Water Quality Standards (GWQS) are ARARs.
- CRQL/CRDL - EPA Contract Required Quantitation and Detection Limits for organic compounds and metals, respectively.

The preliminary screening of groundwater response remedial technologies is summarized in Table 2-11. Detailed evaluations of the remedial technologies and process options for contaminated groundwater is presented in Table 2-12.

2.6.5 Summary of Site 26 OU 7 Retained General Response Actions

For contaminated groundwater, the following technology types and process options were retained:

- No Action

- Limited Action
  Long-term monitoring

- Limited Action
  - Land use restrictions
  - Long-term monitoring

- Active Groundwater Remediation (Treatment)
  Air Sparging and Soil Vapor extraction

TABLE 2-10
SITE 26 REMEDIAL ACTION OBJECTIVES, GENERAL RESPONSE ACTIONS, TECHNOLOGY TYPES, AND PROCESS OPTIONS
OU 7 FEASIBILITY STUDY
NAVAL WEAPONS STATION EARLE, COLTS NECK, NEW JERSEY

Environmental Media	Remedial Action Objectives (from site characterization)	General Response actions (for all RAOs)	Remedial Technology Types (for general response actions)	Process Options
Groundwater	**Protection of Human Health** Prevent human exposure to contaminated groundwater.	No Action	No Action	- Not applicable
		Natural Attenuation	Natural Attenuation	- Biological processes - Chemical processes - Physical processes
	Protection of the Environment Mitigate migration of contaminant VOCs in groundwater.	Limited Action	Institutional Controls	- Deed restrictions - Classification Exception Area designation
			Long-Term Monitoring	- Groundwater monitoring
		Containment	Physical Containment - Vertical barriers - Horizontal barriers	- slurry wall, grout injection, sheet piling - horizontal subsurface barrier

TABLE 2-10 PAGE 2 of 3
SITE 26 REMEDIAL ACTION OBJECTIVES, GENERAL RESPONSE ACTIONS, TECHNOLOGY TYPES, AND PROCESS OPTIONS
OU 7 FEASIBILITY STUDY
NAVAL WEAPONS STATION EARLE, COLTS NECK, NEW JERSEY

Environmental Media	Remedial Action Objectives (from site characterization)	General Response Action (for all RAOs)	Remedial Technology Types (for general response actions)	Process Options
Groundwater (cont.)	(see previous page)	Collection, Treatment, and Discharge	Collection Technologies: - Extraction - Enhanced Removal	- extraction wells, collection trench - Blasting/Hydrofracturing
			Treatment Technologies: - Physical - Chemical - Biological - In-situ	- equalization, dewatering, sedimentation, oil-water separation, filtration, reverse osmosis, air stripping, carbon adsorption, extraction, distillation, evaporation, electrodialysis - ion exchange, electrolytic recovery, enhanced oxidation, chemical oxidation, reduction, neutralization, precipitation, coagulation-flocculation, dechlorination - aerobic or anaerobic biodegradation - air sparging with soil vapor extraction

TABLE 2-10 PAGE 2 of 3
SITE 26 REMEDIAL ACTION OBJECTIVES, GENERAL RESPONSE ACTIONS, TECHNOLOGY TYPES, AND PROCESS OPTIONS
OU 7 FEASIBILITY STUDY
NAVAL WEAPONS STATION EARLE, COLTS NECK, NEW JERSEY

Environmental Media	Remedial Action Objectives (from site characterization)	General Response Action (for all RAOs)	Remedial Technology Types (for general response actions)	Process Options
Groundwater (cont.)			Discharge Technologies: - Beneficial re-use - Surface discharge - Subsurface discharge	- on-site use, off-site use - direct surface discharge, discharge to POTW, spray irrigation - reinjection

TABLE 2-11

PRELIMINARY SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS FOR SITE 26 CONTAMINATED GROUNDWATER

OU 7 FEASIBILITY STUDY

NAVAL WEAPON STATION EARLE, COLTS NECK, NEW JERSEY

GENERAL RESPONSE ACTION	TECHNOLOGY	PROCESS OPTION	DESCRIPTION	SCREENING COMMENTS
No Action	No Action	Not Applicable	No active remediation would be conducted to address contamination.	Retained for baseline comparison purposes in accordance with NCP.
Limited Action	Long-Term Monitoring	Groundwater Monitoring	Periodic sampling and analysis of media to assess groundwater contaminant status and potential migration downgradient.	Potentially applicable. Retained.
Limited Action with Institutional Controls	Long-Term Monitoring	Groundwater Monitoring	Periodic sampling and analysis of media to assess groundwater contaminant status and potential migration downgradient.	Potentially applicable. Retained.
	Institutional Controls	CEA	Classification Exception Area (CEA) 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.	Potentially applicable. Retained.
In Situ Treatment	Air Sparging		Active remediation introduces compressed air to strip volatile contaminants from groundwater.	Potentially applicable. Retained.
	Soil Vapor Extraction		Active remediation applied in conjunction with air sparging to strip volatile contaminants from groundwater.	Potentially applicable. Retained.

TABLE 2-12
EVALUATION OF TECHNOLOGIES AND PROCESS OPTIONS FOR SITE 26 CONTAMINATED GROUNDWATER
OU 7 FEASIBILITY STUDY
NAVAL WEAPONS STATION EARLE, COLTS NECK, NEW JERSEY

GENERAL RESPONSE ACTION	TECHNOLOGY	PROCESS OPTION	EFFECTIVENESS	IMPLEMENTABILITY	COST	CONCLUSION
No Action	No Action	No Action	Does not achieve remedial action objectives.	Implementable	Capital: None O&M: None	Retained.
Limited Action	Long-Term Monitoring	Groundwater Monitoring	Effective method for observing contaminant extent and potential migration and for assessing effectiveness of remedial action.	Readily implementable; numerous companies available with resources to perform monitoring.	Capital: Low O&M: Low	Retained.
Limited Action with Institutional Controls	Long-Term Monitoring	Groundwater Monitoring	Effective method for observing contaminant extent and potential migration and for assessing effectiveness of remedial action.	Readily implementable; numerous companies available with resources to perform monitoring.	Capital: Low O&M: Low	Retained.
	Institutional Controls	CEA	Effectiveness dependent on continued future enforcement to prevent use of underlying groundwater. Does not reduce contamination.	Readily implementable.	Capital: Low O&M: Low	Retained.
In Situ Treatment	Air Sparging		Reduces contaminant concentration in groundwater	Readily implementable, system already installed and running	Capital: High O&M: High	Retained.
	Soil Vapor Extraction		Reduces contaminant concentration in groundwater	Readily implementable, system already installed and running	Capital: High O&M: High	Retained.

3.0 DEVELOPMENT AND SCREENING OF REMEDIAL ACTION ALTERNATIVES

The purpose of the alternative 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 retained for further evaluation in Section 2.0 are combined to form remedial alternatives that provide varying levels of risk reduction.

3.1 SITE 26 OU 7 - DEVELOPMENT AND SCREENING OF ALTERNATIVES

This section will discuss the rationale for development of remedial action alternatives for Site 26 OU 7, describe the assembled alternatives, and present the screening of alternatives. Detailed evaluations and costing of the retained alternatives are presented in Section 4.0.

3.1.1 Site 26 OU 7 - Rationale for Development of Alternatives

Factors considered in formulating the remedial alternatives to achieve the RAOs for Site OU 7 are discussed below:

Statutory and Guidance Considerations - Navy/Marine Corps policy (as stated in the Installation Restoration Manual) dictates that the procedures outlined in the National Oil and Hazardous Substances Contingency Plan (NCP, 40 CFR 300.430) be followed for all IR sites. In accordance with this policy, alternatives were developed in compliance with statutory requirements of the NCP and in consideration of applicable EPA directives and guidance, including:

- Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (Interim Final) (RI/FS Guidance), OSWER Directive No. 9355.3-01, EPA/540/G-89/004, October 1988.

The NCP and the EPA RI/FS guidance present a broad framework for the formulation, evaluation, and selection of remedial alternatives for uncontrolled hazardous waste sites. The NCP encourages development of a range of alternatives, including one or more engineering control alternatives (such as containment), one or more innovative treatment alternatives, and the baseline no-action alternative. Treatment technologies are favored to address principal threats, and engineering controls are favored to address relatively low long-term threats.

Protection of Human Health Considerations - The RAO for protection of human health specifies preventing human exposure to contaminants in site groundwater. The alternatives were formulated to meet this objective.

Protection of the Environment Considerations – The RAO for protection of environment specifies restoration of site groundwater. The alternatives were formulated to meet this objective.

3.1.2 Site 26 OU 7- Remedial Alternatives Descriptions

This section presents detailed descriptions of the remedial alternatives for Site 26 OU 7. As discussed in Section 1, an active groundwater response action is underway for the TCE/DCE plume source area identified in the RI/FS for OU 3. The PCE plume source area which constitutes OU 7 is located in the same space as the OU 3 plume source area and is therefore also under active remediation.

Through establishment of institutional controls in Alternative 3 [Classification Exception Area (CEA) waiver], groundwater will not be used for potable purposes. Long-term (annual) groundwater monitoring is included in each Site 26 OU 7 remedial alternative, except for the No Action alternative. As encouraged by the guidance, a groundwater treatment alternative (Alternative 4) using an extension of the existing AS/SVE system has been included. The key components of Alternatives 1 through 4 are identified on Table 3-1:

3.1.2.1 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. Key components of Alternative 1 are identified on Table 3-1 and described below.

Existing Features - Currently, Site features offer significant protection of human health and the environment. The primary protective feature is that groundwater underlying Site 26 is not used as a potable water supply. As a result, there is currently no pathway for human exposure to VOC-contaminated groundwater. However, potable water supply wells are situated elsewhere on the base (within approximately one mile crossgradient of the site) and site groundwater could conceivably be used as a potable water supply in the future, posing a potential excess human health risk. The groundwater remediation system installed as part of the ROD for OU 3 continues in operation and has significantly reduced the concentrations of VOCs found in monitoring wells.

TABLE 3-1
SITE 26- REMEDIAL ALTERNATIVE COMPONENTS
OU 7 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
4	Groundwater Treatment (In Situ) (Long-Term Monitoring and Institutional Controls)	• Active groundwater remediation • 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.

3.1.2.2 Alternative 2: Limited Action (Long-Term Monitoring)

Alternative 2 was developed as an option that 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 3-1 and described below.

In the event of full or partial transfer of property, through existing legislation or through future base closure authorization, a review would be conducted to determine the suitability of any parcel for transfer of ownership.

Existing Features - Currently, Site features offer limited protection of human health and the environment. The primary protective feature is that groundwater underlying Site 26 is not used as a potable water supply. As a result, there is currently no pathway for human exposure to VOC-contaminated groundwater. However, potable water supply wells are situated elsewhere on the base (within approximately one mile crossgradient of the site) and site groundwater could conceivably be used as a potable water supply in the future, posing a potential human health risk.

Active treatment of groundwater would continue to be conducted under the ROD for OU 3.

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

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.

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

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, dispersion, and precipitation.

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 3-1 and described below.

Institutional Controls - 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 PCE-related 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.

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 assessing whether contaminant migration has increased and whether human or biological receptors or groundwater resources are at risk.

3.1.2.4 Alternative 4: Expansion of OU 3 AS/SVE System (Institutional Controls and Long-Term Monitoring)

Under Alternative 4, the PCE present in groundwater and saturated soils would be removed from the aquifer through AS/SVE, which comprises an active in situ remediation process. Additional sparge points and vapor-extraction wells would be added to the current OU 3 system. Institutional controls would be implemented to prevent exposure to contaminated groundwater for the duration of the groundwater treatment period, until GWQS are achieved. Periodic long-term monitoring would be conducted for the duration of the remediation period to assess the effectiveness of the remedial action and to determine when the remediation is complete. Site conditions and risks would be formally reviewed every 5 years until the groundwater remediation is complete.

Using the AS/SVE system for mass transfer, it is anticipated that the greater part of the chlorinated VOCs would be removed from groundwater and soils. However, the continuous introduction of air into the subsurface maintains a high dissolved oxygen level in both the saturated and unsaturated zones. High dissolved oxygen conditions are not generally favorable to anaerobic biological activity of the chlorinated

VOCs in situ. Biodegradation of VOCs by the indigenous microbe population generally requires anaerobic conditions. Therefore, it is proposed that any AS/SVE remediation scheme would consist of a preliminary active AS/SVE period to treat the areas of significant TCE concentration and remove the bulk of the mass of chlorinated hydrocarbons, followed by a period of long-term monitoring and natural attenuation. Injection of reducing agents into the groundwater through the sparge wells may be used to reduce the dissolved oxygen levels in the groundwater. However, the sandy soils and shallow groundwater at the site are not conducive to anaerobic conditions.

Alternative 4 would employ in situ groundwater treatment to provide long-term protection of human health and the environment. The groundwater treatment system would be designed to reduce volume and concentration of contaminated groundwater; therefore, upon successful start-up of the treatment system (the plume area could actually widen during initial operations), downgradient receptors of contaminated groundwater would begin to be protected. However, potential users of contaminated groundwater beneath Site 26 would not be protected by Alternative 4 until groundwater remediation goals were achieved throughout the plume. It is anticipated that long-term, permanent protection would be achieved after a treatment duration of approximately 5 years. During this period, groundwater contaminants would be removed both by the AS/SVE, which comprises an active in-situ remediation process extraction system, and by natural attenuation.

In the interim, until remediation goals for site groundwater have been achieved, human health would be protected through the use of institutional controls that would restrict the use of untreated contaminated groundwater as drinking water. The effectiveness of this interim protection would depend entirely upon adequate enforcement. If groundwater use restrictions were not adequately enforced, existing health risks would remain until groundwater contaminant concentrations decreased to acceptable levels.

3.1.3 Alternatives Screening

In this section, alternatives are evaluated generally with regard to effectiveness, implementability, and cost to further determine the most plausible array of remedial alternatives for Site 26 OU 3. Three of the four alternatives for OU 7 remediation have been retained for development and detailed analysis.

Alternative 4 has been eliminated for several reasons including anticipated high cost for limited additional protection of human health and the environment, lack of practicality and effectiveness due to low levels of PCE which are spread out over a large heavily wooded area, there is no current human receptor scenario for drinking the water, there are no near downgradient receptors, and there are no associated environmental impacts. The Alternative screening is presented in Table 3-2.

TABLE 3-2
SITE 26 - SCREENING OF REMEDIAL ALTERNATIVES
OU 7 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: none	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.
4	Groundwater Treatment (In Situ) (Long-Term Monitoring and Institutional Controls)	Protects human health through active groundwater remediation Long-term annual groundwater monitoring, institutional controls (CEA) and five-year reviews would protect human health and the environment until GWQS are achieved.	Readily implementable through an extension of the existing AS/SVE system network. Technical difficulties and a low yield of extracted (PCE) product are anticipated due to the low concentrations of PCE and the wide-spread plume.	Capital: high O&M: high	Anticipated high cost for limited additional protection of human health and the environment. Lack of practicality and effectiveness due to low levels of PCE which are spread out over a large heavily wooded area. Eliminated

4.0 DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

This section contains the detailed evaluation of the remedial alternatives that were retained after the screening of alternatives in Section 3.0. In accordance with the EPA RI/FS guidance, each alternative is evaluated with respect to seven criteria: 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; and cost.

4.1 INDIVIDUAL ANALYSIS OF SITE 26 OU 7 ALTERNATIVES

This section is provided to comply with RI/FS preparation guidance. Detailed evaluations of the three Site 26 OU 7 remedial alternatives retained for further evaluation are presented in this section. However, since there is a remediation program underway as a result of an FS, Proposed Plan and ROD for OU 3 that is remediating the OU 7 PCE plume, the three retained OU 7 alternatives are equally protective of human health and the environment. As discussed in Section 1.4, remediation of both operable units composing the VOC plume source at Site 26 (OU 3 and OU 7) is underway as a result of the regulatory administration of the VOC plume prescribed by the ROD for OU 3.

4.1.1 Alternative 1: No Action

The no-action alternative was developed as a baseline case, as required by the NCP. No activities (beyond the groundwater remediation underway for OU 3) are to be conducted under this alternative.

Overall Protection of Human Health and the Environment

The no-action alternative would not provide additional protection of human health or the environment. Contaminants in site groundwater (including PCE-related compounds) would continue to be remediated under the groundwater remediation underway for OU 3 and the potential risk to humans would continue to diminish.

Alternative 1 does not include implementation of additional institutional controls to restrict use of contaminated groundwater in the event of future change in land or groundwater use.

Compliance with ARARs

Alternative 1 would comply with long-term monitoring requirements, since monitoring and evaluation of groundwater contaminants, including PCE-related compounds, would continue to be performed under OU 3 groundwater remediation.

Long-Term Effectiveness and Permanence

Although no remedial actions would occur under Alternative 1, the current and future threats to human health and the environment would continue to be reduced by the remediation underway for OU 3.

No new controls would be used to manage the site under the no-action alternative; therefore, the evaluation of the adequacy and reliability of controls is not applicable.

Reduction of Toxicity Mobility, or Volume through Treatment

The no-action alternative would not reduce the toxicity, mobility, or volume of contamination through treatment, however, groundwater remediation will continue under the ROD for OU 3.

Short-Term Effectiveness

Since no response actions would occur, implementation of the no-action alternative would not pose additional short-term risks to station personnel or the local community.

Implementability

Since no response activities would occur, the no-action alternative is readily implementable. The technical feasibility criteria, including constructibility, operability, and reliability, are not relevant to this alternative. Additional actions can be easily implemented in the future, if warranted.

Permits would not be required under Alternative 1.

Cost

There are no capital or maintenance costs for the no-action alternative, since no activities would be performed under this alternative.

4.1.2 Alternative 2: Limited Action (Long-Term Monitoring)

Alternative 2 relies on long-term groundwater monitoring to achieve the RAO. Over time, groundwater contamination is expected to decrease by the active remediation program currently in place for OU 3, and later by natural effects in the environment. Long-term annual monitoring and five-year reviews would assess contaminant status and potential threats to human health and the environment. Active

remediation by AS/SVE appears to be reducing the concentration of solvents significantly. The amount of time required to achieve cleanup goals is unknown. Maintenance of the proposed CEA, periodic monitoring and five-year reviews will be required until achievement of cleanup goals is confirmed. Key components of Alternative 2 are identified on Table 3-1.

Overall Protection of Human Health and the Environment

Alternative 2 would not prevent direct exposure to site groundwater or institute restrictions on use of site groundwater.

Alternative 2 would not reduce the risks posed by future use of site groundwater. Site groundwater would continue to be remediated under the groundwater remediation underway for OU 3 and the potential risk to humans would continue to diminish.

The long-term annual monitoring program would allow the responsible agency to monitor the quality of groundwater leaving the site, assess potential impacts to downgradient receptors, and determine whether additional remedial actions are necessary. However, these efforts would be duplicative of activities currently underway for the coincident Site 26 OU 3 remediation program.

Use of engineering controls to minimize generation of fugitive dusts and vapors and proper use of personal protective equipment (PPE) by site workers would effectively minimize short-term risks to the local community and workers posed by implementation of this alternative.

Compliance with ARARs

Implementation of Alternative 2 would eventually comply with all ARARs identified in Tables 2-1 through 2-6. Although Alternative 2 does not include active treatment of groundwater, groundwater remediation currently underway in accordance with the ROD for OU 3 would continue. All necessary measures would be taken to comply with the location-specific federal and state ARARs identified in Tables 2-3 and 2-4. It is expected that Alternative 2 would comply with these ARARs.

Long-Term Effectiveness and Permanence

The risk assessment concluded that, under future residential land use and future industrial worker exposure scenarios, exposure to contaminated groundwater beneath the site would result in a potential HI greater than 1 for non-carcinogenic exposures and the carcinogenic risk estimates also exceed EPA's target maximum risk range. Assessing contaminant status at the site through long-term groundwater monitoring would allow for evaluation of site risks and determine the necessity of any further actions to

protect human health or the environment.

The groundwater underlying Site 26 is not currently used as a potable water supply and there are no existing plans for its use; however, public non-community wells and domestic wells are situated elsewhere on the station, indicating that future use of groundwater is conceivable. If site land and groundwater usage changes in the future, or if groundwater monitoring results prompt further action, potential residential users of groundwater could be protected by implementation of institutional controls (access restrictions and CEA) until GWQSs are achieved.

Monitoring and evaluation of groundwater would allow the responsible agency to monitor the quality of groundwater beneath and leaving the site, assess potential impacts to the adjacent lands and downgradient receptors, and determine whether additional remedial actions are necessary. Unless site conditions change, the monitoring program should be effective in minimizing the risks to downgradient receptors and the environment.

Five-year reviews would be required to assess whether the controls provided under this alternative are effective in preventing direct exposures and reducing contaminant leaching and whether groundwater contaminants are decreasing. These reviews would be based in large part on analytical data collected during monitoring events.

No difficulties or uncertainties are anticipated in performing the long-term monitoring and reviews. Groundwater monitoring wells may require replacement if sedimentation or damage occur; the wells would be readily replaceable.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative 2 would not reduce the toxicity, mobility, or volume of contamination through treatment since no treatment is used to address the contaminated site soils or groundwater.

Short-Term Effectiveness

Implementation of Alternative 2 is not expected to pose any significant risks to station personnel or the local community. Workers who implement Alternative 2 would be adequately safeguarded by using appropriate PPE to prevent exposure to contaminated media, contaminant-laden dusts, and airborne VOCs. OSHA standards would be followed and proper PPE would be used during all remedial activities.

No permanent adverse impacts to the environment are anticipated to result under this alternative.

Implementability

Alternative 2 is implementable and is already underway as part of the remedy for OU 3. Long-term monitoring (sampling and analyses) requires readily available resources. Since long-term monitoring is included under Alternative 2, contaminant presence and migration can be assessed. Monitoring of groundwater would be effective for detecting changes in media quality that may indicate potential impacts to downgradient receptors.

Permits would not be required under Alternative 2 since all activities would be conducted on the site; however, the substantive requirements of ARARs would be met.

Since no treatment is proposed, the criterion of availability of treatment technologies, treatment and disposal (TSD) facilities, and capacity is not applicable.

There is ample availability of companies with the trained personnel, equipment, and materials to perform long-term monitoring. Regulatory personnel and environmental specialists are readily available to perform 5-year reviews.

Cost

There is no capital cost to implement Alternative 2 for Site 26 OU 7. Marginal costs for additional (or exchange of) monitoring wells currently used to monitor status of the OU 3 groundwater plume are minor and can be applied to the approved remediation project underway at Site 26 OU 3.

4.1.3 Alternative 3: Limited Action (Long-Term Monitoring with CEA)

Alternative 3 relies on long-term groundwater monitoring and institutional controls (establishment of a CEA) to achieve the RAO. A CEA would prohibit the use of untreated groundwater as drinking water. Over time, groundwater contamination is expected to be reduced by the active groundwater remediation program underway for OU 3 and gradually decrease by chemical and physical mechanisms after the AS/SVE system is retired. Active remediation by AS/SVE appears to be reducing the concentration of solvents significantly. The amount of time required to achieve cleanup goals is unknown. Maintenance of the proposed CEA, periodic monitoring and five-year reviews will be required until achievement of cleanup goals is confirmed. Long-term annual monitoring and 5-year reviews would assess contaminant status and potential threats to human health and the environment. The key components of Alternative 3 are identified on Table 3-1.

Overall Protection of Human Health and the Environment

Alternative 3 would provide protection of human health and the environment by instituting restrictions on use of site groundwater.

Alternative 3 would reduce the risks posed by future use of site groundwater. The human health risk assessment concluded that site groundwater poses non-carcinogenic risks exceeding EPA's maximum risk range under future residential and future industrial exposure scenarios. Site groundwater would continue to be remediated under the groundwater remediation underway for OU 3 and the potential risk to humans would continue to diminish. Upon completion of active groundwater remediation, establishing a groundwater CEA to prohibit the use of the aquifer would provide interim protection to human receptors until groundwater concentrations fall to the remediation goals.

The long-term annual monitoring program would allow the responsible agency to monitor the quality of groundwater leaving the site, assess potential impacts to downgradient receptors, and determine whether additional remedial actions are necessary. However, these efforts would be duplicative of activities currently underway for the coincident Site 26 OU 3 remediation program.

Use of engineering controls to minimize generation of fugitive dusts and vapors and proper use of personal protective equipment (PPE) by site workers would effectively minimize short-term risks to the local community and workers posed by implementation of this alternative.

Compliance with ARARs

Implementation of Alternative 3 would eventually comply with all ARARs identified in Tables 2-1 through 2-6. Alternative 3 does not include active treatment of groundwater. Although Alternative 3 does not include active treatment of groundwater, groundwater remediation currently underway in accordance with the ROD for OU 3 would continue. Initially, the groundwater beneath Site 26 OU 7 would not meet the constituent concentrations specified in the New Jersey GWQS [N.J.A.C. 7:9-6]. Upon completion of the active remediation program at Site 26 OU 3, a CEA would be established to provide the state official notice that the constituent standards would not be met for a specified duration and to ensure that consumption of the untreated groundwater is prohibited.

All necessary measures would be taken to comply with the location-specific federal and state ARARs identified in Tables 2-3 and 2-4. It is expected that Alternative 3 would comply with these ARARs.

Long-Term Effectiveness and Permanence

The groundwater underlying Site 26 is not currently used as a potable water supply and there are no existing plans for its use; however, public non-community wells and domestic wells are situated elsewhere on the station, indicating that future use of groundwater is conceivable. If site land and groundwater usage changes in the future, potential residential users of groundwater would be protected by institutional controls (CEA) until GWQSs are achieved.

Monitoring and evaluation of groundwater would allow the responsible agency to monitor the quality of groundwater beneath and leaving the site, assess potential impacts to the adjacent lands and downgradient receptors, and determine whether additional remedial actions are necessary. The monitoring program, in combination with the CEA, should be effective in minimizing the risks to downgradient receptors and the environment.

Five-year reviews would be required to assess whether the controls provided under this alternative are effective in preventing direct exposures and reducing contaminant leaching and whether groundwater contaminants are decreasing. These reviews would be based in large part on analytical data collected during monitoring events. The effectiveness of the CEA in preventing exposure to site contaminants would be reviewed.

No difficulties or uncertainties are anticipated in performing the long-term monitoring. Groundwater monitoring wells may require replacement if sedimentation or damage occur; the wells would be readily replaceable.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative 3 would not reduce the toxicity, mobility, or volume of contamination through treatment since no treatment is used to address the contaminated site soils or groundwater.

Short-Term Effectiveness

Implementation of Alternative 3 is not expected to pose any significant risks to station personnel or the local community.

Risks posed to station personnel by fugitive dust (bearing adsorbed contaminants) would be minimized by appropriate engineering control measures such as dust suppressants. Workers who implement Alternative 3 would be adequately safeguarded by using appropriate PPE to prevent exposure to contaminated media, contaminant-laden dusts, and airborne VOCs. OSHA standards would be followed

and proper PPE would be used during all remedial activities.

No permanent adverse impacts to the environment are anticipated to result under this alternative. The establishment of the groundwater CEA would await completion of the groundwater remediation program underway at Site 26 OU 3.

Implementability

Alternative 3 is implementable. Long-term monitoring (sampling and analyses) requires readily available resources. Since long-term monitoring is included under Alternative 3, contaminant presence and migration can be assessed. Monitoring of groundwater would be effective for detecting changes in media quality that may indicate potential impacts to downgradient receptors.

Permits would not be required under Alternative 3 since all activities would be conducted on the site; however, the substantive requirements of ARARs would be met as described previously. Approval for implementation of the CEA would be needed from NJDEP.

Since no treatment is proposed, the criterion of availability of treatment technologies, treatment and disposal (TSD) facilities, and capacity is not applicable.

There is ample availability of companies with the trained personnel, equipment, and materials to perform long-term monitoring. Regulatory personnel and environmental specialists are readily available to perform 5-year reviews.

Cost

There is no capital cost to implement Alternative 3 for Site 26 OU 7. Marginal costs for additional (or exchange of) monitoring wells currently used to monitor status of the OU 3 groundwater plume are minor and can be applied to the approved remediation project underway for Site 26 OU 3. Costs for the proposed CEA implementation are already budgeted under the remediation underway for Site 26 OU 3.

4.2 COMPARATIVE ANALYSIS OF SITE 26 OU 7 ALTERNATIVES

A groundwater remediation program consisting of source removal, AS/SVE, institutional controls, and long-term monitoring is underway as a result of the ROD for OU 3. The active remediation program is currently in effect at the adjacent OU 3 and OU 7 plume source areas, effectively remediating both plumes and ensuring protection of human health and the environment.

None of the three retained OU 7 alternatives contains any proposed action that would protect human health or the environment more actively than the program already underway. Therefore it is concluded that each of the three retained remedial alternatives retained for OU 7 would be equally protective of human health and the environment. Implementation of Alternative 3 addresses long-term future exposure.

NJDEP and EPA have requested that any periodic monitoring plan for the combined Site 26 OU 3 and OU 7 plume should be revised to include the proposed monitoring wells and surface water sampling locations discussed in the Technical Memorandum: Extent of Groundwater Contamination at Site 26 UO 3 (Tetra Tech NUS, March 2003