2013 FIVE-YEAR REVIEW

OPERABLE UNIT 1 (SITES 1, 2, 3) AND OPERABLE UNIT 2 (GROUNDWATER)

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

Revision: 3

Prepared for:

NAVFAC
Naval Facilities Engineering Command
NAVFAC MID-ATLANTIC

Department of the Navy
Naval Facilities Engineering Command, Mid-Atlantic
9742 Maryland Avenue
Norfolk, Virginia 23511-3095

Prepared by:

RESOLUTION CONSULTANTS

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A Joint Venture of AECOM & EnSafe
1500 Wells Fargo Building
440 Monticello Avenue
Norfolk, Virginia 23510

Contract Number N62470-11-D-8013
CTO WE08

June 2014

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List of Acronyms

AOC	Area of Concern
APU	Air Purification Unit
AQUA	New York American Water
ARAR	Applicable or Relevant and Appropriate Requirements
AS/SVE	Air Sparging/Soil Vapor Extraction
bgs	below ground surface
BWD	Bethpage Water District
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy
COC	Chemical of Concern
DER	Division of Environmental Remediation
DOH	Department of Health
EE/CA	Engineering Evaluation/Cost Analysis
FS	Feasibility Study
FY	Fiscal Year
GAC	Granular Activated Carbon
GOCO	Government-Owned/Contractor Operated
gpd/ft	gallons per day per foot
gpd/ft^2	gallons per day per square foot
gpm	gallons per minute
GWTP	Groundwater Treatment Plant
HNUS	Halliburton NUS
IAS	Initial Assessment Study
IR	Installation Restoration
LTM	Long-Term Monitoring
LUC	Land Use Controls
MCL	Maximum Contaminant Level
µg/kg	microgram per kilogram
mg/kg	milligrams per kilogram
µg/L	micrograms per liter
$µg/m^3$	micrograms per cubic meter
MIDLANT	Mid-Atlantic
MSL	Mean Sea Level
NA	Not Applicable
NAVFAC	Naval Facilities Engineering Command

NG	Northrop Grumman
NIRIS	Naval Installation Restoration Information System
NWIRP	Naval Weapons Industrial Reserve Plant
NY	New York
NYAW	New York American Water (formerly AQUA New York)
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&M	Operation and Maintenance
ONCT	On-Site Containment System
OU	Operable Unit
OW	Outpost Monitoring Well
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PRG	Preliminary Remedial Goals
RAB	Restoration Advisory Board
RBCs	Risk-Based Concentrations
RCRA	Resource Compensation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SFWD	South Farmingdale Water District
SSDS	Subslab Depressurization Systems
SVE	Soil Vapor Extraction
SVOC	Semi-Volatile Organic Compound
TAGM	Technical and Administrative Guidance Memorandum
TAL	Target Analyte List
TBC	To Be Considered
1,1,1-TCA	1,1,1-trichloroethane
TCE	trichloroethene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TCRA	Time Critical Removal Action
TVOC	Total Volatile Organic Compounds
UFP	Uniform Federal Policy
U.S. EPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VPB	Vertical Profile Boring
VOC	Volatile Organic Compound

Five-Year Review Summary Form
NWIRP Bethpage, Bethpage New York

Site Identification		
Site Name: Naval Weapons Industrial Reserve Plant Bethpage		NY ID: 1-30-003B
Region: Not Applicable (NA)	State: NY	City/County: Bethpage/Nassau
Site Status		
NPL Status: N/A		
Remediation Status (under construction, operating, complete): Under construction		
Multiple Operable Units (highlight): Y N Number of Operable Units: 1		
Construction Completion Date: N/A		
Fund/PRP/Federal Facility Lead: Federal Facility		Lead Agency: DON, NAVFAC Mid-Atlantic (MIDLANT)
Has site been put into reuse? (highlight): Y N		
Review Status		
Who conducted the review (EPA Region, State, Federal Agency): NAVFAC MIDLANT		
Author Name:		Author Title:
Author Affiliation:		
Review Period: 2009 January to 2013 December		Date(s) of Site Inspection: 16 May 2013
Highlight:	Policy Type (name): 1. Pre-SARA 2. Ongoing 3. Removal Only 4. Regional Discretion	Review Number (1, 2, etc.) 2
Triggering Action Event: Records of Decision – OU1 (March 1 1995) which states reviews will be conducted every five years.		
Trigger Action Date: NA		
Due Date: 2014		

OU1 Issues:

The following issues were identified during this review:

Site 1:

- Implementation of the final remedy for non-VOC contaminated soils at Site 1 has been delayed because much higher volumes of impacted media were identified during the remedial design. The Navy is evaluating options for addressing the non-VOC contaminated soil. The remedy is considered protective in the short term due to implementation of Land Use Controls, but may not be protective in the long term.
- On-site groundwater is addressed under OU2. Exposure to contaminated groundwater is controlled through the use of Land Use Controls so there is no immediate threat to human health.
- Although regular site inspections are completed, written annual inspections of the site have not been retained.

Site 2:

- Erosion of the recharge basin walls is continuing at a low rate and in general does not require additional action at this time. The broken storm sewer that resulted in accelerated erosion of the eastern wall of the southeast basin and the basin wall were repaired in 2012 by Nassau County.
- Vegetation at the site remains sparse. Because of the coarse-grained nature of the soil and the flat topography, water and wind erosion are not concerns.
- Although regular site inspections are completed, written annual inspections of the site have not been retained.

Site 3:

- Although regular site inspections are completed, written annual inspections of the site have not been retained.

Recommendations and Follow-Up Actions:

Recommendations/Required Actions

Site 1

- Conduct an RI/FS for addressing soil contamination at Site 1 not covered by the OU1 Record of Decision (ROD).
- Continue operation of the soil vapor extraction containment system. Pursuant to the monitoring plan, conduct offsite monitoring to ensure ongoing protectiveness.
- As part of the RI/FS discussed in #1, complete the groundwater investigation for Site 1 to determine whether PCBs and hexavalent chromium are migrating with groundwater, and if they are migrating, define the vertical and horizontal extent of migration.
- Prepare a new Decision Document that addresses the significant increase of PCB-contaminated soil and hexavalent chromium contaminated groundwater and soil vapor intrusion.
- Implement and document a formal annual Land Use Control inspection program.

Site 2

- Continue to monitor the recharge basins for erosion. If the erosion reaches a point that a wall collapse is a concern or erosion of the soil cover occurs, repairs would be needed.
- Implement and document a formal annual Land Use Control inspection program.

Site 3

- Implement and document a formal annual Land Use Control inspection program.

Protectiveness Statement(s):

Site 1

A long term protectiveness determination of the remedy at Site 1 cannot be made at this time until further information is obtained. Further information will be obtained by the ongoing remedial investigation addendum and follow-on FS. It is expected that these actions will be completed in FY 2016, at which time a protectiveness determination will be made.

The remedy is protective in the short-term because LUCs and an interim soil vapor extraction containment system are in place, and therefore, there is no current or potential exposure. Follow up actions are necessary to address long-term protectiveness because all the remedial action objectives have been met.

Site 2

The remedy at Site 2 — Recharge Basins is currently protective of human health and the environment. Excavation and/or covering of PCB- and PAH-contaminated soil in accordance with the ROD were completed. LUCs have been implemented, and access to the site is currently restricted through fencing and security.

Site 3

The remedy at Site 3 — Salvage Storage Area is currently protective of human health and the environment. Access to the site is currently restricted through implementation of LUCs, fencing, and security.

_____ _____

Date

Five-Year Review Summary Form
NWIRP Bethpage, Bethpage New York

Site Identification			
Site Name: Naval Weapons Industrial Reserve Plant Bethpage			NY ID: 1-30-003B
Region: NA	State: NY	City/County: Bethpage/Nassau	
Site Status			
NPL Status: N/A			
Remediation Status (under construction, operating, complete): Under construction			
Multiple Operable Units (highlight): Y N Number of Operable Units: 1			
Construction Completion Date: N/A			
Fund/PRP/Federal Facility Lead: Federal Facility		Lead Agency: DON, NAVFAC MIDLANT	
Has site been put into reuse? (highlight): Y N			
Review Status			
Who conducted the review (EPA Region, State, Federal Agency): NAVFAC MIDLANT			
Author Name:		Author Title:	
Author Affiliation:			
Review Period: 2009 January to 2013 December		Date(s) of Site Inspection: 16 May 2013	
Highlight:	Policy Type (name): 5. Pre-SARA 6. Ongoing 7. Removal Only 8. Regional Discretion	Review Number (1, 2, etc.) 2	
Triggering Action Event: Records of Decision – OU2 (April 13, 2003) which states reviews will be conducted every five years.			
Trigger Action Date: NA			
Due Date: 2014			

OU2 Issues:

The following issues were identified during this review:

- Not all of the public water supply wells in proximity to site-related VOC-contaminated groundwater have outpost monitoring wells and there are no trigger values established for the new outpost monitoring wells.
- Based on the presence of deep VOC-contaminated groundwater in the area of BWD Plant 6, the effectiveness of the ONCT in capturing all of the site-related contamination is uncertain.
- Based on the finding of VOC-contaminated groundwater at concentrations greater than 1,000 µg/L in the area of BWD Plant 6, implementation of a mass removal system in this area needs to be considered.

Recommendations and Follow-Up Actions:

Recommendations/Required Actions

- Continue to install VPBs and wells to delineate the extent of the plume, monitoring plume migration and attenuation, and serve as sentry points for public water supply wells. Establish trigger values for the new outpost wells and update the Public Water Supply Contingency Plan.
- Continue to investigate potential downgradient adverse OU2 impacts and causes due to suspected incomplete capture by the ONCT system.
- Complete the delineation of the area of groundwater contamination with greater than 1,000 µg/L of VOCs in the area of BWD Plant 6 and pursue implementation of a mass removal system in this area.

Protectiveness Statement(s):

The remedy for OU2 — Groundwater is currently protective of human health and the environment. Access to contaminated groundwater underlying the former NWIRP is currently restricted through LUC measures. Based on the review of performance data, the ONCT appears to be effectively capturing known groundwater contamination associated with the former NWIRP.

For contaminated groundwater that is beyond the ONCT, several actions are being taken. Reduction of offsite hotspot contamination is being addressed by the GM-38 Treatment System. Exposure to contaminated groundwater offsite is limited by Nassau County Department of Public Health regulations, and the public is not exposed to contaminated groundwater due to wellhead treatment implemented at BWD Plants 4, 5, and 6, SFWD Plants 1 and 3, and the interim wellhead treatment system at New York American Water. In addition, a groundwater monitoring/detection program and additional VPB/well installations are being conducted to continue with the assessment of groundwater quality.

_____ _____

Date

1.0 INTRODUCTION

This five-year review has been prepared for the Navy under Contract Task Order WE08 by the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic under the Comprehensive Long-Term Environmental Action Navy (CLEAN) contract number N62470-11-D-8013. This review was conducted for the former Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage, located in the Hamlet of Bethpage, Town of Oyster Bay, Nassau County, Long Island, New York. This review addresses the following Operable Units (OUs) and Sites:

Operable Unit 1 — Soils

- Site 1 — Former Drum Marshalling Area
- Site 2 — Recharge Basin Area
- Site 3 — Salvage Storage Area

Operable Unit 2 — Groundwater

In addition, Site 4 — Former Underground Storage Tanks (also referred to as Area of Concern [AOC] 22) is also located at the former NWIRP Bethpage. Site 4 is still being investigated and a decision document has not yet been prepared. As a result, a five-year review was not conducted for that site.

The five-year review was conducted in accordance with Chief of Naval Operations Letter 5090 N453 SER/11U158119 of 7 June 2011, the United State Environmental Protection Agency's (U.S. EPA) *Comprehensive Five-Year Review Guidance* (EPA 540R-01-007 dated June 2001), and the *Naval Facilities Engineering Command Toolkit for Preparing Five-Year Reviews* (NAVFAC April 2013).

1.1 Purpose

The purpose of the five-year review is to evaluate the implementation and performance of the remedies at the sites to determine whether the remedies are protective of human health and the environment. The methods, findings, and conclusions of the review are documented in this five-year review report. In addition, this report identifies deficiencies found during the review, if any, and provides recommendations to address them. These deficiencies were neither individually nor collectively of such magnitude as to lead to the conclusion that the existing remedies are no longer protective.

This five-year review is required by the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Sec. 121(c), 42 U.S.C. Sec. 9621(c). As stated in the National Oil and Hazardous Substances Pollution Contingency Plan, Section 300.430(f)(4):

> The lead agency, as specified in s 300.515(e), shall make the final remedy selection decision and document that decision in the ROD...(ii) If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.

This is the Department of the Navy's second five-year review of the former NWIRP Bethpage. The first five-year review was initiated in April 2007 by the Navy (Tetra Tech NUS 2008). The first five-year review addressed OU1 Sites 1, 2, and 3. Remedial activities were started at Sites 1, 2, and 3 in 1996 and construction activities were completed at Sites 2 and 3 in 2002. Site 2 and 3 remedial actions consisted of excavation of polychlorinated biphenyl (PCB) contaminated soils (greater than 10 milligrams per kilogram [mg/kg]), a soil/gravel cover over residual contaminated soils, and land use controls (LUCs) to limit access to subsurface. The LUCs include notification and restrictions placed on the parcel in the property transfer agreement.

Remedial actions at Site 1 are ongoing. The operation of an air sparging/soil vapor extraction (AS/SVE) system for volatile organic compound (VOC) contaminated soil and shallow groundwater was completed in 2003. However, because the extent of the PCB-contaminated soils at Site 1 was more extensive than anticipated, additional investigation was required and implementation of the soil excavation and offsite disposal portion of the remedy was delayed. In the interim, in order to protect human health, the LUCs which included limiting site access via fencing at Site 1, and/or installation of a cover (i.e., soil, gravel, or asphalt cover) have been implemented and notification and restrictions are placed on the parcel in the lease agreement. In addition, three removal actions associated with hazardous substances at Site 1 were conducted. Two removal actions were conducted in 2009 to address vapor intrusion concerns. The first removal action was the installation and operation of Air Purifying Units and Sub-slab Depressurization systems. The second removal action was the installation and operation of the soil vapor extraction containment system. In addition, a removal action was conducted in 2013 to remove two underground storage tanks (USTs) that contained chlorinated solvents.

Response actions for the OU2 remedy are also ongoing. Through 2013, the Navy activities have consisted of the installation of outpost and monitoring wells (OW), plume delineation, construction and operation of the GM-38 Area Groundwater Treatment System, and discussion and/or negotiation with potentially effected water supply districts. From the early 2000s to current, in furtherance of the OU2 Record of Decision (ROD), the Navy has reviewed the Northrop Grumman (NG) data to ensure protection of human health and the environment. In 2008, the Navy started collection of additional information, and in 2011 established a third-party independent team to help evaluate off-property groundwater (Bethpage plume) and the OU2 ROD remedy. The results of the additional data and third-party review are presented in Section 5.0.

As discussed in the U.S. EPA *Comprehensive Five-Year Review Guidance* (U.S. EPA 2001), a five-year review determines whether the remedy at a site is protective of human health and the environment. When a remedial action is implemented, a five-year review determines whether immediate threats have been addressed and whether the remedy continues to be protective of human health and the environment. In addition, a five-year review identifies any deficiencies and recommends steps to correct them. To do this, the technical assessment conducted during a five-year review examines three basic questions:

- Question 1: Is the remedy functioning as intended by the decision documents?
- Question 2: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?
- Question 3: Has any other information come to light that could call into question the protectiveness of the remedy?

In order to answer these questions, documents were reviewed, personnel associated with the sites were interviewed, and a site inspection was conducted. This report also includes the findings of the review of newly promulgated standards, and changes in the standards that were identified as applicable or relevant and appropriate requirements (ARARs), to be considered (TBCs), and the factors used to develop site-specific, risk-based levels at the time the ROD was signed. This information was reviewed to determine if changes since the last five-year review may call into question the protectiveness of the remedy. It was determined that recalculation of risk or a risk assessment was not necessary to determine whether a remedy protects human health and the environment, as exposure potentials and chemicals of concern (COCs) have not changed. Where

applicable, monitoring and sampling data and the documentation of operation and maintenance (O&M) were also examined and the information is included in the subsequent site-specific sections.

1.2 Facility History

Operations that would later become NWIRP Bethpage began in the early 1940s. Since its inception, the plant's primary mission was the research prototyping, testing, design engineering, fabrication, and primary assembly of military aircraft. At its peak operation, the facilities at the former NWIRP Bethpage included four plants used for assembly and prototype testing; a group of quality control laboratories, two warehouse complexes (north and south), a salvage storage area, water recharge basins, the Industrial Wastewater Treatment Facility, and several smaller support buildings.

By the 1990s, the facility was situated on 109 acres (Figure 1-2,) and was a Government-Owned/Contractor Operated (GOCO) facility that was operated by NG until September 1998. The NWIRP Bethpage was surrounded on three sides by the NG property and abutted a residential neighborhood on the fourth side. At that time, Navy and NG properties totaled approximately 550 acres.

Operations at NWIRP Bethpage ceased in 1996. As a result, the U.S. Congress passed special legislation (PL 105-85 Sec 2852 FY-1998) that was issued as part of the National Defense Authorization Act of 1998 authorizing conveyance of the Navy's real property at the former NWIRP Bethpage to Nassau County, New York, for economic redevelopment.

The Navy's final land holdings, at termination of NWIRP Bethpage operations, included a main parcel of approximately 105 acres and a separate parcel of approximately 4.5 acres located to the north of the main parcel, which formerly housed a vehicle maintenance facility. The 4.5 acre parcel was transferred to Nassau County on December 10, 2002.

On April 3, 2008, the Navy transferred 96 acres of the 105-acre main parcel to Nassau County and leased the remaining 9 acres to Nassau County. The 9-acre parcel is currently leased to Nassau County but ownership is being retained by the Navy for environmental investigations and remediation. Upon successful remediation of the 9-acre parcel, ownership of the parcel will also be transferred to Nassau County. The transfer and lease documents provide land use controls and notifications of areas in which residual contamination is present.

From 1998 to 2011, activities occurring at the former NWIRP Bethpage have included facility maintenance (security and mowing), storage of Nassau County-impounded vehicles, and environmental investigations and/or remediation of soil, groundwater, and soil vapor (described below).

In 2011, Steel-Los III, LP bought 84-acres of the 96-acre property from Nassau County and has been renovating the property to attract new tenants. Nassau County has retained the remaining 12 acres for economic development. The Navy-owned 9-acre parcel was also subleased by Nassau County to Steel-Los III, LP in 2011. Steel-Los III, LP currently utilizes the owned and leased properties for miscellaneous outdoor storage and as a movie production set. The indoor properties are being used for light industrial and commercial activities. Steel-Los III, LP maintains security for the facility.

1.3 Facility Location

NWIRP Bethpage is located in the Hamlet of Bethpage, Town of Oyster Bay, east-central Nassau County, Long Island, New York, approximately 30 miles east of New York City (Figure 1-1). NWIRP Bethpage is bordered on the north, west, and south by property owned or formerly owned by NG that covered a maximum of approximately 605 acres, and on the east by NG's former Plant 24 and a residential neighborhood (Figure 1-2).

1.4 Surface Features

NWIRP Bethpage is located on a relatively flat, featureless, glacial outwash plain. The site and nearby vicinity are highly urbanized. Because of this, most of the natural physical features have been reshaped or destroyed. The topography at the former NWIRP Bethpage is relatively flat with a gentle slope toward the south. Elevations range from greater than 140 feet (above mean sea level, [MSL]) in the north to less than 110 feet (above MSL) at the southwest corner. NWIRP Bethpage is currently about 9 acres. The dominant features at the facility are Plant 3 (the former manufacturing plant), North Warehouses, South Warehouses, and three groundwater recharge basins located at Site 2. The recharge basins are each approximately 1.5 to 2.5 acres and about 30 to 40 feet deep. Other notable features at the site are a former wastewater treatment plant at Site 2 (Figure 1-2).

1.5 Geology

The NWIRP Bethpage is underlain by approximately 1,100 feet of unconsolidated sediments that overlie crystalline bedrock. The unconsolidated sediments consist of four distinct geologic units

that (in descending order) are the Upper Glacial Formation, the Magothy Formation, the Raritan Clay, and the Lloyd Formation.

The Upper Glacial Formation, which is about 30 to 45 feet thick, consists chiefly of coarse sands and gravels. The Upper Magothy Formation consists chiefly of coarse sands to a depth of about 100 feet, below which are finer sands, silts, and clays. The clay is fairly common but laterally discontinuous; no individual clay horizon of regional extent underlies the former NWIRP Bethpage.

At the former NWIRP Bethpage, the Raritan Clay underlies the Magothy Formation at a depth of approximately 820 feet below ground surface and is reportedly 100 to 150 feet thick. This depth was determined by several borings installed at the facility in 2012. The underlying Lloyd Sand Formation is reportedly about 300 feet thick (Isbister 1966).

1.6 Hydrogeology

The water table beneath the NWIRP Bethpage is in the Magothy Formation. The geologic and hydrologic information obtained from the plethora of work performed at the NWIRP Bethpage indicate that the Upper Glacial and Upper Magothy aquifers beneath the NWIRP Bethpage are interconnected and may be considered a common aquifer. Groundwater in this aquifer occurs under water-table or unconfined conditions. The number and thickness of clay lenses increase with depth within the Magothy, but the horizontally discontinuous nature of these units prevents any one of them from functioning as an aquitard or semi-confining unit.

Most of Long Island is bisected by a northeast-southwest trending, regional groundwater divide. The NWIRP Bethpage lies to the south of this divide, and groundwater beneath the site flows in a generally southeast direction, toward the Atlantic Ocean. The groundwater flow can be affected locally by recharge basins and production wells. The horizontal hydraulic gradient varies throughout the NWIRP Bethpage due to the recharge basins and facility wells. The average hydraulic gradient calculated across the activity is about 5.3 feet per mile (0.001 feet per foot). The average seepage velocity of the groundwater is estimated to range from 0.2 foot per day to 0.9 foot per day.

The glacial deposits are characterized by a high primary porosity and permeability; the porosity is reported to exceed 30 percent. The estimated average values of hydraulic conductivity and transmissivity for the outwash deposits in the Bethpage area are 2,000 gallons per day per square foot (gpd/ft^2) and 100,000 gallons per day per foot (gpd/ft), respectively. Although the water table

beneath the former NWIRP Bethpage lies below these deposits, the high permeability of the glacial deposits allows for the rapid recharge of precipitation to the underlying Magothy Formation (Isbister 1966; McClymonds and Franke 1972).

The Magothy aquifer is the major source of public water in Nassau County. The most productive water-bearing zones are the discontinuous lenses of sand and gravel that occur within the siltier matrix. The major water-bearing zone is the basal gravel. The former NWIRP Bethpage facility production wells were supplied from the Magothy. These wells, which were between 357 and 560 feet below ground surface (bgs) each, had a capacity of 1,200 gallons per minute (gpm). According to Northrop Grumman personnel, the wells often pumped near capacity. The production wells on the Navy's property have been abandoned.

NG installed and operates an On-Site Containment System (ONCT) which is located on the southern side of the former NG-Bethpage facility, which is to the south of the NWIRP, as more fully described below in Section 5.4.

The average hydraulic conductivity of the Magothy aquifer decreases in a southeastward direction as it thickens and the coarser grained lenses become thinner and less persistent. The average transmissivity, however, tends to increase in this same direction due to the abrupt thickening of the aquifer. The estimated average values of hydraulic conductivity and transmissivity for the Magothy in the Bethpage area are 420 gpd/ft^2 and 250,000 gpd/ft, respectively (Isbister 1966; McClymonds and Franke 1972).

1.7 Five Year Review Process

This five-year review was initiated in May 2013. The New York State Department of Environmental Conservation (NYSDEC) was notified verbally of the start of the Five-Year Review for the Navy OU1 and OU2 RODs. The following team members participated in the May 2013 walk through:

- Lora Fly, Navy Remedial Project Manager
- Steve Scharf, NYSDEC
- Steve Karpinski, New York State Department of Health (NYSDOH)
- Brian Caldwell, Resolution Consultants Project Manager (Navy CLEAN contractor)
- Eleanor Vivaudou, Resolution Consultants Project Manager (Navy CLEAN contractor)
- Dave Brayack, Tetra Tech NUS Project Manager (Navy CLEAN contractor)

- Al Taormina, H&S Environmental (Navy O&M Contractor)

The five-year review consisted of the following activities: a review of relevant documents, site inspections (16 May 2013), and limited interviews. The final report will be placed in the Information Repository and Administrative Record File for NWIRP Bethpage. The Information Repository is located at:

Bethpage Public Library
47 Powell Road
Bethpage, New York 11714

In addition, the Administrative Record can be accessed online through the Naval Installation Restoration Information System (NIRIS) at http://go.usa.gov/DyXF.

1.8 Community Involvement

In 1998 a Restoration Advisory Board (RAB) was established for NWIRP Bethpage. The RAB is comprised of members of the community, local environment group members, and state and federal officials. Distribution of information to the RAB and public meetings represent the primary method of communicating information to the community. RAB meetings are held two times per year (generally April and November) and are advertised in a local newspaper (Bethpage Tribune).

Notice of the preparation of the Five-Year Review Report was published in the Bethpage Tribune on May 1, 2013, and a summary of the final Five-Year Review Report will be provided to the RAB at a future meeting (November 2013). A notice of availability of the final Five-Year Review report will be provided to the public in the Bethpage Tribune. The notice will indicate that the Navy made available copies of the report in the Information Repository listed above.

1.9 Applicable or Relevant and Appropriate Requirements and Site Specific Action Levels

The five-year review is being conducted for two purposes:

- To determine if the remedial actions are being implemented as specified in the 1995 and 2003 RODs to protect human health and the environment.

- To determine if there have been changes in the ARARs or site-specific action levels that call into question the protectiveness of the remedy.

The chemical-specific ARARs that were identified in each of the RODs were reviewed, as were new federal and state regulations that have been promulgated to ensure that changes to ARARs do not require re-evaluation of the remedy's protectiveness (i.e., based on findings that indicate the original ARARs are now outside the acceptable risk range). This section describes the review of the potential overall impacts of the new or changed ARARs on the risk posed to human health or the environment.

The benchmarks used to select COCs in the risk assessment for direct contact with soil and sediment originally included United States Environmental Protection Agency (U.S. EPA) Region 3 Risk-Based Concentrations (RBCs), Region 9 Preliminary Remedial Goals (PRGs), U.S. EPA Soil Screening Levels for the protection of migration from soil to groundwater, and New York State Technical and Administrative Guidance Memorandum (TAGM) 4046. Since September 2008, the U.S. EPA Region 3 RBCs and Region 9 PRGs have been replaced with the U.S. EPA Region 9 Regional Screening Levels (RSLs). The most recent update to the RSL tables was in November 2013; the RSLs are regarded as TBC criteria in the evaluation of the OU1 and Navy OU2 remedies, and an evaluation of these indicate that selection of additional COCs to be included in a risk assessment is not warranted.

In December 2006, NYSDEC published 6 New York Codes, Rules and Regulations (NYCRR) Part 375 – Environmental Remediation Programs, including Subpart 375-6 — Remedial Program Soil Cleanup Objective. Subpart 375-6 provides soil cleanup objective tables for (a) Unrestricted use and (b) restricted use scenarios that include protection of human health under residential, restricted residential, commercial, and industrial scenarios, protection of ecological resources, and protection of groundwater. The regulation addresses metal, PCB, pesticide, semi-volatile organic compounds (SVOCs), and VOCs in soil. For the restricted use commercial/industrial scenarios, which are consistent with past, current, and anticipated future land use at the facility, the Part 375-6 objectives are less stringent that the OU1 ROD remedial action levels. Part 375 does not address potential vapor intrusion resulting from contaminated soil.

In October 2010, NYSDEC issued CP-51: Soil Guidance Policy. This policy is intended to replace several TBCs for addressing soil contamination in New York, including TAGM 4046 that was referenced during the development of the OU1 ROD. For inactive hazardous waste sites like the former NWIRP Bethpage, CP-51 identifies the same Soil Clean Objectives as Part 375. It also

provides additional direction regarding the thickness of covers (i.e., 1 foot versus 0.5 foot identified in the OU1 ROD) and sampling frequency for waste characterization that would be considered during implementation of the remedy.

In October 2006, NYSDOH issued final *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*. This guidance identifies procedures to evaluate soil vapor migration from contaminated soils and groundwater into occupied buildings and is considered a TBC for soil vapor remediation at Bethpage. Although the 1995 ROD for Site 1 did not identify soil gas migration as a pathway of potential concern, soil gas sampling in 2008 verified the validity of the pathway of migration to residential homes to the east of the site. In January 2009, a Time Critical Removal Action (TCRA) was performed that consisted of installation of subslab depressurization systems (SSDS) and air purification units (APUs); these systems successfully reduced indoor vapor concentrations to acceptable levels and therefore were shut down in Jan 2012. Potential soil gas migration beyond the former NWIRP boundary is currently being effectively managed by a fence-line containment system.

In conclusion, state and federal ARARs and TBC guidance were reviewed, and it was determined that except for the vapor intrusion pathways, there were no changes in ARARs or TBCs that would require re-evaluation of the protectiveness of the remedies. The vapor intrusion pathway will need to be further evaluated for Site 1 activities.

1.10 Report Organization

This report has been organized with the intent of meeting the general format requirements specified in the *Comprehensive Five-Year Review Guidance* (U.S. EPA 2001), and summarizing the results of the five-year review for OU1 and OU2 in a cohesive and comprehensive manner. Section 1.0 gives an overview of the NWIRP Bethpage and the five-year review process, as well as a discussion of changes in ARARs and site-specific action levels. Sections 2.0 through 5.0 summarize the five-year reviews conducted for each of the individual sites.

Two appendices are included in this report. Appendix A contains the five-year review inspection checklists and the interview summary, and Appendix B contains photographs of the sites taken during the site inspections.

1.11 Next Review

The next review will be done pursuant to CERCLA and the Office of Solid Waste and Emergency Response directive and is scheduled to be completed in 2018.

2.0 SITE 1 — FORMER DRUM MARSHALLING AREA

2.1 Introduction

Site 1 is relatively flat with a 4-foot vegetated windrow located along the eastern end of the site, and is mounded on the north at the location of the former sanitary sewer treatment plant. In the early 1990s, a partial interim soil cover was added to a localized area in response to finding elevated PCB concentrations in some of the site soils. Site access to the current and former NWIRP Bethpage is restricted via fencing and security. In 1998, additional fencing was added to isolate Site 1 from the remainder of the former NWIRP facility. In June/July 2009, buildings, tanks, and concrete aprons within the fenced portion of Site 1 were demolished and disposed/recycled offsite. In 2012, at the request of the property lessees to allow additional parking for facility tenants, the southern Site 1 fence was moved to the north approximately 100 feet and the western fence was moved to the east approximately 30 feet. This new access area was covered with gravel and asphalt in accordance with the OU1 ROD. In April 2012, the current property owner, Steel Equities, uncovered two intact USTs that were found to contain residual solvent material. As discussed below, the USTs and contents were removed in September 2012 and post-removal soil samples were collected. As of 2013, the area bounded by this fence is lightly vegetated soil and includes AOCs 23, 30, and 35. The remainder of Site 1 is covered with concrete or gravel, asphalt or concrete. Dry Wells 20-08 and 34-07 are located outside of the fenced area, but are covered with gravel.

Site 1 remains part of the 9-acre parcel retained by the Navy.

Current use of Site 1 is limited and consists of periodic mowing of vegetation within the fenced-in portion of the site (two to three times per year) and perimeter fence maintenance. Unfenced portions of Site 1 are used for storage, parking, vehicular traffic around Plant 3 and a security patrol of the facility.

2.2 Site Chronology

Site 1 was first identified as a potential source of contamination in the Initial Assessment Study (IAS) in 1986 and contamination was confirmed by a Remedial Investigation (RI) in the early 1990s. Details are presented in Section 2.3 and dates for major events at the site are presented as follows:

Activity	Date
IAS identifies Site 1 as potentially contaminated.	1986
Phase 1 RI — confirms the presence of solvent, metal, and PCB contamination at Site 1.	1992
ROD for Operable Unit Number 1 (Soils and Shallow GW ROD) signed.	May 1995
Additional pre-design delineation of contamination at the site.	1995 to 2001
AS/SVE System installed to address VOC contamination.	1998
AS/SVE System operation (seasonal).	1998 to 2002
Navy re-evaluates implementation requirements for Site 1 PCBs/metal remedy.	2006 to Current
Navy conducts a soil gas investigation along the eastern boundary of Site 1.	January 2008
Navy conducts a soil gas investigation east of Site 1.	October 2008
APUs and SSDS installed in offsite residences.	May 2009
Fence line Soil Vapor Containment system initiated operation; Monthly O&M, Quarterly Operations Reports, Annual status reports.	December 2009 through 2013
APUs and SSDS removed from residences with NYSDEC and NYSDOH concurrence.	January 2012
Two USTs discovered and removed from Site 1, AOC 32.	September 2012
Additional investigation and delineation of PCBs, hexavalent chromium, and other contamination in soil and groundwater at Site 1; Investigation work completed, RI Addendum pending.	2010 through 2013

2.3 Background

Site 1 originally consisted of two former drum marshalling pads that were used to store drums containing waste materials from operations at Plant 3 and potentially other sources at the facility. The waste drums contained chlorinated and non-chlorinated solvents, and liquid cadmium and chromium wastes. In addition, underlying most of Site 1 are approximately 120 abandoned cesspools that were designed to discharge sanitary waste waters from Plant 3. Based on the wide-spread distribution of VOCs and PCBs within the cesspools, it is likely that non-sanitary wastes have been discharged through this system. These cesspools were approximately 10 feet in diameter and 16 feet deep. Based on field observations, the cesspools are currently filled with soil. The drum marshalling areas and extent of the leach field were the original extent of Site 1.

In 2005, because of proximity and similar nature of contamination, the Site 1 boundary was expanded to include adjacent areas of concern consisting of the following (Figure 2-1):

- Drywell/AOC 34-07
- Drywell/AOC 20-08
- AOC 23 — Former Above Ground Storage Tanks
- AOC 30 — Storage Sheds
- AOC 35 — Former Sludge Drying Beds

Initial Assessment Study: In 1986, an IAS conducted at the former NWIRP Bethpage identified materials stored at Site 1 to include waste halogenated and non-halogenated solvents (Rogers, Golden & Halpern 1986). Such storage first took place on a cinder-covered surface over the cesspool field east of Plant 3. From about 1954 through about 1978, drums containing liquid cadmium and chromium waste were stored here. In 1978, the collection and marshalling point was moved a few yards south of the original unpaved site, to an area on a 100-by 100-foot concrete pad. This pad had no cover, nor did it have berms for containment of spills. In 1982, drummed waste storage was transferred to the present Drum Marshalling facility, located in the Salvage Storage Area (Site 3). The IAS concluded that Site 1 posed a potential threat to human health and the environment.

Remedial Investigation (Phase 1): An initial RI was completed in 1992 (Halliburton NUS (HNUS) 1992). The field investigation consisted of collecting 32 soil-gas samples at 16 locations; 7 surface soil samples; 18 subsurface soil samples at 10 locations; installing 7 permanent monitoring wells at 3 locations; and sampling 8 permanent monitoring wells and 10 temporary monitoring wells. All of the samples were analyzed for VOCs. The surface soil samples, shallow subsurface soil samples (less than 5 feet deep), surface water, and groundwater samples were analyzed for inorganic and SVOCs. The groundwater samples were also analyzed for soluble inorganic constituents (less than 0.45 microns) and hexavalent chromium. In addition, surface soils that were observed to be oil stained were analyzed for PCBs and pesticides. Select soil and groundwater samples were also analyzed for engineering-type parameters.

Based on analytical results from the investigation the soils at Site 1 contained sufficient residual volatile organic contamination to confirm a source of groundwater contamination as being near or at the former drum marshalling areas. In addition, PCBs were tentatively identified as being present in the surface soils and were confirmed to be present in the oil stain samples. Pesticides were confirmed to be present in one of the samples.

Phase 2 Remedial Investigation: A Phase 2 RI was conducted in 1993 (HNUS 1993). The overall objective of the Phase 2 RI was to further characterize the nature and extent of environmental contamination and associated risks to human health and the environment at the NWIRP.

The Phase 2 soil testing program results indicated wide-spread low-level PCB contamination in the surface soils at Site 1. The majority of the contaminated soils contained PCBs at a concentration of

10 mg/kg or less. However, soil samples at two locations contained PCBs at concentrations greater than 10 mg/kg. One area was near the southwestern portion of Site 1 (30 mg/kg PCBs) and the other area is along the western edge of the fenced in area at Site 1 (1,470 mg/kg PCBs). As a result of PCBs in surface soils at a concentration greater than 50 mg/kg, an interim action was taken to protect human health. A six-inch soil cover was placed over a portion of the contaminated soils to protect site workers from contact with contaminated soil. This interim action reduced overall risks to offsite residents and onsite workers by a factor of approximately 5 and 20, respectively. The current excess cancer risk to offsite residents and onsite workers, resulting from Site 1 soils, is less than 1×10^{-6} and approximately 1×10^{-5}, respectively. Since 1998, use of the site has been very limited.

The groundwater monitoring program results at Site 1 continued to indicate that this site is a source of VOCs. The two temporary monitoring wells installed during the Phase 2 investigation and placed immediately up- and downgradient of the northern (cinder-based) former pad appeared to confirm that this former pad area is a contributor to VOC groundwater contamination. Post-ROD investigations also implicated the sanitary system cesspools underlying and extending beyond the former pad area as a source of the VOC groundwater contamination. There was sufficient information available to proceed with a Feasibility Study (FS) for VOCs at Site 1, however, additional PCB and arsenic testing of site soils was required as part of pre-design testing.

Feasibility Study/Record of Decision: An FS was completed in 1994 that included Site 1 (HNUS 1994). The FS presented a range of alternatives including S6 that included: fixation (treatment) of metals, incineration of soils containing PCBs at concentrations greater than or equal to 500 mg/kg, land filling of soils containing PCBs at concentrations between 10 and 500 mg/kg and in-situ vapor extraction of VOCs. This alternative was the selected remedy for the site and was documented in a ROD signed in May 1995 (NAVFAC 1995).

2.4 Remedial Actions

Remedy Selection: Remedial Actions at Site 1 were identified in the 1995 Soils and Shallow Groundwater OU1 ROD. These actions consisted of the following components:

- Excavation and fixation (treatment) of arsenic-contaminated soil and landfilled offsite.
- Excavation of PCB-contaminated soil and treatment offsite (PCB concentrations greater than 500 mg/kg).

- Excavation of PCB-contaminated soil, to be landfilled offsite (PCB concentrations greater than 10 mg/kg and less than 500 mg/kg).
- VOC-contaminated soil treated via in-situ vapor extraction.
- VOC-contaminated soil treated via natural flushing (also known as natural attenuation).
- Permeable 6-inch cover over residual contaminated soils and corresponding deed restrictions. Residual soil contamination consists of metal, VOC, polycyclic aromatic hydrocarbons (PAH), and PCB contamination at concentrations greater than TAGM 4046.

Pre-Design Testing: In order to initiate the remedial design, additional soil characterization was conducted to better define the extent of VOC-, PCB-, and arsenic-contaminated soil at Site 1.

Fifteen soil samples were collected from 7 soil boring locations within the Plant 3 building and analyzed for VOCs. Soil sampling from two borings contained chlorinated organics at concentrations above detection limits. Both samples were collected from the top interval just below the floor of the Plant 3 building. The concentrations detected were below the remedial action levels. As a result, it was determined that operation of the AS/SVE system under the Plant 3 building was not required.

At Site 1, outside of the Plant 3 building, 27 soil samples were collected from 9 soil borings and analyzed for VOCs. VOCs were detected at concentrations greater than remedial action levels in two of the five soil boring locations. During the RI investigation, one boring was found to contain elevated levels of volatile organic contamination. These boring locations were located in the areas of known VOC contamination at Site 1.

Additional soil samples were collected and analyzed for PCBs, arsenic, and Toxicity Characteristic Leaching Procedure (TCLP) arsenic, Target Compound List (TCL) Organics (volatiles, semi-volatiles and pesticides) and Target Analyte List (TAL) Metals. This testing confirmed the presence of PCBs at concentrations above action. In addition, the extent of PCB contamination was much greater than anticipated and, as discussed below, more investigation was required. Arsenic was not detected at concentrations above action levels.

In 1996, additional soil testing was conducted at the site and included the collection and analysis of soil samples from previous soil boring locations, but at a greater depth, from new soil boring

locations, and within cesspool locations. The soil boring and cesspool location samples were screened for total PCB concentrations onsite utilizing an immunoassay field screening methodology. In total, there were 331 soil samples analyzed for total PCBs using the onsite screening technology and 15 soil samples analyzed for PCBs at a fixed based laboratory. In addition, the laboratory analyzed 60 soil samples for TCLP constituents and Resource Conservation and Recovery Act (RCRA) parameters (pH, corrosivity, ignitability and reactivity), 215 soil samples for TAL metals, 3 soil samples for TCL volatile organics, and 2 soil samples for full TCL organics (volatiles, semi- volatiles and pesticides/PCBs) and TAL metals.

The data results for both the soil boring and cesspool soil samples analyzed for PCBs were compared to the remedial action level for soil (10 mg/kg), and the TCLP results were reviewed against the regulatory TCLP maximum guidance concentrations. The results of the pre-excavation sampling at Site 1 indicated that the volume and depth of contaminated soil was significantly greater than the original estimate. In particular, the ROD had estimated that the vertical extent of PCB contamination was approximately 7 feet and totaled 1,400 cubic yards of PCB-contaminated soil for removal. Subsequent testing determined that the vertical extent of PCB contamination is approximately 65 feet and extends into the groundwater. Based on current data, approximately 78,100 cubic yards of PCB-contaminated soils (greater than 10 mg/kg) are present and the Navy is evaluating other options for addressing the soil contamination at Site 1.

In addition to PCBs, ten metals (including cadmium and chromium) and VOCs were detected in samples collected from the cesspools at concentrations greater than NYSDEC-recommended soil cleanup objectives, including several cesspools that were not in close proximity to the former drum marshalling areas. These remote findings indicate that these cesspools are also a source of VOC and metal contamination identified at the site.

Dry Well 20-08 and 34-07: In 1998, Dry Wells 20-08 and 34-07 were identified as being contaminated during an investigation conducted under the Underground Injection Control program. Drywells/AOCs 34-07 and 20-08 were part of a storm water management system for this area. PCB fluids are suspected to have entered the system through floor drains in Plant 3 and then entered underlying soils through permeable drywell bottoms. NG conducted a soil removal action at these dry wells in 1998, but confirmation testing found that PCB- impacted soils remain at depth below the excavation (28 feet) and near and below the water table. The PCBs were detected at concentrations greater than 10 mg/kg, the cleanup level for excavation and offsite disposal. Subsequent soil borings determined that the contamination extends to the water table. NG did not

take any further cleanup action with regard to these soils. As a result, because further cleanup was still required, Navy included these dry wells as part of its cleanup of Site 1.

Remedial Actions: In 1997, a pilot-scale AS/SVE was installed at Site 1 — Former Drum Marshalling Area, NWIRP Bethpage, New York to evaluate physical and chemical characteristics for a full scale AS/SVE system.

In 1998, a full-scale AS/SVE System was installed at the site. The system was operated for 6 months in 1998, 9 months in 1999, 9 months in 2000, 4 months in 2001, and 2 months in 2002. In total, the AS/SVE System removed approximately 4,520 pounds of VOCs. In March 2002, the AS/SVE system at the NWIRP Site 1 was shut down as the system was considered to have met its intended purpose of reducing VOCs in soils in the drywell area (Foster Wheeler Corp. 2003).

To determine the effectiveness of the AS/SVE treatment system on VOCs in the subsurface and to delineate the current levels of PCBs and metals in soil, a post-operation soil boring program was conducted in March and April 2002. During the post-operation soil-boring program, 41 soil borings were advanced to the top of the water table, which was approximately 65 feet bgs. The soil samples were analyzed for TCL VOCs, PCBs, and TAL metals. Analysis of the soil samples indicated that VOCs were not detected in the majority of soil boring locations. VOCs that were detected at concentrations greater than the cleanup goals were present in six of the soil boring locations. These VOCs were present at depths ranging from 10 to 64 feet. The Navy conducted an evaluation of the system performance and concluded that the goal of reducing VOCs in soils to protect groundwater was met. Even though several individual soil samples exceeded cleanup goals after treatment, the exceedances were minor and the majority of the soils achieved the goal. NYSDEC concurred that these results warranted removal of the treatment system. Since the majority of the VOC contamination was treated by the AS/SVE system, the ROD identified natural attenuation (formerly called natural flushing) as the remedy to complete site cleanup. In support of this conclusion, in March 2007, a monitoring well at the downgradient edge of the site (FW-3) only contained trichloroethene (TCE, 5.6 micrograms per liter [µg/L]) and tetrachloroethene (PCE, 19 µg/L) at concentrations greater than groundwater standards (5 µg/L each). Prior to remediation (1992), groundwater contamination at the downgradient edge of the site included TCE (1,100 µg/L), 1,1,1-trichloroethane (1,1,1-TCA, 10,000 µg/L), and PCE (430 µg/L). Groundwater monitoring at the site is continuing.

Soil Vapor Migration: In 2006, the NYSDOH finalized guidance that identified soil vapor migration from contaminated soils and groundwater to indoor air quality as a potential exposure

route. The 1995 ROD did not identify this pathway as a potential concern. In January 2008, the Navy collected soil gas samples at the facility fence line, approximately 70 feet from residential housing. Samples were collected at depths of approximately 8, 20, and 45 feet below ground surface (bgs). Data is presented in the Soil Vapor Investigation report (Tetra Tech NUS, 2008), which documents findings of TCE at concentrations up to 19,000 micrograms per cubic meter of air ($\mu g/m^3$) at 7 feet bgs, 180,000 $\mu g/m^3$ at 20 feet bgs, and 150,000 $\mu g/m^3$ at 50 feet bgs. For comparison, the air guideline values for TCE presented in the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH 2006) are 5 $\mu g/m^3$ for indoor air and 250 $\mu g/m^3$ for sub-slab soil vapors. Other VOCs, including PCE and 1,1,1-TCA, were also detected at concentrations up to 90,000 $\mu g/m^3$ in the soil gas samples. Navy actions taken to respond to these findings are described Section 2.5.

2.5 Progress Since Last Review

This is the second five-year review of Site 1. The recommendations from the 2008 Five-Year Review are provided below along with the actions that were taken to address the recommendations:

Complete the re-evaluation of options for addressing soil contamination at Site 1

- Additional Remedial Investigation activities have been completed within the Site 1 area from 2006 through June 2013. Soil sampling has been completed to better define the contaminated soil at Site 1. A Remedial Investigation Addendum report is expected to be finalized in 2014.

Further evaluate the potential for VOC-contaminated soil vapor on the Navy property to impact offsite residents

- From January through April 2009, soil vapor intrusion samples were collected in the residential neighborhood located east and adjacent to Site 1. A total of 18 homes were evaluated during the investigation activities. As an interim measure, APUs were placed into 15 homes to treat any potential vapors that may have entered the homes. In May 2009, under a TCRA, six SSDS were installed in offsite residences.

- Between October and December 2009, a non-TCRA, a fence line soil vapor extraction containment system was installed on Navy property with the goal of preventing further off-property migration of VOC-contaminated vapors and removing existing off-property

VOC-contaminated vapors to the extent practical. Operation of the system started in late December 2009 and continues.

- Based on an evaluation and successful operation of the soil vapor extraction containment system, the Navy determined that the APUs and SSDS in the residential houses could be removed. NYSDOH and NYSDEC concurred with this evaluation in July 2011. The APUs and the SSDS were removed in January 2012.

A *Supplemental Off-Site Soil Vapor Intrusion Monitoring Plan for the Soil Vapor Extraction Containment System* was prepared and finalized in February 2012 with NYSDOH and NYSDEC concurrence. The plan details the installation of additional Soil Vapor Pressure Monitoring (SVPM)/soil gas monitoring points and the vacuum field and soil gas monitoring to be conducted in the residential neighborhood east of Site 1 at the former NWIRP Bethpage. The plan was implemented in January 2013. Evaluation of the monitoring results from 2013 provides evidence that the soils vapor extraction containment is achieving its goals and that a vacuum field has been established within the affected area in the residential neighborhood.

In 2012, an underground storage tank (UST) manway and two pipes were uncovered while new owner, Steel Equities, was grading a road within the Site 1 area. The UST manway was missing its cover and upon further investigation, it appeared that the tank was filled with sand, but a void allowed liquids to collect near the top of the tank. The tank contents were found to contain chlorinated solvents consistent with its reported use to store PCE. The two USTs and contents were removed in September 2012 under a TCRA. The TCRA was documented in a Construction Completion Report in May 2013. An Action Memorandum, consistent with CERCLA, was prepared that summarized these activities. Chlorinated VOCs, PCE or TCE, were detected in 8 of 16 bottom- or side-wall samples at maximum concentrations of 1,200 microgram per kilogram (µg/kg) and 73 µg/kg, respectively. Although these concentrations exceeded the OU1 ROD goals, there was no evidence of a large scale release from these tanks. As a result, it was concluded that any residual VOC contaminated soil and groundwater would be addressed under the ongoing response activities. The required notice of availability of the administrative record for the removal was published and no significant public comments were received

2.6 Five-Year Review Process

2.6.1 Document Review

Since the last Five Year Review, the following documents were prepared and have been reviewed in the preparation of this re-evaluation:

Technical Memorandum for Evaluating Soil Remediation Technologies Site 1 — Former Drum Marshalling Area	Tetra Tech NUS, Inc./2008
Site 1 — Soil Vapor Investigation	Tetra Tech NUS, Inc./2008
Site 1 — Phase 2 Soil Vapor Testing Letter Report	Tetra Tech NUS, Inc./2009
Work Plan Addendum Supplemental Indoor Air Testing, Basement Sealing, and Installation of Residential Vapor Phase Carbon Units	Tetra Tech NUS, Inc./2009
Design Analysis Report for Soil Vapor Extraction Containment System at Site 1 — Former Drum Marshalling Area	Tetra Tech NUS, Inc./2009
Site 1 — Phase II Soil Vapor Report	Tetra Tech NUS, Inc./2009
Final Removal Action Completion Report for Installation Restoration (IR) Site 1 — Former Drum Marshalling Area Non-Time Critical Removal Action	ECOR/2009
Time-Critical Removal Action — Off-site Soil Vapor Intrusion, Site 1	U.S. Navy/2009
Quarterly Data Summary Report Indoor Air and SSD Monitoring (May, June, and July 2009), (August, September, and October 2009)	Tetra Tech NUS, Inc./2009
Data Summary Report Soil Vapor Intrusion Investigation Site 1 — Former Drum Marshalling Area	Tetra Tech NUS, Inc./2009
Final Work Plan for the Design, Installation and Operation of Soil Vapor Extraction System Site 1, Former Drum Marshalling Area	Tetra Tech EC, Inc./2009
Quarterly Data Summary Report Soil Vapor Intrusion Monitoring (November and December 2009, and January 2010), (February, March, April 2010)	Tetra Tech NUS, Inc./2010
Action Memorandum Non-Time Critical Removal Action for Soil Vapor Extraction System Site 1 Former Drum Marshalling Area	Tetra Tech NUS, Inc./2010
Final Sampling and Analysis Plan PCB Investigation Site 1 — Former Drum Marshalling Area	Tetra Tech NUS, Inc./2010
Final Operation and Maintenance Plan for Soil Vapor Extraction Containment System Site 1, Former Drum Marshalling Yard	Tetra Tech EC, Inc./2010
Soil Gas Sampling Work Plan Addendum Site 1 — Former Drum Marshalling Area	Tetra Tech NUS, Inc./2010
Work Plan Addendum Indoor Air and Soil Gas Sampling	Tetra Tech NUS, Inc./2010
Quarterly Data Summary Report Soil Vapor Intrusion Monitoring (May - August 2010)	Tetra Tech NUS, Inc./2010
Data Summary Report and Home Evaluation Soil Vapor Intrusion Investigation Site 1 — Former Drum Marshalling Area	Tetra Tech NUS, Inc./2011
Final Quarterly Operations Report Third Quarter 2010 Soil Vapor Extraction System Site 1 — Former Drum Marshalling Area	ECOR/2011
Data Summary Report and Home Evaluation January through March 2011 Soil Vapor Intrusion Investigation Site 1 — Former Drum Marshalling Area	Tetra Tech NUS, Inc./2011
Interim Data Summary Report and Sampling and Analysis Plan (SAP) Addendum PCB Investigation at Site 1 — Former Drum Marshalling Area	Tetra Tech NUS, Inc./2011
Modifications to Existing Soil Vapor Extraction System at Site 1 — Former Drum Marshalling Area	Tetra Tech NUS, Inc./2011
Final 2011 Annual Operations Report for Soil Vapor Extraction Containment System at Site 1 NWIRP Bethpage	H&S/2012

Final Supplemental Offsite Soil Vapor Intrusion Monitoring Plan for the Soil Extraction Containment System, Site 1 — Former Drum Marshalling Area	Tetra Tech NUS, Inc./2012
Final SAP Addendum for Site 1 Soils, PCB Investigation at Site 1 — Former Drum Marshalling Area	Tetra Tech NUS, Inc./2012
Interim Data Summary Report Groundwater Polychlorinated Biphenyls at Site 1	Tetra Tech, Inc./2012
2012 Annual Operations Report for Soil Vapor Extraction Containment System at Site 1 Former Drum Marshalling Area	H&S/2013
Final Work Plan for Time Critical Removal Action Area of Concern 32 PCE Underground Storage Tanks NWIRP Bethpage	H&S/2012
Construction Completion Report for Time Critical Removal Action Area of Concern 32 PCE Underground Storage Tanks NWIRP Bethpage	H&S/2013

2.6.2 Data Review and Evaluation

During the past five-year period, additional investigation of soil, groundwater, and soil vapor has been conducted within the Site 1 area and in offsite locations. The investigations were described in Sections 2.4 and 2.5 and brief summaries are provided below:

Additional Soil Investigation: The May 2012 *Final SAP Addendum for Site 1 Soils — PCB Investigation at Site 1* provided recent sample results summaries and described additional data gaps. Sampling activities conducted in 2009 and 2010 were used to refine the horizontal and vertical extent of PCB contaminated soils at Site 1. The evaluation included the current understanding regarding the nature and extent of Site 1 contamination and a conceptual site model that outlined contamination boundaries for PCBs at depth intervals of 0 to 2 feet bgs, 2 to 15 feet bgs, 15 to 25 feet bgs, and greater than 25 feet bgs. PCB concentrations ranging from 1 mg/kg to greater than 500 mg/kg have been identified in each of the depth intervals. PCB contamination was also identified below the water table. In addition to PCBs, the site also includes metals (cadmium and chromium) and PAHs at concentrations greater than potential cleanup goals. Based on current data, approximately 78,100 cubic yards of PCB-contaminated soils (greater than 10 mg/kg) are present. Due to the significant change in volume (from 1,400 to 78,100 cubic yards) of PCB-impacted soil and, to a lesser extent, the area of PCB-contaminated soils, the Navy is re-assessing the nature and extent of contamination at Site 1. Further sampling was completed in 2012 and 2013 pursuant to the May 2012 SAP, and evaluation is ongoing.

Soil Vapor Migration: The *2011 Annual Operations Report for Soil Vapor Extraction Containment System at Site 1* and *2012 Annual Operations Report for Soil Vapor Extraction Containment System at Site 1* provide details of the system operation and monitoring as well as offsite soil vapor monitoring data. Overall VOC concentrations in the combined influent remained relatively consistent throughout 2012, with total VOC concentrations ranging from 2,017 $\mu g/m^3$ to

2,950 µg/m^3. In August 2011, combined influent VOC concentrations increased to 2,820 µg/m^3 from prior levels which ranged from 1,000 to 1,900 µg/m^3. Overall, concentrations remain well below baseline concentrations observed in December 2009 when a total VOC concentration of 63,650 µg/m^3 was observed. The operation of the soil vapor extraction containment system has the added benefit of further reducing the quantity of VOCs in Site 1 soils, which would accelerate the cleanup of site groundwater.

The *Offsite Vapor Intrusion Monitoring Plan* was developed to identify actions needed to ensure that the concentration of VOCs in off-property soil vapor and that an off-property vacuum field is maintained. Quarterly offsite vapor monitoring consists of vacuum readings from 12 Soil Vapor Extraction Wells (SVEWs) and 18 SVPMs. The 12 SVEW are located on Site 1 while the 18 SVPMs are located in the residential neighborhood. In January 2013, the Navy conducted its first offsite soil gas sampling event using the 18 SVPMs. The results indicated the SVE Containment System is operating effectively.

Groundwater Investigation: Beginning in November 2010, the Navy collected groundwater samples from shallow, intermediate, and deep monitoring wells ranging from 40 to 296 feet bgs. PCBs in samples collected from each interval were detected at concentrations exceeding the Federal and NYSDOH maximum contaminant levels (MCLs) of 0.5 µg/L, including up to 14 µg/L north of Site 1 and 3.4 µg/L south of Site 1. The extent of PCB-contaminated groundwater downgradient of Site 1 has yet to be defined with PCBs at a maximum concentration of 2.7 µg/L being detected at the southern (former) NWIRP property line.

In addition, hexavalent chromium was detected in several groundwater samples. These detections exceeded the current MCL of 100 µg/L. The maximum detection of hexavalent chromium was 181 µg/L located downgradient of Site 1. Hexavalent chromium was detected in upgradient groundwater at a maximum concentration of 82 µg/L and at the southern (former) NWIRP property line at a maximum concentration of 40 µg/L.

2.6.3 Site Inspection and Interviews

A site inspection was conducted on 16 May 2013. Representatives of the Navy, NYSDEC, NYSDOH, the facility management (H&S), and CLEAN contractor were present. The facility manager (Mr. Al Taormina) was interviewed at that time. Through the interview process, Mr. Taormina confirmed the positive status of on-going activities which include site security, fencing and asphalt

maintenance, SVE operation, and deed restrictions. Mr. Taormina is on-site daily and observes and reports the site condition.

Appendix A includes the Site Inspection Checklist and Five-Year Review interview summary and Appendix B includes the photo log taken during the inspection.

During the site inspection, the vegetation within the perimeter-fenced in portion of the site was mowed, with vegetation covering approximately 75 percent of the area; concrete pads and bare soil represented the balance of the site. During the inspection, there was no evidence of erosion or dust generation. The vegetated portion of the site is fenced in on all sides with a locked access from the west. Outside the interior fenced area, the surface consists of intact concrete, asphalt, or gravel and there was no evidence of exposed soil known to contain elevated concentrations of PCBs.

The SVE Containment System remains in operation and is maintained by H&S Environmental. Other operations at the site are currently limited to control of vegetation and fence repair (Site 1). Front gate security is present at the facility during the week days and evenings.

2.7 Technical Assessment

Technical assessment of the Site is addressed in this section.

Question A: Is the remedy functioning as intended by the decision documents?

Implementation of the Site 1 portion of the remedy is in progress. The Site 2 and Site 3 portions of the remedy have been implemented and are functioning as intended. Operation of the AS/SVE system reduced VOC concentrations in groundwater by more than 99 percent and residual groundwater concentrations are in line with expected results (i.e., 1 to 4 times groundwater standards). The remaining VOCs in the soils are being addressed through natural attenuation processes that are expected to occur over a 30-year period. VOC-contaminated groundwater that has migrated beyond the boundaries of the former NWIRP property is expected to be captured by the downgradient ONCT system that is operated by NG on its property. LUCs have been implemented at the site to eliminate the potential risk to human health and consist of installation of fencing, provisions for site security and restrictions on the use of groundwater that is impacted by VOCs. In addition these LUC have been incorporated into the lease agreement. As discussed below, because of significantly higher volumes of contaminated soil, soil excavation and

offsite disposal of PCB- and metal-contaminated soils have not yet been started and the permeable cover is not complete.

Studies conducted from 1995 to 2001 identified the presence of significantly more PCB contamination in the soil at the site than had been identified in the ROD.

From 2006 through 2013 additional investigations were conducted at the site to further delineate the extent of PCBs contaminated soil and to evaluate potential migration of PCBs and metals in groundwater. An RI Addendum is expected to be completed within fiscal year (FY) 2014, after which an FS will be completed to evaluate remedial alternatives. A new or amended ROD will then be prepared to address PCBs and metals in groundwater. In the interim, fencing and Land Use Controls have been established for this area which restrict access and limit direct exposure; the additional contamination will be addressed after completion of the FS.

In addition to the increased volume of PCB-contaminated soil, PCBs and hexavalent chromium have been detected in groundwater at concentrations in excess of the MCLs. Land Use Controls have been implemented by the Navy to restrict groundwater use at the former NWIRP and groundwater in the area is not used as a potable water source. As a result there is no immediate threat to human health from this contamination.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

Except for vapor intrusion (exposure pathway), the exposure assumptions toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy are still valid. The vapor intrusion which was not identified in the 1995 OU1 ROD, was initially identified as a potential pathway by the U.S. EPA in 2001 and further defined by NYSDOH in 2006. In response to discussions between the Navy and NYSDEC, the Navy conducted a soil gas investigation along the fence line between Site 1 and a residential neighborhood east of Site 1. Based on the results of this investigation, the Navy expanded its investigation into the residential neighborhood. Based on these findings, air purification units (APUs) and SSDS were initially installed in several residences as an interim mitigation measure. Between October and December 2009, a fence line soil vapor extraction containment system was installed and operation of the system started in late December 2009. Operation of this system has reduced off-property VOC concentrations in sub-slab vapor and indoor air to levels meeting U.S. EPA and NYSDOH quality guidelines. In addition, the operation of the soil vapor extraction containment system is currently reducing the quality of residual VOCs at

Site 1. This development may require the Navy to amend the OU1 ROD or develop a new ROD for this issue.

During preparation of the OU1 ROD, Site 1 was being used as an active storage area, with exposure assumptions similar to an industrial use scenario. Since 1998, the unpaved area inside the interior fenced portion of Site 1 (inside the fence line of the northern portion of Site 1) is not active and is visited less than once per month. As a result, current exposures are less than anticipated in the ROD. Future use of the site is identified for vehicle parking, storage, or green space, which would be consistent with ROD exposure assumptions. Although there have been changes in toxicity data since the ROD, these changes would not affect the ROD's remedial goals, which are based on ARARs and function by eliminating contact between potential receptors and residual contaminants.

The remedial action objectives of the remedy will be revised to include prevention of unacceptable levels of site related VOCs in soil vapor migrating to residential areas to the east of the site. Additionally, a ROD Amendment or new ROD will be prepared that describes the selected remedy and how the removal actions taken to date, and any additional removal actions implemented during RI/FS, contribute to the efficient performance of the long-term remedial action.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Other than the vapor intrusion, volume of PCB-contaminated soil and the presence of PCBs and hexavalent chromium in groundwater, as previously discussed, no other information has come to light that calls into question the protectiveness of the remedy.

Summary of Technical Assessment

Site 1 does not present a current risk to human health, as Land Use Controls have been implemented to control exposure pathways. LUCs have been implemented to limit access to site soils and groundwater underlying Site 1. Access to the site is limited by security and fencing which adequately controls direct contact exposure.

PCBs and chromium were detected in groundwater at the downgradient edge of Site 1. The ONCT (for VOC contaminated groundwater; operated by NG) would limit the potential unmonitored migration of this contamination beyond the ONCT to public water supplies to the south.

VOCs in site soils were treated via an AS/SVE system. This system also reduced VOC concentrations in groundwater by more than 99 percent. Residual VOC concentrations in groundwater are in line with treatment goals and natural attenuation processes are being used to address residual site contamination. The operation of the soil vapor extraction containment system will accelerate the natural attenuation processes by reducing the quantity of VOCs in the site soil. The groundwater is being addressed by OU2.

A soil vapor study conducted in January 2008 identified the potential for migration of VOCs in soil gas to residential area east of the site. Interim response measures consisting of the installation and operation of APUs and SSDs were implemented by the Navy in 2009 while a fence-line soil vapor extraction containment system was installed and operation of the system started in late December 2009. The soil vapor extraction (SVE) containment system continues to operate; data on the operation and maintenance (including mass recovery) are collected and shared semi-annually with NYSDEC and NYSDOH. Because of the successful operation of the SVE system, the APUs and SSDS were subsequently removed with concurrence of the NYSDEC and NYSDOH.

2.8 Issues

The following issues were identified during this five-year review at Site 1:

1. Implementation of the final remedy for non-VOC contaminated soils at Site 1 has been delayed because of the finding of much higher volumes of impacted media than had been identified during the ROD. The Navy is evaluating options for addressing the non-VOC contaminated soil. The remedy is considered protective in the short term due to implementation of Land Use Controls, but may not be protective in the long term.

2. PCBs and hexavalent chromium have been identified in the groundwater at the site at concentrations greater than the MCLs. Exposure to contaminated groundwater is controlled through the use of Land Use Controls so there is no immediate threat to human health. However, additional investigation and engineering analysis is being performed to provide a remedy for onsite groundwater.

3. Although regular site inspections are completed, formal annual inspections of the site have not been documented in the form of a Land Use Control inspection/evaluation report.

2.9 Recommendations and Follow-up Actions

The following recommendations and follow-up actions are proposed for the site:

1. Conduct an RI/FS for addressing soil contamination at Site 1 not covered by the OU1 ROD.

2. Continue operation of the soil vapor extraction containment system. Pursuant to the monitoring plan, conduct offsite monitoring to ensure ongoing protectiveness.

3. As part of the RI/FS discussed in #1, complete the groundwater investigation for Site 1 to determine whether PCBs and hexavalent chromium are migrating with groundwater, and if they are migrating, define the vertical and horizontal extent of migration.

4. Prepare a new Decision Document that addresses the significant increase of PCB-contaminated soil, hexavalent chromium contaminated groundwater (addressed under OU 2), and soil vapor intrusion.

5. Implement and document a formal annual LUC inspection program.

2.10 Protectiveness Statement

A long term protectiveness determination of the remedy at Site 1 cannot be made at this time until further information is obtained. Further information will be obtained by the ongoing remedial investigation addendum and follow-on FS. It is expected that these actions will be completed in FY 2016, at which time a protectiveness determination will be made.

The remedy is protective in the short-term because LUCs and an interim soil vapor extraction containment system are in place, and therefore, there is no current or potential exposure. Follow-up actions are necessary to address long-term protectiveness because all the remedial action objectives have been met. In particular, because of significantly higher volume of contaminated media, the PCB- and metal-contaminated soil portion of the remedy has not been implemented and the remedy cannot be implemented as identified in the ROD. In addition, PCB- and hexavalent chromium-contaminated groundwater must be addressed. In addition, a remedy to provide long-term protection of human health from residual VOCs in site soils is required.

3.0 SITE 2 — RECHARGE BASINS

3.1 Introduction

Site 2 is a relatively flat area located in the northeast corner of the Navy's property and north of Site 1, (Figure 1-2). The site is enclosed by a facility perimeter fence along the north, east and south and an interior facility fence along the west (Figure 3-1). It contains three recharge basins that currently receive storm water. The storm water is received from catch basins located on current and former NWIRP property and former NG property to the north and east and the treated discharge from the Bethpage Community Park's groundwater pump and treatment system.

3.2 Site Chronology

Site 2 was first identified as a potential source of contamination in the IAS in 1985. Based on the analytical results of a RI in the early 1990's, Site 2 was not likely a significant source of groundwater contamination. Details are presented in Section 3.3 and dates and major events at the site are presented as follows:

Activity	Date
IAS identifies Site 2 as potentially contaminated.	1985
Phase 1 RI — concluded that Site 2 was redistributing the contaminated groundwater and not contributing to the source.	1991
Phase 2 RI — concluded that PCBs were widely found in the surface soils at Site 2.	1993
ROD for excavation and disposal of contaminated soil and soil cover (Soils ROD) signed.	May 1995
Post Remedial Action Phase 1 — 7,239 tons of PCB contaminated soil was excavated.	1996
Surface Soil results revealed PCB contaminated soil.	2001
Construction completion of soil and gravel cover.	2002
Environmental Evaluation of County Motor Vehicle Impound Lots identified the presence of PAHs in basin sediments. PAHs are likely attributable to run off from asphalt parking lots or motor vehicles.	2008
Evaluation of Recharge Basin Capacity and Storm Water Inflow.	2008
Repair of eastern wall of the southeastern recharge basin.	2012

3.3 Background

Historically, the recharge basins were reported to have been used primarily for disposal of storm water and single-pass non-contact cooling water for air conditioning units that was derived from onsite production wells. Originally, these basins also received rinse waters from NG's operations. There is additional historical evidence of unauthorized, concentrated industrial waste discharges to these basins as well by NG. Also located on this site were the former sludge drying beds which no longer exist and have been filled in. Sludge from the Plant 2 industrial waste treatment facility was reported to have been dewatered in these beds before being disposed of offsite.

Initial Assessment Study: In 1985, an IAS conducted at the former NWIRP Bethpage identified contaminants of concern at Site 2 to include chromium (including hexavalent), aluminum, nitric acid, and sulfuric acid materials (Rogers, Golden & Halpern 1986). Direct evidence of past hazardous waste disposal was collected regarding the recharge basins at Site 2.

Surface water drainage on Long Island is, for the most part, locally controlled, with numerous recharge basins used to channel this resource back to the groundwater. Several such recharge basins are located at the former NWIRP Bethpage. Prior to 1984, some Plant 3 production-line rinse waters were discharged to the recharge basins. The Environmental/Energy Survey of the activity, published in 1976, states that 1.85 million gallons per week were discharged to the recharge basins. These waters were directly exposed to chemicals used in industrial processes (involving the rinsing of manufactured parts). All non-rinse, contact wastewater was reported by NG to have gone to the Plant 2 Industrial Wastewater Treatment Plant and later the Plant 3 Industrial Wastewater Treatment Facility. Reportedly, these discharges of dilute rinse waters did not contain chromates, based on the IAS; however subsequent facility and site investigations revealed the likelihood that chemical discharges, more concentrated than rinse waters, may have been released to the storm water system through various drainage features inside and outside of Plant 3. Since 1977, the discharge rate to the recharge basins was 14 million gallons per week of non-contact cooling water. The non-contact cooling water was obtained from the facility groundwater production wells.

Adjacent to the recharge basins are the former sludge drying beds, which were operated in the 1960s and 1970s. Sludge from the Plant 2 Industrial Waste Treatment Facility (south Northrop Grumman Complex) was reported to have been dewatered in the drying beds before offsite disposal.

On several occasions in the 1940s and 1950s, sampling performed by the Nassau County Department of Health detected levels of hexavalent chromium in excess of allowable limits. NG was notified of these incidents of non-compliance and was asked to perform corrective actions necessary to eliminate the problem. Reportedly, NG complied with the request. It was concluded that Site 2 posed a potential threat to human health and the environment.

Remedial Investigation (Phase 1): A Final RI was conducted in 1991 (HNUS 1992). The field investigation consisted of collecting 48 soil-gas samples at 24 locations, 13 surface soil samples, 14 subsurface soil samples at 13 locations, 2 surface water samples, and 4 sediment

samples; installing 3 permanent monitoring wells at 2 locations; and sampling 3 permanent monitoring wells and 11 temporary monitoring. All of the samples were analyzed for VOC constituents. The surface soil samples, shallow subsurface soil samples (less than 5 feet deep), surface water, sediment, and groundwater samples were analyzed for inorganics and SVOCs. The groundwater and surface water samples were also analyzed for soluble inorganic constituents (less 0.45 microns) and hexavalent chromium. In addition, surface and subsurface soils that were observed to be oil stained were analyzed for PCBs and pesticides. Select soil and groundwater samples were analyzed for engineering-type parameters.

Based on analytical results, Site 2 is not likely a significant source of groundwater contamination. Minimal VOC contamination was present in Site 2 soils and groundwater. The surface water entering the recharge basins contained sufficient concentrations of VOCs to result in the observed groundwater contamination. Based on the concentration of VOCs found in the production wells, it was likely that the recharge basins were redistributing the contaminated groundwater. Also, it should be noted that since the concentration of VOCs in the surface water were lower than in the production wells, the system is likely to result in partial treatment of the groundwater by volatilization. A Phase 2 RI and a FS was recommended to address soil and groundwater contamination.

Phase 2 Remedial Investigation: A Phase 2 RI was conducted in 1992 (HNUS 1993). The overall objective of the Phase 2 RI was to further characterize the nature and extent of environmental contamination and associated risks to human health and the environment at the NWIRP. Based on analytical results from the Phase 2 RI, PCBs were widely found in the surface soils at Site 2, with a maximum concentration of 7.4 mg/kg. Subsurface (3 to 5 feet deep) PCB soil contamination was limited to the southeast corner of Site 2 (6.8 mg/kg) and the northern edge of Site 2, near the former sludge drying beds (36.6 mg/kg). Limited PCB contamination of the basin sediments was also found.

Based on the results of groundwater investigations and computer modeling, it was likely that the recharge basins at Site 2 acted as a secondary source of solvent contaminated groundwater. Contaminated water extracted from production wells at other areas of the former NWIRP and NG was reintroduced into the groundwater at Site 2. NG pursued treatment of this water prior to re-injection. There was sufficient information available to proceed with a FS for Site 2.

Feasibility Study/Record of Decision: Following the Phase 2 RI, a FS was completed in 1994 that included Site 2 (HNUS 1994). An alternative that included excavation of soils contaminated with PCBs between 10 and 500 mg/kg and disposal of the contaminated soil offsite, natural flushing to remove residual VOC contamination, and covering the site and residual contaminated soil with six inches of permeable material (soil or gravel) was selected for the site. The selected remedy was documented in a ROD signed in May 1995 (Navy/NYSDEC 1995).

As identified in the ROD the post-excavation action required to continue protection of human health and environment at Site 2 was as follows:

1. Prevent direct contact (dermal and ingestion) between contaminants in soils at concentrations greater than cleanup goals to site workers and potential future residents. Primary site contaminants for direct contact are PCBs and PAHs.

3.4 Remedial Actions

Remedy Selection: Remedial Actions at Site 2 were identified in the 1995 Soils ROD. These actions consisted of the following components:

- Excavation of PCB-contaminated soil, to be landfilled offsite (PCB concentrations greater than 10 mg/kg and less than 500 mg/kg).
- VOC-contaminated soil to undergo natural flushing (also known as natural attenuation).
- Permeable 6-inch cover over the surficial (non-basin) residual contaminated soils on the northwestern portion of the site, and corresponding deed restrictions. Residual soil contamination consists of metal, VOC, PAH, and PCB at concentrations greater than TAGM 4046.

Pre-Excavation Testing: In 1995, a pre-excavation soil sampling and an estimate for excavation was conducted at Site 2 (Foster Wheeler, Corp. 1995). The pre-excavation field investigation conducted at the site included the collection and analysis of soil samples from across the site to determine the extent of contamination, especially with regard to PCBs and arsenic. Concentrations of PCBs were detected in the soil samples that exceeded the excavation soil comparison levels of 10 mg/kg.

Remedial Actions: In 1996, the excavation and offsite disposal portion of the remedial action was conducted at Site 2 (C.F. Braun 1996). The purpose of the remedial action was to remove PCB-contaminated soil that had concentrations in excess of 10 mg/kg. During the remedial action, a total of 7,239 tons of PCB contaminated soil was excavated and disposed of at the Grayback Mountain hazardous waste landfill located in Clive, Utah. Removal of all PCBs at concentrations in excess of 10 mg/kg was verified through field test kits and fixed-based laboratory analysis. Based on the remedial action and the confirmation sampling it can be concluded that all PCB contamination in excess of 10 mg/kg was removed from Site 2 and disposed of properly.

Soil and gravel cover was installed in 2001 (Tetra Tech NUS 2002). A notification was entered into the Deed of Transfer to Nassau County, New York describing the location where residual contamination above NYSDEC standards will remain and specified that written consultation with NYSDEC and appropriate precautions must be taken prior to disturbing soils at this site.

3.5 Progress Since Last Review

This is the second five-year review of Site 2. The recommendations from the 2008 (First) Five-Year Review are provided below along with the actions that were taken to address the recommendations:

- Continue to monitor the recharge basins for erosion. If the erosion reaches a point that a wall collapse is a concern or erosion of the soil cover occurs, repairs would be needed.
  - Regular monitoring of the basin area is being conducted (annually).
  - Continued erosion of the eastern wall of the southeastern recharge basin was noted during these inspections. The cause of the erosion was a broken storm water sewer pipe that drained storm water from the former NG parking lot east of this basin. In 2011, the erosion had reached the point that it had encroached on the soil cover installed east of the basin. Nassau County, the property owner, was notified and the storm water pipe and basin wall were repaired in 2012.

3.6 Five-Year Review Process

3.6.1 Document Review

Since the last Five Year Review, the following documents were prepared and have been reviewed in the preparation of this re-evaluation:

Environmental Evaluation of County Motor Vehicle Impound Lots	Tetra Tech NUS, Inc./2008
Final Sampling and Analysis Plan PCB Investigation Site 1 — Former Drum Marshalling Area	Tetra Tech NUS, Inc./2010
Interim Data Summary Report and SAP Addendum PCB Investigation at Site 1 — Former Drum Marshalling Area	Tetra Tech/2011
Interim Data Summary Report, Groundwater, PCB Investigation at Site 1	Tetra Tech/2012

3.6.2 Data Review and Evaluation

During the past five years, studies conducted at Sites 1 and 3 included sediment and surface water sampling at Site 2. The results of the *Environmental Evaluation of County Motor Vehicle Impound Lots* (for Site 3) focused on potential contaminants associated with the County use of the Parking Lot identified low levels of PAHs in the Site 2 basin sediments and storm water. A comparison of these results with U.S. EPA screening levels did not identify a potentially significant risk to human health under the current reduced exposure scenario.

As presented in the 2012 *Interim Data Summary Report*, PCBs were detected in surface water entering the southwestern recharge basin at a concentration of 0.35 µg/L during a storm event. PCBs were not detected in a similar sample of the inlet to the northeast recharge basin. The MCL for PCBs is 0.5 µg/L.

3.6.3 Site Inspection and Interviews

A site inspection was conducted on 16 May 2013. Representatives of the Navy, NYSDEC, NYSDOH, the facility management (H&S), and CLEAN contractors were present. The facility manager (Mr. Al Taormina) was interviewed at that time. Through the interview process, Mr. Taormina confirmed the positive status of on-going activities which include site security, fencing and asphalt maintenance, and deed restrictions. Mr. Taormina is on-site daily and observes and reports the site condition.

Appendix A includes the Site Inspection Checklist and Five-Year Review interview summary and Appendix B includes the photo log taken during the inspection.

A fence surrounds Site 2 as shown on Figure 3-1. Site 2 contained vegetation with minimal erosion along the western edge of the site. The north recharge basin exhibited minor erosion of the steep bank in the southwest corner. The southeast recharge basin's eastern inlet exhibited moderate level erosion running down along the bank. The northwest and northeast quadrants of Site 2 contain tall, dead vegetation sparsely scattered through the landscape. Vegetation in the southeast quadrant is reasonably well established covering approximately 90 percent of the

ground surface. The southeast recharge basin intake structure (located in the northwest corner) exhibits moderate levels of erosion. The southeast recharge basin had previously exhibited significant erosion, but Nassau County repaired this in 2012.

3.7 Technical Assessment

Technical assessment of the site is addressed in this section.

Question A: Is the remedy functioning as intended by the decision documents?

In 1996, the PCB-contaminated soils were removed from the site in accordance with the ROD. The concentrations of PCBs and PAHs remaining in the soils were low enough that incidental contact with the soils would not adversely affect human health. In addition, a cover was placed on those soils which contained contaminants greater than a residential use scenario in accordance with the ROD. The soil cover remains intact and continues to act as a barrier to potential human contact to site contaminants. As a result, the remedy is continuing to function as intended in the decision document.

Some erosion was noted within the recharge basins. Continued monitoring and, if required, repair of the erosion needs to be conducted to ensure that contaminated soils do not become exposed. Since 2008, in those limited instances where the erosion had extended into the cover, the County has performed necessary repairs.

The vegetation on the cover remains relatively sparse. However, the lack of vegetative cover has not affected the functioning of the remedy. The site is mostly level and the soils are coarse-grained sands. These soils drain very well and precipitation infiltrates without any significant overland flow. This continued flushing of the soil is beneficial to allow attenuation of residual VOCs in site soils. Likewise, the coarse-grained soils do not become airborne and therefore are not subject to wind erosion.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

During preparation of the ROD, Site 2 was being used to recharge storm water and non-contact cooling water, with exposure assumptions similar to an industrial use scenario. Since 1998, Site 2 has not been active and only rarely visited (once per month or less). As a result, current exposures are less than anticipated in the ROD. Future use of the site is identified for water recharge and green space, which would be consistent with ROD exposure assumptions. Changes in toxicity data since the ROD would not affect ROD assumptions. Cleanup levels are the same as during the ROD.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No new information that would affect the protectiveness of the remedy has become available. PCBs, PAHs, Diesel Range Organics, and metals were identified in the basin sediments during the 2008 *Environmental Evaluation of County Motor Vehicle Impound Lots*. In addition, higher concentrations of PCBs were noted in the 2011 to 2013 basin samples, potentially because the basin is still active. Based on a comparison of this data with the ROD and Federal and State risk screening values, no action was recommended at that time. Access to the basins should continue to be restricted and personnel entering the recharge basins should be notified of the presence of PCBs and PAHs and wear appropriate personal protective equipment.

Summary of Technical Assessment

Site 2 does not present a current risk to human health or the environment. Access to the site is limited by security and fencing which adequately controls direct contact exposure.

3.8 Issues

The following issues were identified during this five-year review at Site 2:

1. Erosion of the recharge basin walls is continuing at a low rate and in general does not require additional action at this time. The broken storm sewer that resulted in accelerated erosion of the eastern wall of the southeast basin and the basin wall were repaired.

2. Vegetation at the site remains sparse. Because of the coarse-grained nature of the soil and the flat topography, water and wind erosion are not concerns.

3. Although regular site inspections are completed, formal annual inspections of the site have not been documented in the form of a LUC inspection/evaluation report.

3.9 Recommendations and Follow-up Actions

The following recommendations and follow-up actions are proposed for the site:

1. Continue to monitor the recharge basins for erosion. If the erosion reaches a point that a wall collapse is a concern or erosion of the soil cover occurs, repairs would be needed.

2. Implement and document a formal annual LUC inspection program.

3.10 Protectiveness Statement

The remedy at Site 2 — Recharge Basins is currently protective of human health and the environment. Excavation and/or covering of PCB- and PAH-contaminated soil in accordance with the ROD were completed. LUCs have been implemented, and access to the site is currently restricted through fencing and security.

4.0 SITE 3 — SALVAGE STORAGE AREA

4.1 Introduction

The former NWIRP Bethpage Salvage Storage Area is located north of the Plant 3 and west of Site 2. Site 3 currently consists of an asphalt-paved parking area and is fenced on the northern and eastern sides.

4.2 Site Chronology

Site 3 was first identified in the 1985 IAS (Rogers, Golden & Halpern 1986). Based on the analytical results of an RI in the early 1990s Site 3 was a likely source of onsite groundwater contamination. Details are presented in Section 4.3 and dates and major events at the site are presented as follows:

Activity	Date
IAS identifies Site 3 as posing a potential threat to human health and the environment.	1985
Phase 1 RI — concluded that Site 3 was a likely source of groundwater contamination.	1991
Phase 2 RI — concluded that PCBs were not a significant concern at the areas tested at Site 3.	1993
ROD for natural flushing and soil cover (Soils ROD) signed.	May 1995
A deed restriction was ordered.	2001
Construction completion of soil and gravel cover work performed in 1998.	2002
Nassau County uses sites as a parking lot for impounded vehicles.	2003 to 2012
Environmental Evaluation of County Motor Vehicle Impound Lots identified the presence of PAHs in basin sediments. PAHs are likely attributable to run off from asphalt parking lots or motor vehicles.	2008

4.3 Background

Fixtures, tools, and metallic scrap were stored at Site 3 from the early 1950s through 1969, prior to recycling. Stored materials included aluminum and titanium scraps and shavings. While in storage, cutting oils dripped from some of this metal. Additionally, drum marshalling was also conducted in this area.

In about 1960, the Salvage Storage Area was reduced in size to accommodate parking. In about 1970, it was reduced again for the same reason. Consequently, storage facility locations at this site have been periodically moved to accommodate parking.

Initial Assessment Study: In 1985, an IAS conducted at the former NWIRP Bethpage identified potential chemicals of concern at Site 3 (from both drum marshalling and salvage storage areas) to include cutting oils, aluminum, titanium, and halogenated and non-halogenated solvents

(Rogers, Golden & Halpern 1986). In 1985, IAS team members observed oil staining on the ground; however, soil tests performed by NG in 1984 revealed that oil stains were surficial. Oil residues were not detected below the top several inches of soil material in the Salvage Storage Area at the locations tested.

In addition to salvage storage, a 100- by 100-foot area within the boundary of the Salvage Storage Area was used for the marshalling of drummed waste. This area was covered with coal ash cinders. Drum marshalling continued at Site 3 from the early 1950s to 1969. Wastes stored throughout the area included waste oils as well as waste halogenated and non-halogenated solvents. The exact location of this former drum marshalling area was uncertain; however, it was suspected to be near the current investigative derived waste storage area.

It was concluded that Site 3 posed a potential threat to human health and the environment.

Remedial Investigation (Phase 1): A Final RI was conducted in 1991 (Halliburton NU 1992). The field investigation consisted of collecting 60 soil-gas samples at 30 locations, 8 surface soil samples and 14 subsurface soil samples at 9 locations; installing 5 permanent monitoring wells at 2 locations; and sampling of 9 temporary monitoring well, 5 permanent monitoring wells and 4 production wells. All of the samples were analyzed for VOC constituents. The surface soil samples, shallow subsurface soil samples (less than 5 feet deep), surface water, sediment, and groundwater samples were analyzed for inorganics and SVOCs. The groundwater and production well samples were also analyzed for soluble inorganic constituents (less 0.45 microns) and hexavalent chromium. In addition, surface and subsurface soils that were observed to be oil stained were analyzed for PCBs and pesticides. Select soil and groundwater samples were analyzed for engineering-type parameters.

Based on analytical results, Site 3 was a likely source of groundwater contamination. Although VOCs were identified in site soils at concentrations that could impact groundwater, these concentrations were much lower than identified at Site 1. Any groundwater contamination that originated at Site 3 would be investigated with contamination originating from Site 1. The soils were determined to pose a risk to onsite workers. Based on the concentration of VOCs that were found in the production wells, the recharge basins at Site 2 were likely to be redistributing the contaminated groundwater from Site 3. Also, it should be noted that since the concentration of VOCs in the surface water was lower than in the production wells, the system was likely to result in

partial treatment of the groundwater by volatilization. A Phase 2 RI and an FS was recommended to address soil and groundwater contamination.

Phase 2 Remedial Investigation: A Phase 2 RI was conducted in 1992 (HNUS 1993). The overall objective of the Phase 2 RI was to further characterize the nature and extent of environmental contamination and associated risks to human health and the environment at the former NWIRP Bethpage. The Phase 1 and 2 RI data indicated that PCBs were not a significant concern at the areas tested at Site 3. The Phase 1 RI data did find VOC and inorganic chemical contamination in soil and groundwater at Site 3. There was sufficient information available to proceed with a FS for Site 3.

Feasibility Study/Record of Decision: Following the Phase 2 RI, a FS was completed in 1994 that included Site 3 (HNUS 1994). Based on the relatively low concentrations of VOCs detected in Site 3 soil and groundwater, an active source area remedy was not identified. Rather, an alternative that included natural flushing to remove residual VOC contamination and installation of a 6-inch permeable cover (soil or gravel) to address residual contaminated soil was selected. The selected remedy was documented in a ROD signed in May 1995 (Navy/NYSDEC 1995).

Based on the ROD, the action required to protect human health and environment at Site 3 was as follows:

1. Prevent direct contact (dermal and ingestion) between contaminants in soils at concentrations greater than cleanup goals and site workers and potential future residents. Primary site contaminants for direct contact are metals and PAHs.

4.4 Remedial Actions

Remedy Selection: Remedial Actions at Site 3 were identified in the 1995 Soils ROD. These actions consisted of the following components:

- VOC-contaminated soil to undergo natural flushing (also known as natural attenuation).
- Permeable cover over residual contaminated soils and corresponding deed restrictions. Residual soil contamination consists of metals, VOCs, and PAHs at concentrations greater than TAGM 4046.

Remedial Actions: In 2001, ten surface soil samples were collected at Site 3 and analyzed for SVOCs, pesticides, PCBs, and inorganic constituents (Tetra Tech 2001). Positive detections were noted for each of these constituents but not necessarily at concentrations greater than the ROD goals. As discussed below, most locations had at least one exceedance of NYSDEC TAGM 4046 and ROD PRGs, indicating that a deed restriction for future use of the site would be required.

Exceedances of NYSDEC TAGM 4046 and ROD industrial PRGs were minor and noted for only two chemicals, benzo(a)pyrene and arsenic. Benzo(a)pyrene was detected in all ten samples at concentrations ranging from 130 µg/kg to 660 µg/kg. The ROD PRG (330 µg/kg) and the U.S. EPA Region 9 PRG (296 µg/kg) were similar for benzo(a)pyrene. The average benzo(a)pyrene concentration at the site was 316 µg/kg, which was less than the ROD PRG and was only slightly greater than the U.S. EPA Region 9 PRG.

Arsenic was detected in all ten samples at concentrations ranging from 2.8 mg/kg to 10.4 mg/kg. The ROD PRG (5.4 mg/kg) and the U.S. EPA Region 9 PRG (6.6 mg/kg) were similar for arsenic.

Based on the analytical data for surface soil as well as historic subsurface soil, a deed restriction was recommended for all of Site 3. Even though individual minor exceedances of arsenic and benzo(a)pyrene, with conservative industrial use criteria were noted for Site 3, the average Site 3 concentrations were less than these criteria, indicating that a soil cover was not necessary. The scraping and removal of metal fragments from the soil and placement of 2 inches of cover soil in the late 1990s likely resulted in the noted decreases in site risks from those estimated in the ROD.

As part of the ROD issued in May 1995, selected remedies for Site 3 included natural flushing to remove residual VOC contamination and cover the site and residual contaminated soil with 6 inches of permeable material (soil or gravel) (Navy/NYSDEC 1995).

The test data from February 2001 confirmed that the 1998 scraping and covering conducted at Site 3, in combination with natural degradation, completed the necessary field work identified under the 1995 OU 1 ROD (Tetra Tech NUS 2002). A notification was entered into the Deed of Transfer to Nassau County, New York that described where residual compounds will remain and specified that written consultation with NYSDEC and appropriate precautions must be taken prior to disturbing soils at this site.

4.5 Progress Since Last Review

This is the second five-year review of Site 3. The 2008 (First) Five-Year Review indicated that there were no issues, recommendations, or follow-up actions for Site 3.

4.6 Five-Year Review Process

4.6.1 Document Review

Since the last Five Year Review, the following documents were prepared and have been reviewed in the preparation of this re-evaluation:

Environmental Evaluation of County Motor Vehicle Impound Lots	Tetra Tech NUS, Inc./2008

4.6.2 Data Review and Evaluation

During the past five years, the *Environmental Evaluation of County Motor Vehicle Impound Lots* was conducted. This investigation focused on potential contaminants associated with the County use of the Parking Lot. The study identified low levels of metals, PCBs, and PAHs in site soils. A comparison of these results with the ROD goals and U.S. EPA screening levels did not identify a potentially significant risk to human health.

4.6.3 Site Inspection and Interviews

A site inspection was conducted on 16 May, 2013. Representatives of the Navy, NYSDEC, NYSDOH, the facility management (H&S), and CLEAN contractors were present. The facility manager (Mr. Al Taormina) was interviewed at that time. Through the interview process, Mr. Taormina confirmed the positive status of on-going activities which include site security, fencing and asphalt maintenance, SVE operation, and deed restrictions. Mr. Taormina is on-site daily and observes and reports the site condition.

Appendix A includes the Site Inspection Checklist and Five-Year Review interview summary and Appendix B includes the photo log taken during the inspection.

Site 3 is fenced on the northern and eastern sides. The southern internal fence has been removed, however, overall site access remains controlled through the main security gate and outer perimeter of the site remains fenced. The site is generally paved throughout and the asphalt surface was observed to be in good condition. Most of the site area is currently in use for miscellaneous outdoor storage and as a movie production set.

4.7 Technical Assessment

Technical assessment of the site is addressed in this section.

Question A: Is the remedy functioning as intended by the decision documents?

During the site cleanup in 1998, the more contaminated soils were removed from the site. The concentration of PAHs in the remaining soil was low enough that incidental contact with the soils would not adversely affect human health, even under a residential use scenario. As a result, the remedy is continuing to function as intended in the decision document.

The site is mostly level and the surface is either coarse-grained sands or asphalt. The soils drain very well and precipitation infiltrates without any significant overland flow. The asphalt directs most of the precipitation into storm drains that lead to recharge basins at Site 2. Continued flushing of the soil (even limited flushing of soils under the asphalt) is beneficial to allow attenuation of residual VOCs in site soils. Likewise, the coarse-grained soils do not become airborne and therefore are not subject to wind erosion.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

During preparation of the ROD, Site 3 was being used to store equipment and as a parking lot, with exposure assumptions similar to an industrial use scenario. Between 1998 and 2003, Site 3 was not active and only rarely visited (once per month or less). At the time of the 2008 review, the Site was being used by Nassau County to store impounded vehicles. During the May 2013 site inspection, the site area was utilized for miscellaneous outdoor storage and as a movie production set. As a result, current exposures are similar to those anticipated in the ROD. Future use of the site is identified as for storage, parking, and green space, which would be consistent with ROD exposure assumptions. Changes in toxicity data since the ROD would not affect ROD assumptions. Cleanup levels are the same as during the ROD.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No new information that would affect the protectiveness of the remedy has become available.

Summary of Technical Assessment

Site 3 does not present a current risk to human health or the environment. Access to the site is limited by security and fencing which adequately controls direct contact exposure.

4.8 Issues

The following issues were identified during this five-year review at Site 3:

1. Although regular site inspections are completed, formal annual inspections of the site have not been documented in the form of a LUC inspection/evaluation report.

4.9 Recommendations and Follow-up Actions

The following recommendations and follow-up actions are proposed for the site:

1. Implement and document a formal annual LUC inspection program.

4.10 Protectiveness Statement

The remedy at Site 3 — Salvage Storage Area is currently protective of human health and the environment. Access to the site is currently restricted through implementation of LUCs, fencing, and security.

5.0 OPERABLE UNIT 2 — GROUNDWATER

5.1 Introduction

OU2 consists of site-related VOC contaminated groundwater beneath the Navy's former 105 acre parcel, and VOC-contaminated groundwater that has migrated south and east off-property, where it becomes mixed with contamination originating on the NG property and forms a 3,000-acre plus area of VOC-contaminated groundwater plumes that extend south of Hempstead Turnpike and at varying depths. The groundwater contamination extends to a depth of approximately 750 feet but is not continuous throughout this area and is not present at all depths. Other non-OU2 sources of groundwater contamination that are known or believed to be contributing to the OU2 plumes include the Bethpage Community Park OU3 groundwater, Hooker Ruco Superfund Site, and potentially other smaller releases, such as dry cleaners and gasoline stations. Figures 5-1 and 5-2 portray shallow and deep site-related VOC-contaminated isoconcentration contours, respectively.

The shallow groundwater (less than 300 feet bgs) is depicted as the relatively large area of groundwater (covers most of the OU2 area groundwater) with lower concentrations of VOCs (less than 50 µg/L). Periodically, evidence of releases from other suspected sources (e.g., dry cleaners and gasoline stations) are encountered in this groundwater. Some areas of the deep groundwater plumes (greater than 300 feet bgs) can also contain lower concentrations of VOCs, but more areas of these plumes are characterized by the presence of higher concentrations of VOCs that form elongated plumes. The terms shallow and deep groundwater are conceptual and there are localized deviations to this general characterization.

In addition, the Navy's OU1 ROD identified a two- to three-acre area of highly-concentrated (greater than 1,000 µg/L), VOC contaminated groundwater underneath NWIRP Site 1. This groundwater was limited to a depth of approximately 64 feet bgs (i.e., water table). The OU1 remedy included provisions for partial treatment of this groundwater with the Site 1 soils. This remedial action was completed in 2002, with resulting residual VOC concentrations of less than 50 µg/L, which is typical of other shallow groundwater addressed with OU2.

5.2 Site Chronology

In 2001, NYSDEC issued its State "regional groundwater" ROD that described a remedial strategy to address contaminated groundwater beneath both Navy and NG property and also addressed that portion of contaminated groundwater that had migrated downgradient of both properties into the surrounding community. The NYSDEC ROD included a number of response measures that were categorized into a Groundwater Remedial Program and a Public Water Supply Program. In 2003,

the Navy issued its CERCLA OU2 ROD, under which Navy response actions are being conducted. The Navy ROD process evaluated and adopted certain components of the NYSDEC ROD that would be implemented by the Navy and also provided for an institutional control to prevent future, inappropriate groundwater extraction at the former NWIRP property. The remedial actions have been implemented and continue to be optimized. They are discussed in the following sections.

5.3 Background

The OU2, VOC-contaminated groundwater plumes, the extent of which are still under active investigation, are collectively approximately 1.5 miles wide and 3 miles long and extend to a depth of approximately 750 feet. Figures 5-1 and 5-2 portray shallow (approximately 50 to 300 feet bgs) and deep (greater than 300 feet bgs) VOC-contaminated isoconcentration contours, respectively. The Navy's OU2 cleanup standards were based on Federal and State MCLs. During the RI/FS, risk-based values were also evaluated. The Federal and State MCLs have not changed.

The VOC-contaminated groundwater that originates at least in part from the former NWIRP Bethpage property and extending off property is addressed in the Navy's 2003 ROD (NAVFAC 2003). The ROD specified that on-property groundwater contamination be addressed through Navy implementation of LUCs to restrict groundwater use (implemented by the Navy). Further, although not included as a component of the Navy's ROD, the Navy recognized that on-property contamination migrating or drawn from the former NWIRP could commingle with contamination captured by the existing NG-owned and operated ONCT system, which was designed to prevent contamination from migrating beyond NG's southern facility boundary.

The Navy's ROD also specified that off-property groundwater would be addressed through:

1) An active remedial program including design, implementation, and O&M of an extraction well system near the GM-38 location (construction completed in 2010 and currently operated, maintained, and monitored by the Navy),

2) Installation of vertical profile borings (VPBs) and monitoring wells to allow for identification and monitoring of groundwater contamination and placement of OW.

3) Development of *Public Water Supply Contingency Plan* (PWSCP) (Arcadis 2003) that would use the VPB data along with groundwater modeling to target OW locations and to develop OW trigger values.

4) Installation of OWs for public water supplies that have the potential to be impacted by the OU2 VOC-contaminated groundwater

5) A provision for wellhead treatment for public water supply systems or alternative approach pursuant to the PWSCP.

6) Evaluation of the GM-75 Area Groundwater to determine whether another hotspot is present.

In addition, the Navy's ROD also identified a non-detect goal of 0.5 µg/L for individual VOCs in the public water supplies, as opposed to the MCL of 5 µg/L.

5.4 Remedial Actions

5.4.1 On-Property Groundwater

LUCs to restrict groundwater use were incorporated in the property transfer and lease documents when the property was transferred to Nassau County in 2008. In addition, the LUCs will be included in the final property document, when the remaining 9 acres is transferred to Nassau County. Implementation of the LUCs is currently tracked by the Navy through annual inspections of the former NWIRP Bethpage Sites 1, 2, and 3. These annual inspections ensure that no new wells have been drilled on the property for potable water use. This restriction does not apply to wells used for monitoring groundwater quality.

Although NG's operation of its downgradient ONCT system was not a component of the Navy ROD, there would be a concern for adverse impacts to the overall OU2 remedy if the ONCT is not operating effectively to contain and treat contamination upgradient from the southern boundary of the former NG-Bethpage facility.

As recently as 2012, NG concluded in its *Annual Groundwater Report* that the ONCT was performing hydraulic containment as expected:

> "ARCADIS has evaluated the hydraulic monitoring and the groundwater quality data collected during 2012, and concludes that the onsite portion of the OU2 Groundwater Remedy is operating as expected and hydraulic containment of the onsite portion of total

volatile organic compounds (TVOCs) in groundwater continues in a manner consistent with previous years."

Therefore, as discussed below, until the finding of high concentrations of TCE in Bethpage Water District (BWD) Well 6-2 (screened 700 to 770 feet bgs) the Navy did not focus additional attention on the ONCT's effectiveness.

5.4.2 GM-38 System Design, Implementation, and Operation and Maintenance

In 2009, the Navy started operation of the GM-38 Groundwater Treatment System, which is approximately 8,500 feet south, southeast and hydraulically downgradient of NWIRP Bethpage. The system includes two recovery wells and several co-located monitoring wells (Figure 5-3). Extracted groundwater is treated and returned to groundwater by discharge to Nassau County Recharge Basin #495. Quarterly samples are collected from eight monitoring wells to determine effectiveness; these reports are available in the information repository. Currently, an analysis is being performed by the Navy to define the capture zone of the recovery system. Through October 2013, approximately 1,900 MG of groundwater containing 7,400 pounds of VOCs were extracted and treated. Quarterly and Annual Reports on the O&M of the GM-38 system are submitted to NYSDEC by H&S Environmental (the Navy's Remedial Action Contractor), and are available in the administrative Record at http://go.usa.gov/DyXF.

5.4.3 Installation of Vertical Profile Borings and Monitoring Wells

The Navy's program of installing VPBs and associated monitoring wells, along with outpost wells is ongoing. Additionally, NG has installed its own VPBs and monitoring wells and provides monitoring and reporting for the monitoring well program. Figure 5-4 shows the location of the existing VPBs and outpost wells for OU2. From 2000 through 2013, the Navy has installed 33 VPBs, 30 groundwater monitoring wells, and 18 outpost (or sentry) wells.

A Long Term Monitoring (LTM) program is ongoing to define the configuration of the groundwater plumes and to determine effectiveness of remedial measures implemented to date; this program includes the outpost wells installed as part of the Public Water Supply Contingency Plan. In the LTM program, there are a total of approximately 88 wells (including the offsite outpost wells noted above), which are sampled quarterly, semiannually, or annually by NG, and reported on a quarterly and annual basis by NG; these reports are available for review in the Bethpage Library.

5.4.4 Public Water Supply Contingency Plan

One component of the Navy's OU2 RODs, a Public Water Supply Contingency Plan was produced that provided for installation and monitoring of outpost, or sentinel wells, proximal to water supply wells and establishment of trigger, or action levels, in certain wells that would initiate further evaluation. The trigger values were based on achieving a total volatile organic compound concentration of 0.5 µg/L or less in the public water supply wells.

5.4.5 Bethpage Water District

Between 1990 and 1996, treatment systems were installed at the three impacted public water supply well fields operated by the BWD, Plants 4, 5, and 6. The Navy paid for the design, construction and 30 years of O&M for Plant 5. NG entered into an agreement to fund the design, construction and 20 years of O&M for Plants 4 and 6. When the 20-year period for Plant 6 ended, NG and BWD could not reach consensus on additional funding for this plant and NG declined to continue O&M payments. During this time, the concentration of VOCs increased at Plant 6 and exceeded the original design limits for the treatment system. In order to ensure protection of the water supply, the Navy negotiated a separate settlement with BWD for Plant 6 to address these higher VOCs concentrations. NG remains a responsible party for these costs as well as other costs for other similarly affected water districts.

In response to contamination associated with the BCP OU3 plume, BWD implemented an upgrade at Plant 4 to ensure compliance with drinking water standards. Data from BWD Plant 5 provided evidence that this plant is operating as anticipated. BWD Plant 6 recently encountered VOC concentrations that exceeded its design parameters. In response to these findings, as an interim measure, BWD installed liquid phase granular activated carbon (GAC) polishing of the existing treatment system. In 2013, the Navy negotiated with BWD for the installation, operation, and maintenance of a long-term system that would treat the higher concentrations of VOCs that were being extracted. The new treatment system would include dual tower treatment (one for BWD Well 6-1 and one for BWD Well 6-2) and vapor phase treatment to reduce the atmospheric emissions of VOCs from air stripping of Well 6-2 water that would be consistent with Federal and State values. Treated water will continue to be tested monthly and the results reported by the BWD per their NYSDOH and Nassau County Department of Health (DOH) permits.

5.4.6 South Farmingdale Water District

In 2004, during the initial sampling of the outpost monitoring wells, VOCs at concentrations greater than the trigger values were identified in two of these wells associated with South Farmingdale

Water District (SFWD). After confirmation of the results, the Navy commenced negotiations with SFWD to install well head treatment for two of the three wells at the SFWD Plant No. 1. In 2008, the Navy installed three additional outpost wells to monitor the quality of water that may be captured by the third (deeper) well at the facility. Construction of the treatment system was completed in 2011 and the system is operating. Despite the projection that the well field would be impacted within 5 years after detection in the outpost well (i.e., sooner than 2009), as of 2012, detections of chemicals of concern have not been reported in this well field.

As in 2004, during the quarterly of the outpost monitoring wells, VOCs at concentrations greater than the trigger values were identified in a second set of outpost wells, these wells were associated with SFWD Well Field No. 3. Based on subsequent testing of the outpost wells and of the vertical distribution of VOCs in area groundwater via VPBs, it was conducted that there was vertical cross contamination of the VOCs in the outpost wells, and that the initial reported VOC detections were false positives. As a result, the outpost well was repaired and an additional deeper outpost well was installed to more accurately monitor groundwater that would be intercepted by SFWD Well Field No. 3. In 2008 to 2010, additional investigations conducted in the area confirmed that this well field could be impacted in the near future (e.g., less than 5 years). As a result, the Navy commenced negotiations with SFWD to install well head treatment for this well field. Construction of this system was completed in 2013 and the system is operating. Detections of site-related constituents have not been reported in this well field.

5.4.7 New York American Water (formerly AQUA New York)

In 2006, VOCs were first detected in one of New York American Water (NYAW, formerly AQUA New York) supply wells located at the Seaman's Neck Road Facility (Well 3S). VOCs had not been detected in the associated outpost monitoring wells. Based on these detections, increased monitoring was conducted at the facility. After confirmation that the VOCs were present and likely associated with the OU2 groundwater, the Navy began negotiations with the NYAW. Because the concentrations of VOCs were increasing between 2007 and 2011, the Navy designed and installed an interim treatment system, while design and construction of the full scale system proceeded. The interim treatment system started operation in 2012 and operated seasonally through 2013. The maximum TCE concentration detected in the water supply well was 2.6 µg/L in fall 2011. In 2013, the TCE concentrations in Well 35 ranged from non-detect at 0.5 µg/L to 1.9 µg/L. Since startup, the interim treatment system has provided effluent water that achieves the non-detect goal of 0.5 µg/L. The interim treatment system will continue to operate

until the full-scale well head treatment system is constructed and starts operations. Construction completion is tentatively planned for FY 2014.

5.5 Progress Since Last Review

This five-year review is the second evaluation of the OU2 groundwater remedy since the implementation of the OU2 remedy; the *Remedy Optimization Team Report for the Bethpage Groundwater Plume Remedy*, June 2011 (Optimization Team Report) was the first evaluation. In 2011, the Navy convened a team of independent nationally-recognized experts to evaluate the effectiveness of the on-going remedy for the Bethpage plumes and recommend potential future steps for optimizing the remedy. The Optimization Team Report developed by this team recommended:

- Installation of vertical profile borings and monitoring wells to evaluate containment in deeper portion of the OU2 aquifer.
- Installation of monitoring wells/clusters midway between the leading edge of plume and Massapequa Water District supply wells to monitor plume progress.
- Evaluation of technical/economic feasibility of plume containment at the current leading edge.

Based on the recommendations in the Optimization Team Report, the Navy developed the *Study of Alternatives for Management of Impacted Groundwater at NWIRP Bethpage* (Tetra Tech, 2012) to evaluate the technical and economic feasibility of alternatives for management of impacted groundwater downgradient of NG, Navy and other sources. The study concluded that the OU2 ROD remains protective of the water supplies in the area. In addition, considerable plume capture is already ongoing via the ONCT, offsite hot-spot treatment, and capture in impacted supply wells. The Navy concluded that Alternative 2A, "increase in the ongoing and capture by selected supply wells," would enhance the protective measures in the current ROD.

Since 2012, the following activities have occurred for OU2 Groundwater under the Navy OU2 ROD and the PWSCP:

- Continued operation of the GM-38 groundwater treatment system.

- Installation and sampling of 12 VPBs, 7 outpost wells and 12 monitoring wells.
- Quarterly sampling of GM-38 monitoring wells.
- Construction and operation of the NYAW Interim Wellhead Treatment System. The system is operating in compliance with the ROD and the Nassau County Department of Health permit. Construction of full scale system is in progress
- Construction and operation of the SFWD Plant No. 1 Wellhead Treatment System. The system is operating in compliance with the Nassau County DOH permit. Settlement was reached.
- Construction of the SFWD Plant No. 3 Wellhead Treatment System. The system is operating in compliance with the Nassau County DOH permit. Settlement is in progress.
- Construction and operation of the BWD Plant No. 6 Wellhead Treatment System GAC polishing unit. The system is operating in compliance with the Nassau County DOH permit. Settlement was reached.

5.6 Five-Year Review Process

5.6.1 Document Review

The following key documents were prepared since the last Five Year Review and have been reviewed in the preparation of this re-evaluation:

Letter Regarding Results of Third Quarter 2007 Groundwater Monitoring at Operable Unit 2 NWIRP Bethpage New York (NY)	3/12/2008
Letter Regarding Results of Fourth Quarter 2007 Groundwater Monitoring for Operable Unit 2 NWIRP Bethpage NY	6/4/2008
Letter Regarding Results of First Quarter 2008 Groundwater Monitoring for Operable Unit 2 NWIRP Bethpage NY	7/31/2008
Letter Regarding Results of Second Quarter 2008 Groundwater Monitoring Operable Unit 2 (OU 2) NWIRP Bethpage NY	8/21/2008
Letter Requesting Implementation of Wellhead Treatment Contingency Plan for Operable Unit 2 NWIRP Bethpage NY	10/17/2008
Letter Regarding Results of Third Quarter 2008 Groundwater Monitoring for Operable Unit 2 NWIRP Bethpage NY	1/7/2009
Letter Regarding Results of Fourth Quarter 2008 Groundwater Monitoring for Operable Unit 2 NWIRP Bethpage NY	2/12/2009
Letter Regarding Results of First Quarter 2009 Groundwater Monitoring for Operable Unit 2 NWIRP Bethpage NY	6/18/2009

2008 Annual Groundwater Monitoring Report for Operable Unit 2 (OU 2) NWIRP Bethpage NY	6/18/2009
Letter Regarding Results of Second Quarter 2009 Groundwater Monitoring for Operable Unit 2 NWIRP Bethpage NY	9/11/2009
Letter Regarding Results Of Third Quarter 2009 Groundwater Monitoring for Operable Unit 2 NWIRP Bethpage NY	11/18/2009
2009 Annual Groundwater Report for Operable Unit 2 (OU 2) NWIRP Bethpage NY	3/29/2010
Letter Regarding the Transmittal of Results of First Quarter 2010 Groundwater Monitoring for Operable Unit 2 (OU 2) NWIRP Bethpage NY	5/14/2010
Annual Groundwater Monitoring Report OU 2 NWIRP Bethpage NY	3/30/2011
2011 Letter Work Plan Addendum for Pre-Design Field Investigation at Operable Unit (OU) 2 Off-Site Groundwater Investigation NWIRP Bethpage NY	5/1/2011
Letter And Comments From New York State Department of Environmental Conservation Regarding Draft Remedy Optimization Team Report for Bethpage Groundwater Plume NWIRP Bethpage NY	5/18/2011
Letter Regarding the Transmittal of Draft Letter Work Plan Addendum for Pre Design Field Investigation 2011 Operable Unit 2 (OU 2) Off Site Groundwater Investigation NWIRP Bethpage NY	5/31/2011
Transmittal Letter Regarding GM-38 Groundwater Remediation Quarterly Operations Report Division of Environmental Remediation (DER) Site 1-30-0035-OU 2 NWIRP Bethpage NY	6/13/2011
Remedy Optimization Team Report for the Bethpage Groundwater Plume Remedy, prepared by The Technical Team for Optimization of the Bethpage Plume Remedy for the Naval Facilities Engineering Command Mid-Atlantic	6/15/2011
Letter Report Regarding Results of First Quarter 2011 Groundwater Monitoring at Operable Unit 2 (OU 2) NWIRP Bethpage NY	6/30/2011
Transmittal Letter Regarding Monthly Groundwater Monitoring/Air Emission Report GM-38 Operable Unit (OU) 2 August 2011 with Transmittal NWIRP Bethpage NY	9/13/2011
Study of Alternatives for Management of Impacted Groundwater at NWIRP Bethpage NY	1/1/2012
Letter Work Plan Addendum for Pre Design Field Investigation for Offsite Groundwater Investigation at Operable Unit 2 (OU2) NWIRP Bethpage NY	3/30/2012
Groundwater Discharge Monitoring And Air Emission Report At GM-38 with Transmittal Letter NWIRP Bethpage NY	5/9/2012
Quarterly and Annual Reports – Operation and Maintenance of the GM-38 Treatment System	2009-2012

In addition, summary data packages of VPBs and associated monitoring wells were reviewed. These reports are available in the Administrative Record.

5.6.2 Data Review and Evaluation

LUCs: LUCs have been implemented restricting the use of onsite groundwater. Periodic inspections are conducted to ensure compliance, verifying that no new wells have been drilled accessing groundwater and that existing wells are used only for monitoring purposes.

ONCT System: The operation of the ONCT system is reviewed and reported quarterly and annually by NG. This includes a detailed analysis of pumpage volumes, mass removed by the system, and an effectiveness evaluation. Recent VOC data from BWD Plant 6-2 indicates that some upgradient VOC contamination may bypassing containment. The Navy is currently doing an

evaluation of the ONCT capture zone by reviewing hydraulic and analytical monitoring data, installation of additional VPBs/wells, and computer modeling. This will assist the Navy in determining if its implementation of OU2 remedial action tasks is being adversely impacted by the ONCT's inability to capture some of the upgradient contamination.

GM38 Treatment System: The operation of the GM-38 system is reviewed and reported quarterly and annually by the Navy's Remedial Action Contractor (H&S Environmental). The 2012 *Annual Operations Report* (H&S 2013) was reviewed in detail as it contains the historical and most recent data available.

The total annual volume of groundwater treated during the 12-month period based on effluent flow totals was 483,867,320 gallons. The Groundwater Treatment Plant (GWTP) operated with an average uptime of 91.9% at an average effluent flowrate of 921 gpm. During 2012, approximately 1,535 pounds of VOCs were removed by the GWTP, for an average monthly mass removal rate of approximately 128 pounds per month.

In Recovery Well 1, concentrations of TCE have decreased from initial concentrations in early 2010 of 710 µg/L to below 300 µg/L for the latter half of 2012. Concentrations of cis-1,2-DCE have followed a similar trend, decreasing from a high of 160 µg/L in February 2010 to a low of 20.5 µg/L in November 2012. PCE concentrations have also exhibited decreasing trends over time, with concentrations decreasing from 180 µg/L in February 2010 to a low of 41.2 µg/L in April 2012. Concentrations of vinyl chloride have decreased below initial concentrations in 2010. After reaching a maximum concentration of 61 µg/L in February 2010, vinyl chloride concentrations have remained below 5.0 µg/L since the final quarter of 2011, decreasing to non-detectable levels in four out of twelve months in 2012.

In Recovery Well 3, concentrations of TCE have decreased from initial concentrations in February 2010 (660 µg/L), to a low of 193 µg/L in November 2012. Concentrations of cis-1,2-DCE have remained consistently below 4.0 µg/L. PCE has been detected during only four sampling events: June 2011 (0.69 J µg/L), May 2012 (0.29 J µg/L), June 2012 (3.4 µg/L), and December 2012 (1.9 µg/L).

The intent of the groundwater treatment system at GM-38 is to remove mass and reduce elevated VOC concentrations to levels similar to those in the surrounding aquifer, and in doing so minimize the impacts on downgradient water supply wells and currently unaffected portions of the aquifer. A total of 1,535 pounds of VOCs were removed by the GWTP in 2012 and

decreasing contaminant concentration trends have been observed in the recovery wells and several of the monitoring wells. A capture zone evaluation and path forward report is in progress. Based on a preliminary review of the data, the system is functioning as anticipated.

Outpost Monitoring: During 2012 sampling, OWs BPOW1-1 and BPOW1-2 exhibited detections of site-related VOCs below their respective NYSDEC Standards, Criteria, and Guidance (SCGs), but above the total VOC outpost trigger values. Freon 113 was detected in Wells BPOW4-1 and BPOW4-2 at concentrations less than its respective SCG but above the trigger value. Based on the consistency of trigger value exceedances and additional evaluation of the VOC plume by the Navy through the installation of additional VPBs and wells, the original nine outpost wells (BPOW1-1, BPOW1-2, BPOW1-3, BPOW2-1, BPOW2-2, BPOW3-1, BPOW3-2, BPOW4-1, and BPOW4-2) have met the goal of the Public Water Supply Contingency Plan, and can continue to serve as monitoring wells positioned near the distal portions of the VOC plume, proximal to public water supply wells. In addition, nine new outpost wells have been installed (BPOW1-4, BPOW1-5, BPOW1-6, BPOW2-3, BPOW3-3 and BPOW3-4, BPOW 5-1, BPOW 5-2, and BPOW 5-3). Trigger values are currently being developed for these wells.

5.6.3 Site Inspection and Interviews

A site inspection of the GM-38 area was conducted on 16 May 2013. Representatives of the Navy, NYSDEC, facility management (H&S), and CLEAN contractor were present. The facility manager (Mr. Al Taormina) was interviewed at that time. Through the interview process, Mr. Taormina confirmed the positive status of the monitoring of groundwater wells along with on-going activities at GM-38. H&S Environmental staff, the Navy's Remedial Action Contractor, is on-site daily and observes and reports the site condition. Quarterly and annual reporting of the operation of the GM-38 system is submitted to NYSDEC by H&S Environmental; these reports are available in the Administrative Record at: http://go.usa.gov/DyXF.

Appendix A includes the Site Inspection Checklist used as part of the site inspection and Appendix B includes the photo log taken during the inspection. The system is operating properly and successfully and is meeting the intent of the ROD; the data indicate that mass recovery by the GM-38 system has been successful in the deeper groundwater (>450 feet); shallow groundwater data (320 feet to 435 feet) indicate a potential continuing source north of the treatment plant. Overall analysis of the data is being performed by the Navy to evaluate optimization of the system (reduction of operation of recovery well RW-01 and shutdown of RW-03), and a report of this evaluation was submitted to NYSDEC for review in March 2014.

5.7 Technical Assessment

Technical assessment of the site is addressed in this section.

Question A: Is the remedy functioning as intended by the decision documents?

On-property LUCs instituted by the Navy are successfully limiting exposure to contaminated groundwater, and are ensured through the use of security and periodic LUC inspections. In off-property areas, the depth to OU 2 groundwater is over 100 feet bgs, making non-permitted well installation impractical. In addition, State and County regulators that provide for well installation permits have been provided documentation of the known extent of the OU 2 VOC-impacted groundwater, and existing State and County regulations prohibit the installation of potable water supply wells in the area.

The onsite containment system data, as reported and evaluated by NG, indicate that the onsite portion of the OU2 groundwater remedy has formed an effective hydraulic barrier that prevents the offsite migration of VOC impacted groundwater to depths of approximately 600 feet bgs. The concentration of VOCs in downgradient monitoring wells screened to a depth of approximately 500 feet bgs or less are decreasing as would be expected based on the operation of the ONCT System. Similarly, the concentrations of VOCs in BWD Well 6-1 (screened from 328 to 381 feet bgs) are decreasing as expected, from approximately 150 µg/L in 2005 to less than 50 µg/L in 2012. The ONCT system is being operated by NG, and O&M costs are not available.

However, the concentration of VOCs in BWD Well 6-2, screened from 700 to 770 feet bgs, increased from less than 50 µg/L prior to 2006, to approximately 400 µg/L in 2007 to 2009, 800 µg/L in 2010, and approximately 1,000 to 1,200 µg/L in 2011 to 2013. In response to the higher concentrations of VOCs, liquid phase GAC was added to the treatment system to ensure effective treatment of the groundwater prior to distribution. However, the findings of presence of the relatively high concentrations of VOCs in Well 6-2, 10 to 16 years after the start of the ONCT system in 1998 provides evidence that some of the higher concentrations of VOCs (greater than 1,200 µg/L) may be bypassing the ONCT system. Alternatively, the higher VOC concentrations identified in BWD Well 6-2 may result from VOCs the migrated beyond the NG facility boundary prior to the start of the ONCT system. In order to evaluate the source, magnitude, and extent of these higher concentrations of VOCs, in 2013 the Navy installed additional VPBs and monitoring wells around BWD Plant 6 and the ONCT and conducted a pumping test using BWD Well 6-2. Additional VPBs and monitoring wells are currently being installed and an evaluation of the data collected is ongoing. The Navy will inform NG and NYSDEC of its findings. In 2013, the cost with this program was approximately $2,000,000.

The intent of the GM-38 Treatment System is to remove mass and reduce elevated VOC concentrations to levels similar to those in the surrounding aquifer, and in doing so minimize the impacts on downgradient water supply wells and currently unaffected portions of the aquifer. Data indicate that the intent of the groundwater treatment system at GM-38, is being met. Based on the most recent annual removal of 1,535 pounds of VOCs by the GWTP in 2012 and decreasing contaminant concentration trends observed in the recovery wells and several of the monitoring wells since system installation, this system is operating properly and successfully. The O&M costs for the GM-38 Treatment System are approximately $800,000 per year. In 2013, a pumping test was conducted to evaluate the effectiveness of the system in extracting the identified hotspot. These data are currently being evaluated by the Navy and will be submitted to NYSDEC in 2014.

O&M costs associated with SFWD Plant 1 were addressed through lump sum payment from the Navy to SFWD. The lump sum payment included both capital and estimated O&M costs and therefore actual O&M costs are not available. The Navy is currently operating an Interim Treatment System at NYAW Seamen's Neck Road. The approximate cost for operating this system is $21,000 per month. In 2012 and 2013, the system operated for 7 months and 8 months, respectively.

Outpost monitoring and additional VPB and well installations, intended to provide information regarding plume configuration, condition, and migration and early warning to potentially impacted public water supply wells, is ongoing. In 2010 to 2012, the costs with this program were approximately $1,000,000 per year.

The 2011 Optimization Team Report findings and the 2012 Study of Alternatives for Management of Impacted Groundwater identified:

1) the need to improve the performance of the outpost wells in providing notification of potential impacts to downgradient public water supply wells; and

2) the enhanced use of existing infrastructure to enhance the capture of VOC-impacted groundwater and reduce associated migration.

In response to improving the performance of the outpost wells, the Navy is implementing a more robust outpost well program, upgradient of each public water supply well field, and conducting connectivity testing between the well field and the outpost wells. In response to the enhanced use

of existing infrastructure, the Navy is conducting discussions with the water districts and appropriate regulators to determine the associated requirements.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

The interim remedial actions implemented to meet RAOs are still valid for offsite groundwater, and limit exposure potential to contaminated groundwater. Cleanup levels, which were based on MCLs for the COCs in offsite groundwater, have not changed since the ROD. In addition, the ROD identifies a site-related non-detect goal of 0.5 µg/L for public water supplies, which is significantly less than current MCL of 5 µg/L.

Vapor intrusion was considered as a potentially new pathway for offsite groundwater. However, the offsite OU 2 groundwater is overlain by at least 50 feet of non-impacted groundwater, which would act as a barrier to volatilization and vapor intrusion.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Two issues that could call into question the protectiveness of the remedy were identified. The effectiveness of the ONCT in providing full capture of the OU 2 groundwater is currently being re-evaluated. This concern results from the finding of TCE at a concentration greater than 1,000 µg/L in BWD Well 6-2 and at VPB locations 137 and 139, near BWD Plant 6. Currently, the Navy is performing additional investigations in these areas to determine the nature and extent of contamination.

The initial program for the outpost monitoring wells in predicting impacts to public water supply wells has not been as reliable as planned. In 2004, the detection of VOCs in outpost wells associated with SFWD Plant Nos 1 and 3, indicated that detectable levels of VOCs should have been detected in these well field by 2010; as of 2013, VOC detections have not been reported in these well fields. In 2006, VOCs were detected in a NYAW supply well. The associated outpost wells did not provide advance notice of these detections. A review of the data found that for SFWD, the initial outpost wells were not located in a primary groundwater flow path into the well field, where as for NYAW, a plume was located side-gradient of the well field and that the VOC-impacted groundwater was being captured by the well field under sustained pumping. Based on these findings, going forward, the Navy is implementing a more robust outpost well program that evaluates primary and secondary flow pathways and then confirms the connectivity of the outpost wells to the well field through pumping tests.

Summary of Technical Assessment

The remedial actions implemented in response to the ROD are operating properly and successfully and are sufficiently protective of human health and the environment. Transient elements of these actions, such as installation and sampling of additional VPBs/wells are ongoing, and the need for these in order to meet RAOs is appropriately gauged through periodic sampling.

5.8 Issues

The following issues were identified during this five-year review:

1. Not all of the public water supply wells in proximity to site-related VOC-contaminated groundwater have outpost monitoring wells and there are no trigger values established for the new outpost monitoring wells.

2. Based on the presence of deep VOC-contaminated groundwater in the area of BWD Plant 6, the effectiveness of the ONCT in capturing all of the site-related contamination is uncertain.

3. Based on the finding of VOC-contaminated groundwater at concentrations greater than 1,000 µg/L in the area of BWD Plant 6, implementation of a mass removal system in this area needs to be considered.

5.9 Recommendations and Follow-up Actions

The following recommendations and follow-up actions are proposed for this Operable Unit:

1. Continue to install VPBs and wells to delineate the extent of the plume, monitoring plume migration and attenuation, and serve as sentry points for public water supply wells. Establish trigger values for the new outpost wells and update the Public Water Supply Contingency Plan.

2. Continue to investigate potential downgradient adverse OU2 impacts and causes due to suspected incomplete capture by the ONCT system.

3. Complete the delineation of the area of groundwater contamination with greater than 1,000 µg/L of VOCs in the area of BWD Plant 6 and pursue implementation of a mass removal system in this area.

5.10 Protectiveness Statement

The remedy for OU2 — Groundwater is currently protective of human health and the environment. Access to contaminated groundwater underlying the former NWIRP is currently restricted through LUC measures. Based on the review of performance data, the ONCT appears to be effectively capturing known groundwater contamination associated with the former NWIRP.

For contaminated groundwater that is beyond the ONCT, several actions are being taken. Reduction of offsite hotspot contamination is being addressed by the GM-38 Treatment System. Exposure to contaminated groundwater offsite is limited by Nassau County Department of Public Health regulations, and the public is not exposed to contaminated groundwater due to wellhead treatment implemented at BWD Plants 4, 5, and 6, SFWD Plants 1 and 3, and the interim wellhead treatment system at New York American Water. In addition, a groundwater monitoring/detection program and additional VPB/well installations are being conducted to continue with the assessment of groundwater quality.

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— *Environmental Evaluation of County Motor Vehicle Impound Lots Naval Weapons Industrial Reserve Plant, Bethpage, New York.* April 2008.

— *Site 1 Soil Vapor Investigation Naval Weapons Industrial Reserve Plant, Bethpage, New York.* April 2008.

— *Groundwater Sampling Data Summary Site 1 — Former Drum Marshalling Area Naval Weapons Industrial Reserve Plant, Bethpage, New York.* May 2008.

— Technical Memorandum for Evaluating Soil Remediation Technologies Site 1 — Former Drum Marshalling Area Naval Weapons Industrial Reserve Plant, Bethpage, New York. September 2008.

— *Indoor Air Sampling Work Plan Naval Weapons Industrial Reserve Plant, Bethpage, New York.* November 2008.

— *Five-Year Review for Sites 1, 2, and 3 Naval Weapons Industrial Reserve Plant, Bethpage, New York.* December 2008.

— Letter Work Plan for Pre-Design Field Investigation Off-Site Location GM-75 Naval Weapons Industrial Reserve Plant, Bethpage, New York. September 2008.

— Site 1-Phase 2 Soil Vapor Testing Letter Report Naval Weapons Industrial Reserve Plant, Bethpage, New York, EPA ID # 002047967. January 2009.

— *Work Plan Addendum Supplemental Indoor Air Testing, Basement Sealing, and Installation of Residential Vapor Phase Carbon Units Naval Weapons Industrial Reserve Plant, Bethpage, New York.* February 2009.

— *Design Analysis Report for Soil Vapor Extraction Containment System at Site 1 — Former Drum Marshalling Area Naval Weapons Industrial Reserve Plant, Bethpage, New York.* April 2009.

— *Site 1 Phase II Soil Vapor Report Naval Weapons Industrial Reserve Plant, Bethpage, New York.* August 2009.

— *Engineering Evaluation and Cost Analysis (EE/CA) Non-Time Critical Removal Action Site 1 — Former Drum Marshalling Area Naval Weapons Industrial Reserve Plant, Bethpage, New York.* September 2009.

— *Quarterly Data Summary Report Indoor Air and SSD Monitoring (May, June, and July 2009) Naval Weapons Industrial Reserve Plant, Bethpage, New York.* October 2009.

— *Data Summary Report Soil Vapor Intrusion Investigation Site 1 — Former Drum Marshalling Area Naval Weapons Industrial Reserve Plant, Bethpage, New York.* October 2009.

— Quarterly Data Summary Report Indoor Air and SSD Monitoring (August, September, and October 2009) Naval Weapons Industrial Reserve Plant, Bethpage, New York. December 2009.

— *Summary Report for Pre-Design Field Investigation Off-Site GM-75 NWIRP Bethpage (Draft Revision 1) Naval Weapons Industrial Reserve Plant, Bethpage, New York.* September 2009.

— *Quarterly Data Summary Report Soil Vapor Intrusion Monitoring (November and December 2009, and January 2010) Naval Weapons Industrial Reserve Plant, Bethpage, New York.* February 2010.

— Action Memorandum Non-Time Critical removal Action for Soil Vapor Extraction System Site 1 Former Drum Marshalling Area Naval Weapons Industrial Reserve Plant, Bethpage, New York. February 2010.

— *Quarterly Data Summary Report, Soil Vapor Intrusion Monitoring (February, March, and April 2010), Naval Weapons Industrial Reserve Plant, Bethpage, New York.* May 2010.

— *Final Sampling and Analysis Plan PCB Investigation Site 1 — Former Drum Marshalling Area Naval Weapons Industrial Reserve Plant, Bethpage, New York.* May 2010.

— *Soil Gas Sampling Work Plan Addendum Site 1 — Former Drum Marshalling Area Naval Weapons Industrial Reserve Plant Bethpage, New York.* August 2010.

— Letter Work Plan Pre-Design Investigation OU2 Offsite Groundwater Investigation, Naval Weapons Industrial Reserve Plant Bethpage, New York, Naval Weapons Industrial Reserve Plant Bethpage, New York. September 2010.

— *Work Plan Addendum for Indoor Air and Soil Gas Sampling, Naval Weapons Industrial Reserve Plant, Bethpage, New York.* September 2010.

— Letter Work Plan Site 4-Soil Delineation and Bench-Scale Study Naval Weapons Industrial Reserve Plant Bethpage, New York. September 2010.

— *Quarterly Data Summary Report, Soil Vapor Intrusion Monitoring (May — August 2010), Naval Weapons Industrial Reserve Plant Bethpage, New York.* November 2010.

— *Basis of Design Report for Wellhead Treatment for Trichloroethene Contamination at Aqua New York Seamans Neck Road Water Plant Naval Weapons Industrial Reserve Plant Bethpage, New York.* December 2010.

— *BPOW 2-1 and BPOW 2-2 Outpost Monitoring Wells Repair and Sampling Summary Naval Weapons Industrial Reserve Plant Bethpage, New York.* January 2011.

— Technical Memorandum Process Optimization for the GM-38 System Operation Naval Weapons Industrial Reserve Plant Bethpage, New York. January 2011.

— *Data Summary Report and Home Evaluation Soil Vapor Intrusion Investigation Site 1 — Former Drum Marshalling Area Naval Weapons Industrial Reserve Plant Bethpage, New York.* February 2011.

— *BPOW 1-3 Outpost Monitoring Wells Repair and Sampling Summary Naval Weapons Industrial Reserve Plant Bethpage, New York.* February 2011.

— Letter Work Plan for BPOW 1-4, 1-5, and 1-6 Monitoring Well Installation Offsite Groundwater Investigation Naval Weapons Industrial Reserve Plant Bethpage, New York. February 2011.

— *Work Plan Addendum Site 4 Groundwater Sampling Work Plan Naval Weapons Industrial Reserve Plant Bethpage, New York.* March 2011.

— Letter Work Plan Addendum Pre-Design Field Investigation OU2 Off-Site Groundwater Investigation Naval Weapons Industrial Reserve Plant Bethpage, New York. May 2011.

— *Data Summary Report and Home Evaluation (January — March 2011), Soil Vapor Intrusion Investigation, Site 1 — Former Drum Marshalling Area, Naval Weapons Industrial Reserve Plant Bethpage, New York.* June 2011.

— *Interim Data Summary Report and SAP Addendum PCB Investigation at Site 1 — Former Drum Marshalling Area Naval Weapons Industrial Reserve Plant Bethpage, New York.* July 2011.

— *Modification to Existing Soil Vapor Extraction Containment System at Site 1 — Former Drum Marshalling Area, Naval Weapons Industrial Reserve Plant Bethpage, New York.* September 2011.

— Letter regarding Proposed Modification to Discharge Limits for Off Gas Volatile Organic Compounds for Air Stripping Tower, GM-38 Offsite Groundwater Treatment Plant, Naval Weapons Industrial Reserve Plant Bethpage, New York. November 2011.

— *Vertical Profile Boring 133 Work Plan Addendum Operable Unit 2 (OU 2) Offsite Groundwater Investigation, Naval Weapons Industrial Reserve Plant Bethpage, New York.* December 2011.

— *Engineers Report for Interim Emergency Treatment for Wellhead Treatment for Trichloroethene Contamination, Aqua New York's Seamans Neck Road Water Plant, Naval Weapons Industrial Reserve Plant Bethpage, New York.* December 2011.

— *Study of Alternatives for Management of Impacted Groundwater at NWIRP Bethpage, New York.* January 2012.

— *Final Supplemental Offsite Soil Vapor Intrusion Monitoring Plan for the Soil Vapor Extraction Containment System, Site 1 — Former Drum Marshalling Area, Naval Weapons Industrial Reserve Plant Bethpage, New York.* February 2012.

— Letter Work Plan Addendum, TT-102D/TT-102D2 (VPB-133) Pre-Design Field Investigation, Naval Weapons Industrial Reserve Plant Bethpage, New York. March 2012.

— *Final Sampling and Analysis Plan Addendum for Site 1 Soils, PCB Investigation at Site 1 — Former Drum Marshalling Area, Naval Weapons Industrial Reserve Plant Bethpage, New York.* May 2012.

— Letter Work Plan Addendum — May 2012 Vertical Profile Boring (VPB-134, VPB-135, VPB-136) Pre-Design Field Investigation, OU2 Groundwater, Naval Weapons Industrial Reserve Plant Bethpage, New York. May 2012.

— Summary Packet Vertical Profile Boring 129 and TT 101D, TT101D1, TT101D2, NWIRP Bethpage, New York, July 2012

— Summary Packet Vertical Profile Boring 131, NWIRP Bethpage, New York, July 2012

— Summary Packet Vertical Profile Boring 132, NWIRP Bethpage, New York, July 2012

— Summary Packet Vertical Profile Boring 127 and BPOW 1-3, 1-4, 1-5, and 1-6, NWIRP Bethpage, New York, August 2012

— Summary Packet Vertical Profile Boring 128 and BPOW 3-3 and 3-4, NWIRP Bethpage, New York, August 2012

— Summary Packet Vertical Profile Boring 130 and BPOW 2-1, 2-2, and 2-3, NWIRP Bethpage, New York, August 2012

— Interim Data Summary Report for Groundwater PCB Investigation At Site 1 — Former Drum Marshalling Area, NWIRP Bethpage, New York, September 2012

— Summary Packet Vertical Profile Boring 134, NWIRP Bethpage, New York, November 2012

— Summary Packet Vertical Profile Boring 135, NWIRP Bethpage, New York, November 2012

— Summary Packet Vertical Profile Boring 136, NWIRP Bethpage, New York, November 2012

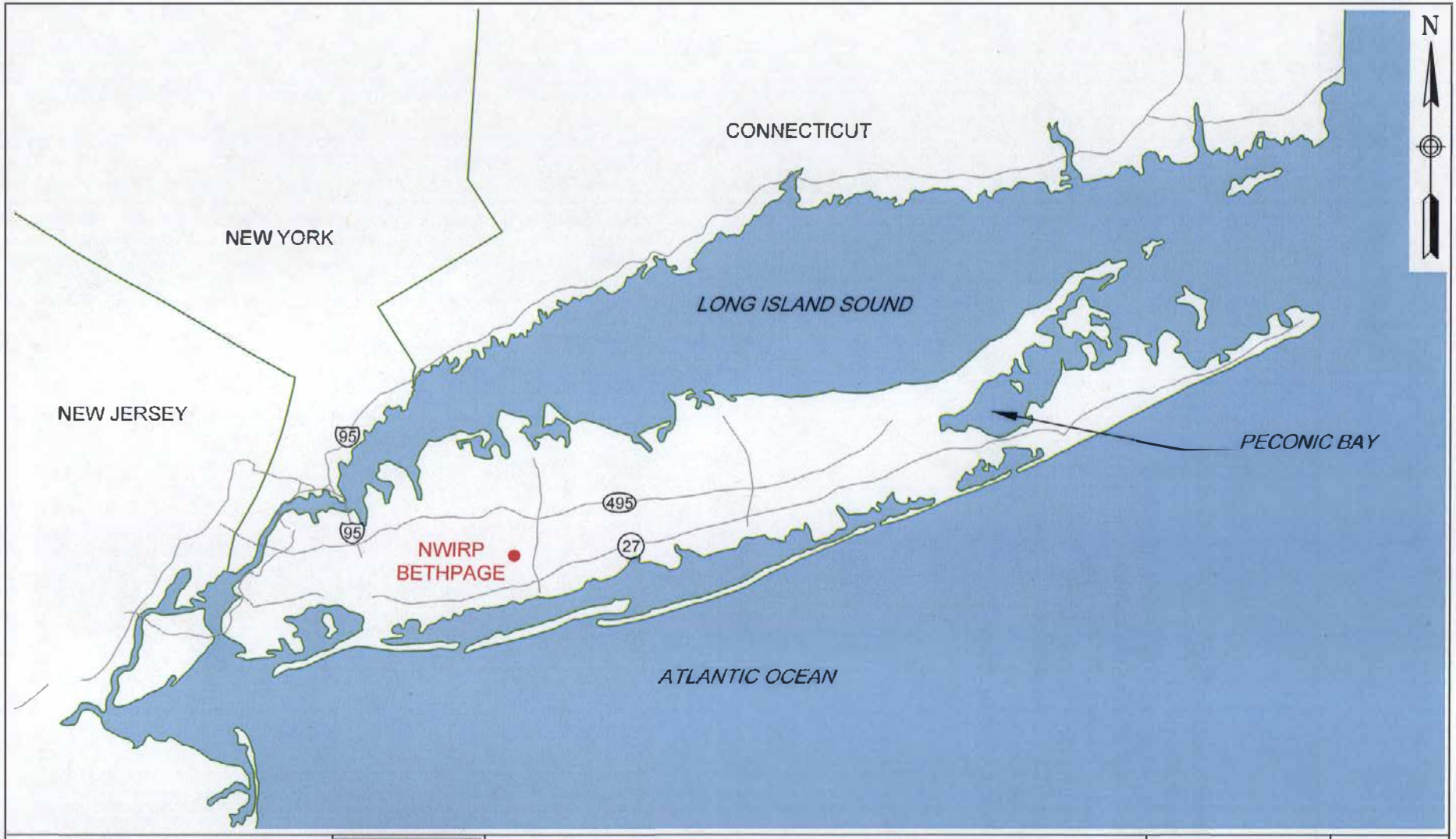
— Summary Packet Vertical Profile Boring 133 and TT 102D/TT102D2, NWIRP Bethpage, New York, November 2012

— Summary Report for 2010 to 2012 OffSite Vertical Profile Borings and Monitoring Wells Pre-Design Field Investigation, NWIRP Bethpage, New York, November 2012

— Summary Report for 2012 On-Site Vertical Profile Borings Pre-Design Field Investigation (VPB-134, -135, and -136), NWIRP Bethpage, New York, November 2012

U.S. Navy. *Time-Critical Removal Action — Off-site Soil Vapor Intrusion, Site 1, NWIRP Bethpage, New York.* June 2009.

Figures



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SCALE IN MILES

NAVFAC

GENERAL LOCATION MAP
NWIRP BETHPAGE
BETHPAGE, NEW YORK

N62470-11-D-8013	WE08
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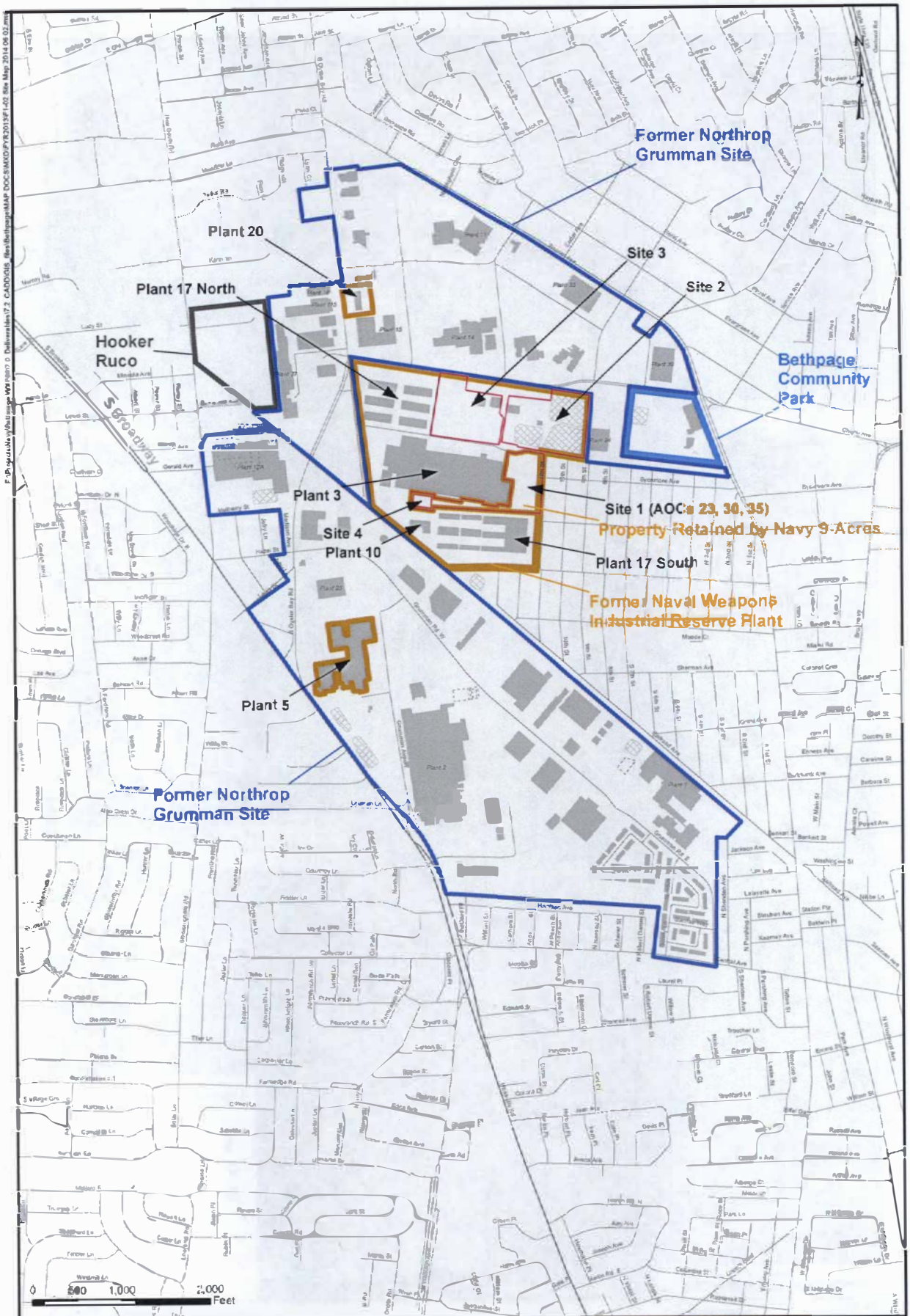
1-1	0



SITE MAP

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

NAVFAC

CONTRACT NUMBER	CTO NUMBER
N62470-11-D-8013	WE15
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE NO. 1-2	REV 0

DRAWN BY	DATE
MC	6/3/11
CHECKED BY	DATE
DB	6/3/11
REVISED BY	DATE
EV	6/3/2014
SCALE	AS NOTED

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SITE 1 - FORMER DRUM MARSHALLING AREA
LAYOUT MAP
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

CONTRACT NUMBER	CTO NUMBER
N62470-11-D-8013	WE08
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE NO. 2-1	REV

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TT/MC	8/3/11
CHECKED BY	DATE
TT/DB	8/3/11
REVISED BY	DATE
EV	6/2/2014
SCALE	AS NOTED

NAVFAC

SITE 2 - RECHARGE BASIN
LAYOUT MAP
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

CONTRACT NUMBER	CTO NUMBER
N62470-11-D-8013	WE08
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE NO. 3-1	REV 0

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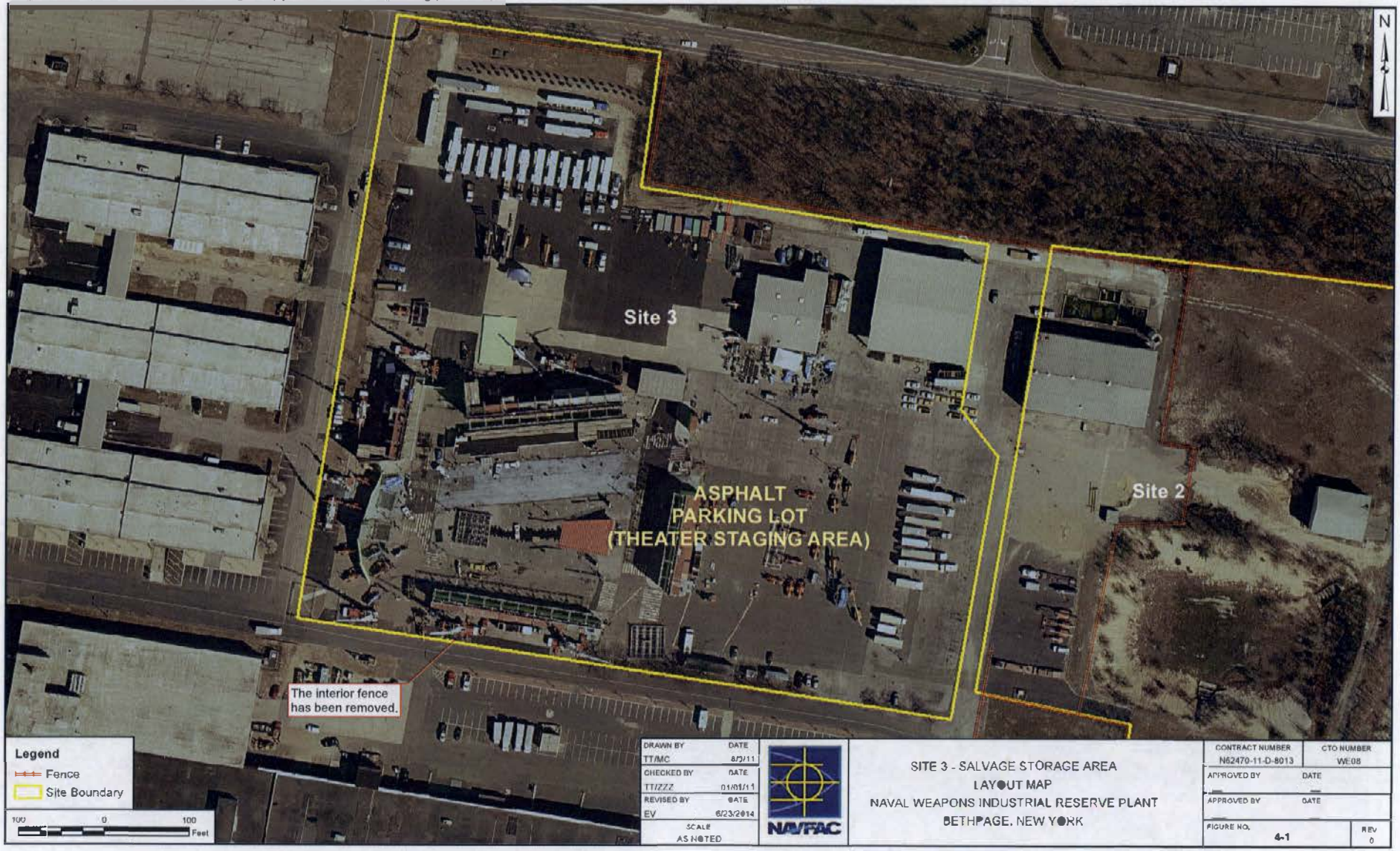

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TT/ZZZ	01/01/11
REVISED BY	DATE
EV	6/23/2014
SCALE	AS NOTED

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SITE 3 - SALVAGE STORAGE AREA
LAYOUT MAP
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

CONTRACT NUMBER	CTO NUMBER
N62470-11-D-8013	WE08
APPROVED BY	DATE
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FIGURE NO.	REV
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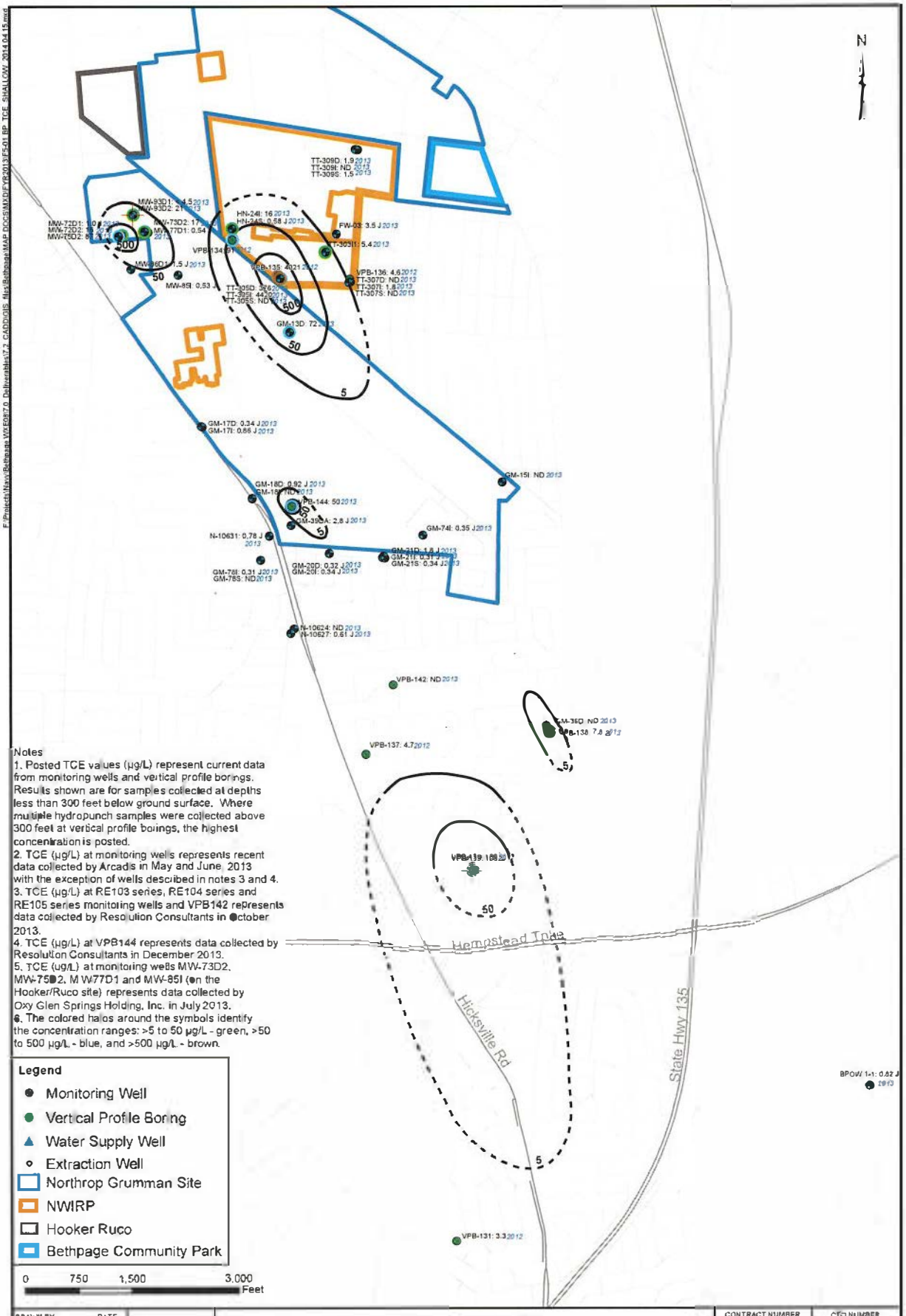
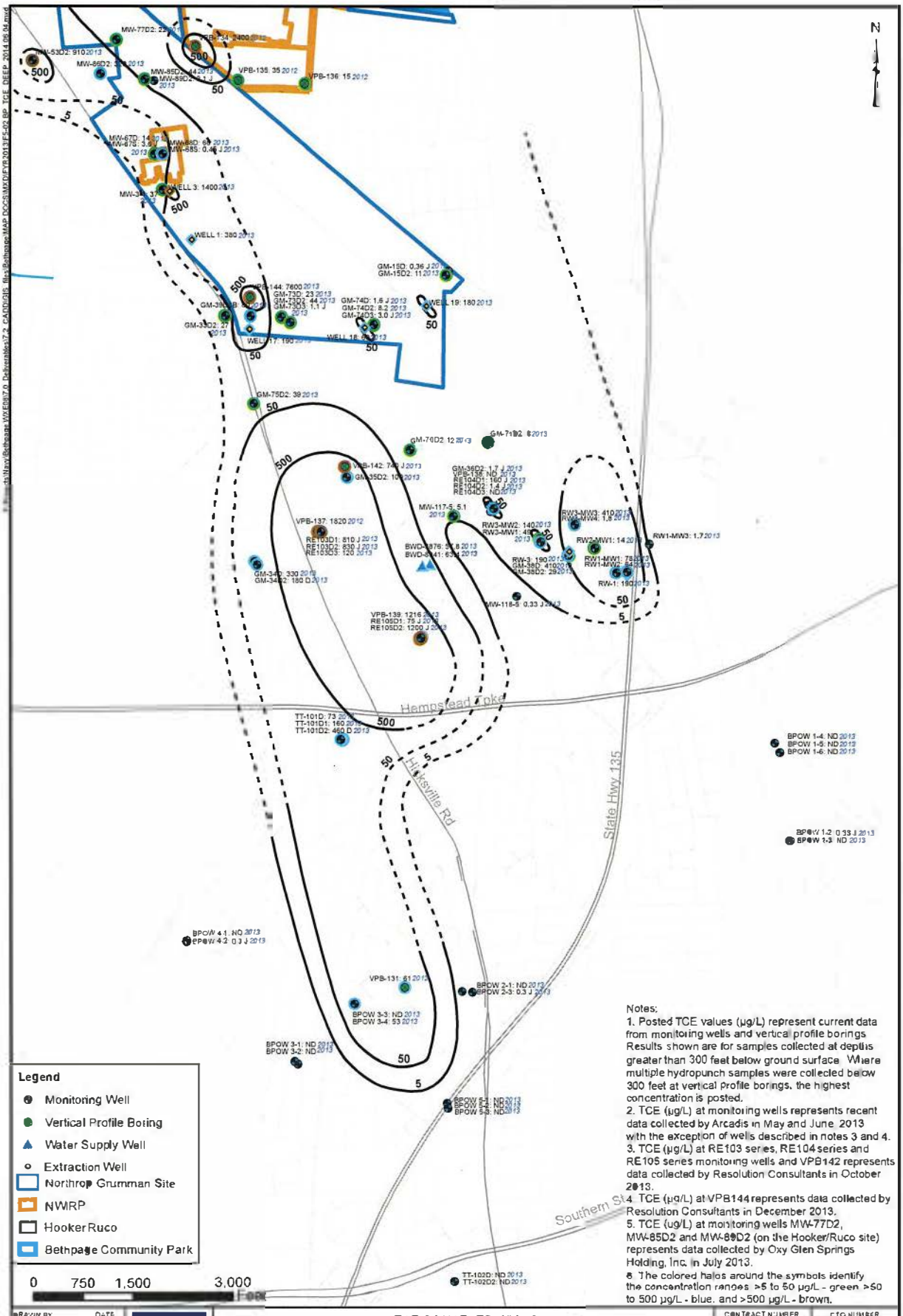

N
Hempstead Tpke
Hicksville Rd
State Hwy 135
500
50
5
Notes
1. Posted TCE values (µg/L) represent current data from monitoring wells and vertical profile borings. Results shown are for samples collected at depths less than 300 feet below ground surface. Where multiple hydropunch samples were collected above 300 feet at vertical profile borings, the highest concentration is posted.
2. TCE (µg/L) at monitoring wells represents recent data collected by Arcadis in May and June, 2013 with the exception of wells described in notes 3 and 4.
3. TCE (µg/L) at RE103 series, RE104 series and RE105 series monitoring wells and VPB142 represents data collected by Resolution Consultants in October 2013.
4. TCE (µg/L) at VPB144 represents data collected by Resolution Consultants in December 2013.
5. TCE (µg/L) at monitoring wells MW-73D2, MW-75D2, MW77D1 and MW-85I (on the Hooker/Ruco site) represents data collected by Oxy Glen Springs Holding, Inc. in July 2013.
6. The colored halos around the symbols identify the concentration ranges: >5 to 50 µg/L - green, >50 to 500 µg/L - blue, and >500 µg/L - brown.
Legend
Monitoring Well
Vertical Profile Boring
Water Supply Well
Extraction Well
Northrop Grumman Site
NWIRP
Hooker Ruco
Bethpage Community Park
0 750 1,500 3,000 Feet
DRAWN BY TT DATE 11/22/13
CHECKED BY TT DATE 11/22/13
REVISED BY EV DATE 5/29/2014
SCALE AS NOTED
NAVFAC
TCE CONCENTRATIONS
IN SHALLOW (<300 FT BGS)
OU2 GROUNDWATER
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK
CONTRACT NUMBER N62470-11-D8013
CTO NUMBER WE08
APPROVED BY
FIGURE NO 5-1
REV 0



Notes:
1. Posted TCE values (µg/L) represent current data from monitoring wells and vertical profile borings. Results shown are for samples collected at depths greater than 300 feet below ground surface. Where multiple hydropunch samples were collected below 300 feet at vertical profile borings, the highest concentration is posted.
2. TCE (µg/L) at monitoring wells represents recent data collected by Arcadis in May and June 2013 with the exception of wells described in notes 3 and 4.
3. TCE (µg/L) at RE103 series, RE104 series and RE105 series monitoring wells and VPB142 represents data collected by Resolution Consultants in October 2013.
4. TCE (µg/L) at VPB144 represents data collected by Resolution Consultants in December 2013.
5. TCE (ug/L) at monitoring wells MW-77D2, MW-85D2 and MW-89D2 (on the Hooker/Ruco site) represents data collected by Oxy Glen Springs Holding, Inc. in July 2013.
6. The colored halos around the symbols identify the concentration ranges: >5 to 50 µg/L - green; >50 to 500 µg/L - blue, and >500 µg/L - brown.

DRAWN BY TT	DATE 12/12/13
CHECKED BY TT	DATE 12/12/13
REVISED BY EV	DATE 6/4/2014
SCALE AS NOTED	

NAVFAC

TCE CONCENTRATIONS
IN DEEP (>300 FT BGS)
OU2 GROUNDWATER
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

CONTRACT NUMBER N6247(-11-DB013	CTO NUMBER WE08
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE NO 5-2	

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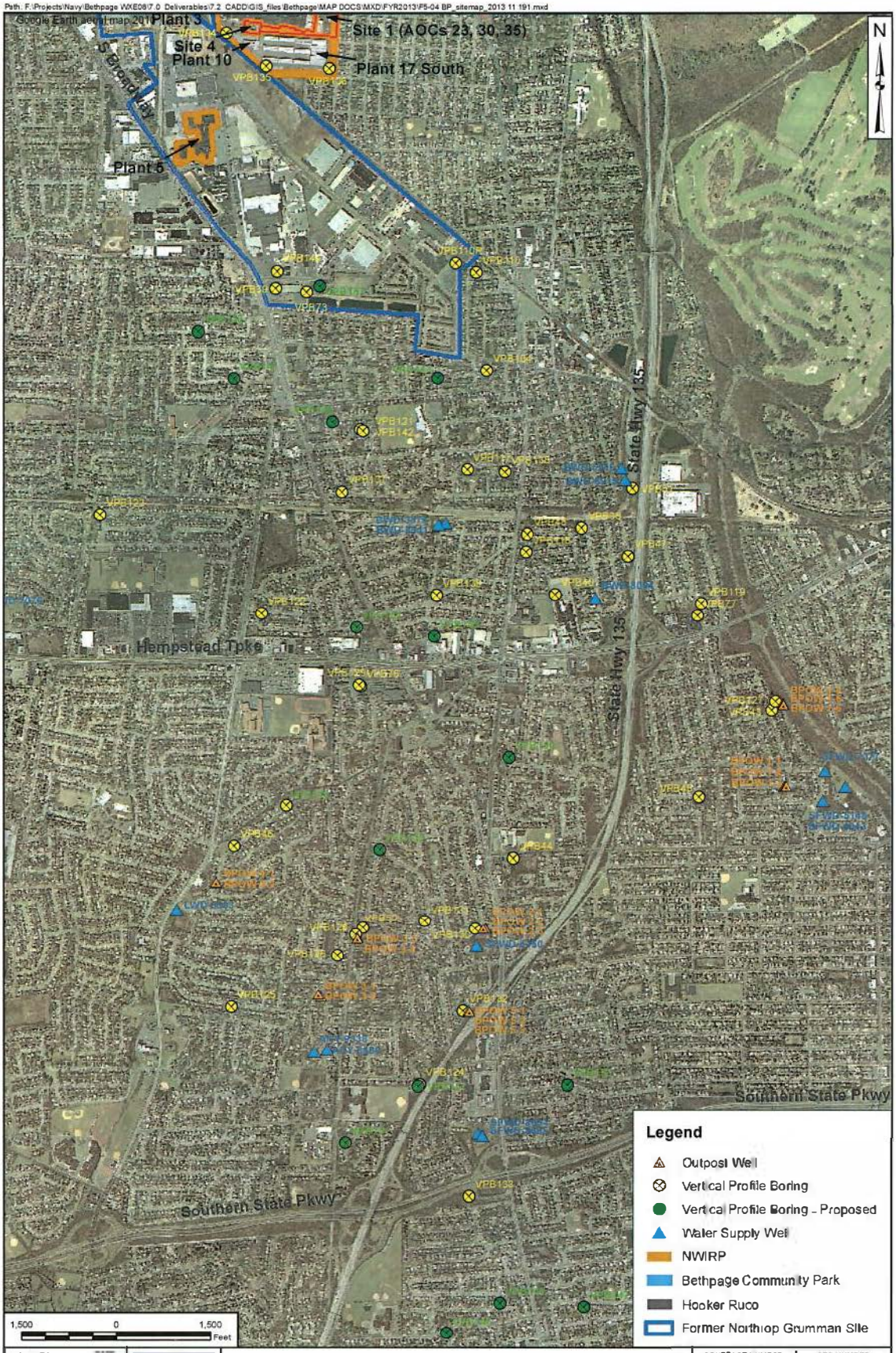
GM-38 GROUNDWATER TREATMENT SYSTEM SITE LAYOUT
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

CONTRACT NUMBER	CTO NUMBER
N62470-11-D-8013	WE08
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE NO. 5-3	REV 1



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MC	6/3/11
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DB	6/3/11
REVISED BY	DATE
EV	6/3/2014
SCALE	AS NOTED

NAVFAC

EXISTING VPB NETWORK AND OUTPOST WELL NETWORK
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

CONTRACT NUMBER	CTO NUMBER
N62470-11-D-8013	WE08
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE NO. 5-4	REV 1

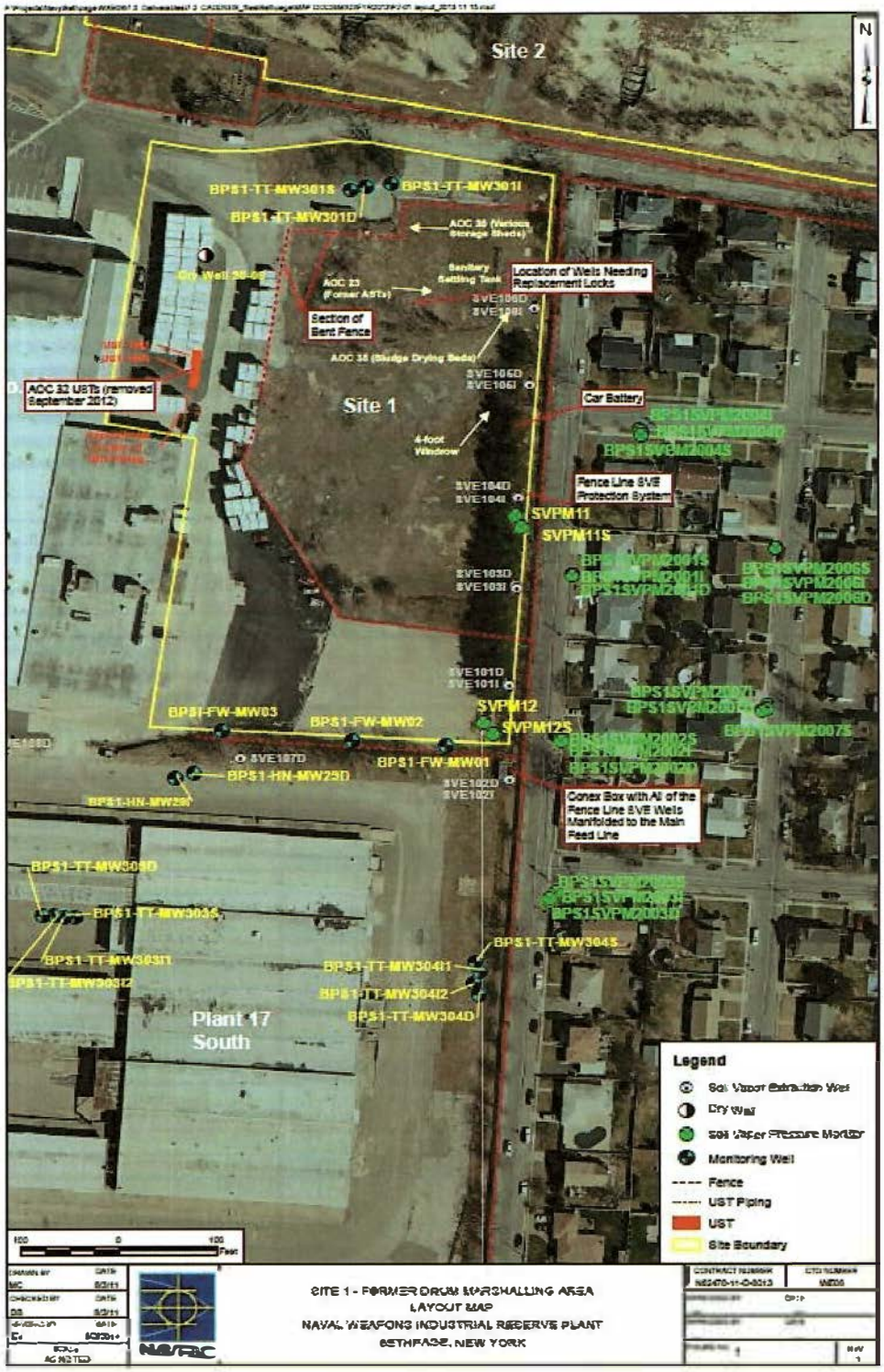
Appendix A
Five Year Review Inspection Checklists
Five Year Review Interview Summary

Appendix A

Site Inspections Checklists
May 2014

NWIRP Bethpage - Five Year Review Site Inspection Checklist			Remarks
Site Name: Site 1, NWIRP Bethpage			See accompanying figure
Date/Time: May 16, 2013; 8 am			
Inspector: Lora Fly (Navy), Steve Scharf (NYSDEC); Steve Karpinski (NYSDOH)			
Signature:			
Remedial Elements in place: LUCs for soil and groundwater; fencing to limit access; SVE system to address soil and shallow gw contamination and offsite VOC migration; front gate security to property.			SVE system includes Plant 3 subslab soil venting to protect workers and fence line protection to intercept soil vapor and prevent offsite migration to residential area. Five additional SVE wells were installed in October 2011 to address potential VOCs under Plant 3 and the South Warehouse. The locations of these wells were between Plant 3 and the Southern Warehouse. Front gate security is present. The fence is bent on two short sections.
	YES	**NO**	
Are institutional controls and LUCs properly implemented and fully enforced?	X		Interviewed Mr. Al Taormina, Navy Site Coordinator, during inspection.
(If no, note on map and explain in Remarks)			
For active remediation systems, are the following components in good condition and operating properly:			SVE system is operated and maintained by H&S Environmental; quarterly and annual reports are submitted to the Navy and NYSDEC
(If no, explain in Remarks)			
Pumps and Electrical:	X		
Extraction system pipelines, valves, valve boxes, and appurtenances:	X		
Treatment technologies:	X		
Discharge structures and appurtenances:	X		
Recovery wells:	X		
Do any observations indicate that RAO's are not being met?			
(If no, note on map and explain in Remarks)			
Has land use on- or offsite changed?		X	
(If yes, explain in Remarks)			
Are monitoring wells functioning, locked and in good condition?		X	Onsite wells need to have locks replaced
(If no, explain in Remarks)			
Is the site free of identifiable concerns, such as dumping of chemicals or debris, or unanticipated activity?	X		
(If no, explain in Remarks)			
Are there any previously undocumented features/conditions at the site (ie new wetlands, grading, paving, grade changes, roads, etc.)?		X	
(If yes, note on map and explain in Remarks)			

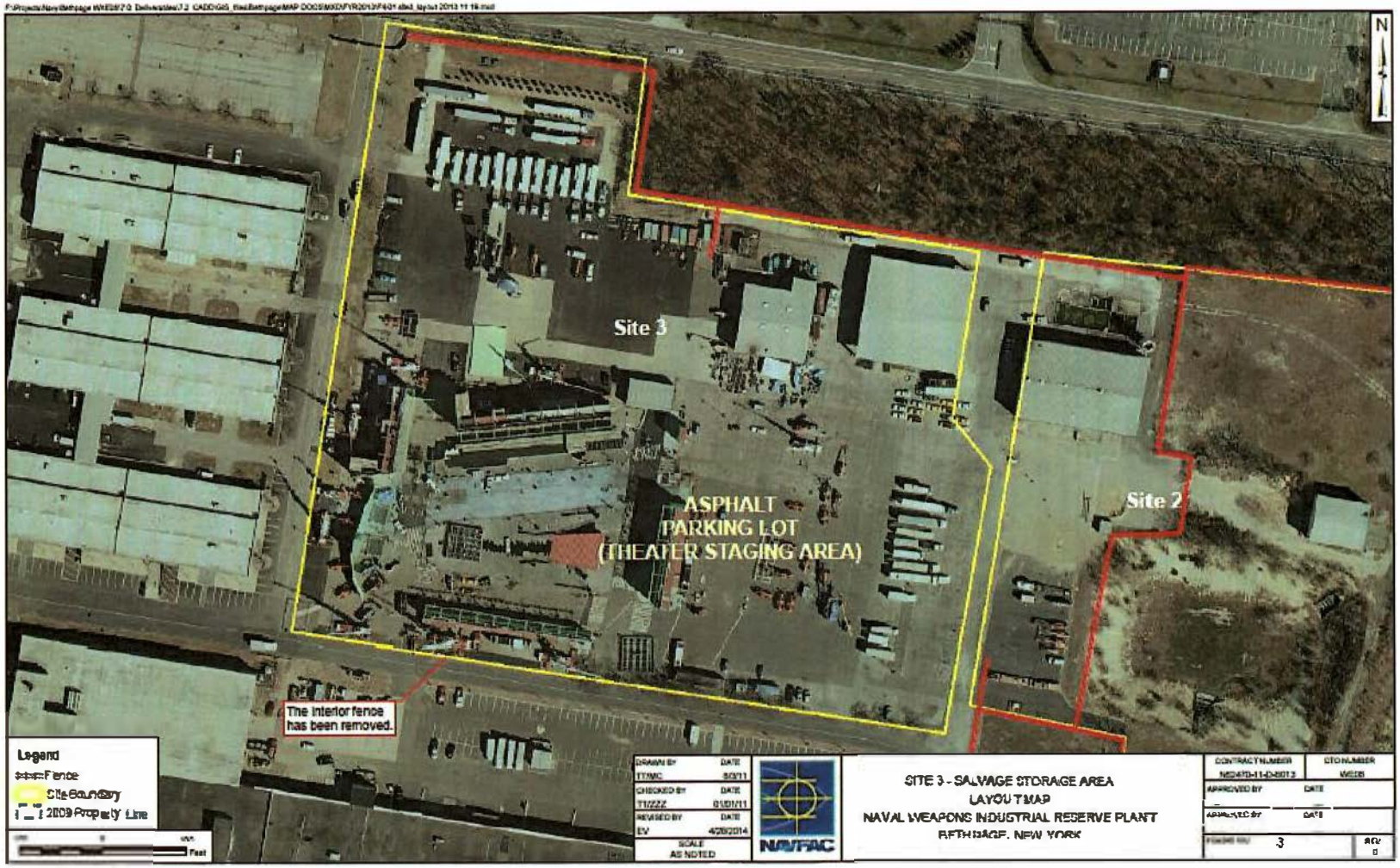
Resolution of noted issues: Nuts will be added to Blower 1-B nuts in 2014; onsite well locks will be replaced during next sampling; Facility Manager will arrange to have eastern perimeter fence checked for debris periodically; missing cesspool lids will be replaced.


Site 2
Site 1
Plant 17 South
N
BPS1-TT-MW301S
BPS1-TT-MW301I
BPS1-TT-MW301D
AOC 38 (Various Storage Sheds)
City Well 35-05
AOC 23 (Former ASTs)
Sanitary Settling Tank
Location of Wells Needing Replacement Locks
Section of Bent Fence
AOC 35 (Sludge Drying Beds)
SVE106D
SVE106I
AOC 32 USTs (removed September 2012)
Car Battery
4-foot Window
SVE104D
SVE104I
Fence Line SVE Protection System
SVPM11
SVPM11S
SVE103D
SVE103I
SVE101D
SVE101I
SVPM12
SVPM12S
BPS1-FW-MW03
BPS1-FW-MW02
BPS1-FW-MW01
SVE107D
BPS1-HN-MW29D
BPS1-HN-MW29S
SVE102D
SVE102I
Conex Box with All of the Fence Line SVE Wells Manifolded to the Main Feed Line
BPS1-TT-MW303D
BPS1-TT-MW303S
BPS1-TT-MW303I1
BPS1-TT-MW303I2
BPS1-TT-MW304S
BPS1-TT-MW304I1
BPS1-TT-MW304I2
BPS1-TT-MW304D
Legend
Soil Vapor Extraction Well
Dry Well
Soil Vapor Pressure Monitor
Monitoring Well
Fence
UST Piping
UST
Site Boundary
100 0 100 Feet
SITE 1 - FORMER DRUM MARSHALLING AREA
LAYOUT MAP
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

NWIRP Bethpage - Five Year Review Site Inspection Checklist			Remarks
Site Name: Site 2, NWIRP Bethpage			See accompanying figure
Date/Time: May 16, 2013; 9 am			
Inspector: Lora Fly (Navy), Steve Scharf (NYSDEC); Steve Karpinski (NYSDOH)			
Signature:			
Remedial Elements in place: LUCs for soil and groundwater; soil cover to limit surface exposure; perimeter fencing to limit access; front gate security to property			Soil cover is in good shape, and although sparsely vegetated is not eroding; perimeter fence is intact; front gate security is present
	YES	**NO**	
Are institutional controls and LUCs properly implemented and fully enforced?	X		Interviewed Mr. Al Taormina, Navy Site Coordinator, during inspection.
(If no, note on map and explain in Remarks)			
For active remediation systems, are the following components in good condition and operating properly:			Not applicable; no active remediation system
(If no, explain in Remarks)			
Pumps and Electrical:			
Extraction system pipelines, valves, valve boxes, and appurtenances:			
Treatment technologies:			
Discharge structures and appurtenances:			
Recovery wells:			
Do any observations indicate that RAO's are not being met?		X	
(If no, note on map and explain in Remarks)			
Has land use on- or offsite changed?		X	
(If yes, explain in Remarks)			
Are monitoring wells functioning, locked and in good condition?	X		
(If no, explain in Remarks)			
Is the site free of identifiable concerns, such as dumping of chemicals or debris, or unanticipated activity?	X		Slight erosion noted on sides of slopes of retention basins, but soil cover is intact; no imminent risk of edge collapse of soil cover
(If no, explain in Remarks)			
Are there any previously undocumented features/conditions at the site (ie new wetlands, eradine. oaving. grade changes, roads, etc.)?		X	
(If yes, note on map and explain in Remarks)			


Area of Slope Erosion
Area of Slope Erosion
FORMER SLUDGE DRYING BEDS
RECHARGE BASIN
Site 2
Site 3
Erosion Area Repaired
Area of Slope Erosion
RECHARGE BASIN
Area of Slope Erosion
RECHARGE BASIN
Area of Slope Erosion
Site 1
N
Legend
Fence
Site Boundary
2009 Property Line
SITE 2 - RECHARGE BASIN
LAYOUT MAP
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK
NAVFAC

NWIRP Bethpage - Five Year Review Site Inspection Checklist			Remarks
Site Name: Site 3 , NWIRP Bethpage			See accompanying figure
Date/Time: May 16, 2013; 10am			
Inspector: Lara Fly (Navy), Steve Scharf (NYSDEC); Steve Karpinski (NYSDOH)			
Signature:			
Remedial Elements in place: LUCs for soil and groundwater; pavement cover to limit surface exposure; perimeter fencing to limit access; frontgate security check to property			Pavement is in good shape; front gate security is present; perimeter fence is intact; interior fence has been removed
	YES	**NO**	
Are institutional controls and LUCs properly implemented and fully enforced?	X		Interviewed Mr. Al Taormina, Navy Site Coordinator, during inspection.
(If no, note on map and explain in Remarks)			
For active remediation systems, are the following components in good condition and operating properly:			Not applicable; no active remediation system
(If no, explain in Remarks)			
Pumps and Electrical:			
Extraction system pipelines, valves, valve boxes, and appurtenances:			
Treatment technologies:			
Discharge structures and appurtenances:			
Recovery wells:			
Do any observations indicate that RAO's are not being met?		X	
(If no, note on map and explain in Remarks)			
Has land use on- or offsite changed?		X	
(If yes, explain in Remarks)			
Are monitoring wells functioning, locked and in good condition?	X		
(If no, explain in Remarks)			
Is the site free of identifiable concerns, such as dumping of chemicals or debris, or unanticipated activity?		X	
(If no, explain in Remarks)			
Are there any previously undocumented features/conditions at the site (ie new wetlands, grading, paving, grade changes, roads, etc.)?	X		A portion of the parking area is utilized as a movie set; the interior fence has been removed
(If yes, note on map and explain in Remarks)			


Site 3
ASPHALT
PARKING LOT
(THEATER STAGING AREA)
Site 2
The interior fence has been removed.
Legend
Fence
Site Boundary
2009 Property Line
Feet
N
SITE 3 - SALVAGE STORAGE AREA
LAYOUT MAP
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK
NAVFAC
SCALE
AS NOTED

NWIRP Bethpage - Five Year Review Site Inspection Checklist			Remarks
Site Name: OU2 - GM-38 GWTP Offsite Groundwater, NWIRP Bethpage			
Date/Time: May 16, 2013; 11 am			
Inspector: Lora Fly (Navy); Steve Scharf (NYSDEC)			
Signature:			
Remedial Elements in place: Groundwater recovery and exsitu treatment system; perimeter fencing to limit access to treatment system.			Fencing is intact, recovery and treatment system is operating prooerly and successfully
	YES	**NO**	
Are institutional controls and LUCs properly implemented and fully enforced?	X		Interviewed Mr. Al Taormina, Navy Site Coordinator, during inspection.
(If no, note on map and explain in Remarks)			
For active remediation systems, are the following components in good condition and operating properly:			Hot spot groundwater recovery system is operated and maintained by H&S Environmental; quarterly and annual reports are submitted to the Navy and NYSDEC
(If no, explain in Remarks)			
Pumps and Electrical:	X		
Extraction system pipelines, valves, valve boxes, and appurtenances:	X		
Treatment technologies:	X		
Discharge structures and aopurtenances:	X		
Recovery wells:	X		
Do any observations indicate that RAO's are not being met?			
(If no, note on map and explain in Remarks)			
Has land use on- or offsite changed?		X	
(If yes, explain in Remarks)			
Are monitoring wells functioning, locked and in good condition?	X		
(If no, explain in Remarks)			
Is the site free of identifiable concerns, such as dumping of chemicals or debris, or unanticipated activity?	X		
(If no, explain in Remarks)			
Are there any previously undocumented features/conditions at the site (ie new wetlands, grading, paving, grade changes, roads, etc.)?		X	
(If yes, note on map and explain in Remarks)			

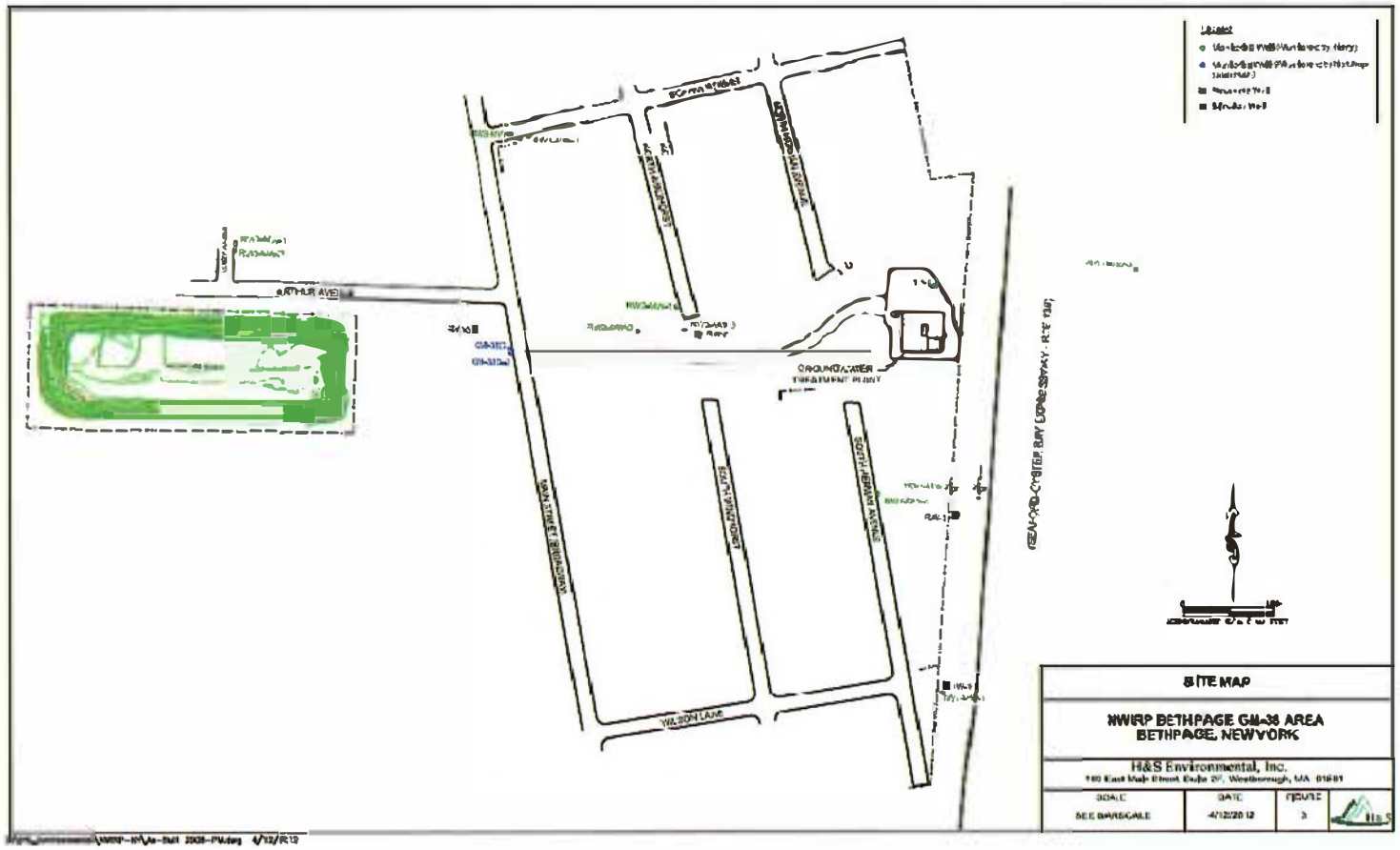


Figure 4.

GM-38 Groundwater Treatment System Site Layout (Source: 2012 Annual Operations Report, GM-38 Area Groundwater Remediation, Naval Weapons Industrial Reserve Plant, Bethpage New York. H&S Environmental, 2013).

RESOLUTION CONSULTANTS

To: Lora Fly, DON, NAVFAC MIDLANT; Project File

From: Brian Caldwell, P.G., Resolution Consultants

Subject: **Five Year Review Interview Summaries — NWIRP Bethpage Sites 1, 2, 3 (OU1), and GM-38 Treatment Plant — Offsite Groundwater (OU2) — NWIRP Bethpage**

Date: 18 Dec 2013

This memorandum documents interviews conducted during the 2013 Annual Land Use Control (LUC) Inspections performed for Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage Sites 1, 2, and 3 (OU1) and GM-38 Treatment Plant — Offsite Groundwater (OU2) on 16 May 2013. These 2013 annual LUC inspections were performed in conjunction with the Five Year Review inspections, and fulfill the requirements of both. The Navy performs annual inspections of OU1 and OU2 to ensure that LUCs designed to minimize risk exposure pathways are being maintained as intended as part of the site remedies.

Site backgrounds for Sites 1, 2, and 3 and GM-38 Treatment Plant — Offsite Groundwater are provided in the 2013 Five Year Review and the 2013 LUC Inspection Report (Resolution Consultants). Interviewed personnel for these sites include Mr. Al Taormina (H&S Environmental, contracted Facility Manager for the Navy). Interview summaries are provided by site in the following section. These interviews were performed as "rolling interviews" conducted during the site inspections and afterwards as needed. In addition, Mr. Taormina was contacted on 18 December 2013 via phone to confirm outstanding details.

INTERVIEW SUMMARIES

SITE 1:

1. **What is your overall impression of the project?** Mr. Taormina indicated a positive sentiment to the progress of the project. Navy contractor Tetra Tech is preparing an RI addendum and a revised FS to support remediation of the site, addressing both soil and shallow groundwater.

2. **What is the remedy and is the remedy functioning as expected?** Remedial elements in place include:

   - Perimeter fencing to limit general access (functioning)
   - Interior fencing to limit worker access (functioning)
   - Gravel, concrete and asphalt soil cover outside of interior fencing to limit worker exposure (functioning)
   - SVE system to address soil and shallow groundwater contamination and offsite VOC migration (functioning)
   - Front gate security to property to limit general access (functioning)
   - Deed restriction with property transfer to prohibit extraction of groundwater (functioning)

3. **What does the monitoring data show?** Monitoring data of the fence-line soil gas remedy is reported monthly, quarterly, and annually. Results indicate that containment on NWIRP property is successful.

4. **Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.** LUCs are enforced through deed restrictions; windshield inspections of site fencing restricting access occur daily through normal vehicle progress to the onsite work trailer at Site 4. O&M activities of the interim SVE remedy are performed by H&S Environmental. The main site entrance from South Oyster Bay Road is maintained by a security check by Steel Equities.

5. **Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.** Changes have included moving of the site's interior fencing; this was described as moving the western interior fencing approximately 30 feet to the east, and moving the southern interior fencing approximately 100 feet to the north – this was

done to provide Steel Equities greater access to their property. The area outside of the interior fencing but within perimeter fencing was covered with gravel and asphalt in accordance with the Site 1 ROD.

6. **Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.** No unexpected difficulties.

7. **Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.** bO&M of the fenceline SVE system is operated by H&S; the system is monitored daily and adjusted at the control warehouse to maintain efficiency.

8. **Do you have any comments, suggestions, or recommendations regarding the project?** Maintain contact with Steel Equities as their operations continue to expand.

SITE 2:

1. **What is your overall impression of the project?** Mr. Taormina indicated a positive sentiment to the progress of the project. Nassau County conducts periodic inspections of the recharge basins, and repairs were performed at the intake structure on the east side of the southeast basin.

2. **Is the remedy functioning as expected?** Remedial elements in place include: Permeable 6-inch cover over the surficial (non-basin) residual contaminated soils on the northwestern portion of the site; and corresponding deed restrictions to limit the use of groundwater and limit worker exposure. The LUCs restrictions limiting the use of groundwater and limiting worker exposure is functioning appropriately.

3. **What does the monitoring data show?** There is no media monitoring as part of the remedy for this site.

4. **Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.** LUCs are enforced through deed restrictions. The main site entrance from South Oyster Bay Road is maintained by a security check by Steel Equities. Soil cover is inspected annually by Nassau County and by the Navy.

5. **Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.** Repairs (surface stabilization) have been made to the east intake structure in the southeast recharge basin by Nassau County. This repair does not affect the protectiveness of effectiveness of the remedy.

6. **Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.** No unexpected difficulties.

7. **Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.** There are no O&M systems or sampling performed as part of the remedy; annual inspections by the Navy and Nassau County are performed to ensure integrity of the soil cover and the basin walls.

8. **Do you have any comments, suggestions, or recommendations regarding the project?** No comments.

SITE 3:

1. **What is your overall impression of the project?** Mr. Taormina indicated a positive sentiment to the progress of the project. Steel Equities is maintaining front gate security and soil cover.

2. **Is the remedy functioning as expected?** Remedial elements in place include: A soil cover over the surficial residual contaminated soils and corresponding deed restrictions to limit the use of groundwater and limit worker exposure. LUCs limiting the use of groundwater and limiting worker exposure as specified in the ROD is functioning appropriately.

3. **What does the monitoring data show?** There is no monitoring of site media performed as part of the ROD.

4. **Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site use of the groundwater and presence, describe staff and frequency of site inspections and activities.** Two remedies are implemented for this site: LUCs preventing use of groundwater and maintenance of a soil cover to prevent worker exposure. LUCs are enforced through deed restrictions; windshield inspections of site fencing restricting access occur daily through normal vehicle traffic in the area by Steel Equities. The main site entrance from

South Oyster Bay Road is maintained by a security check by Steel Equities. Soil cover is maintained by Steel Equities.

5. **Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.** Changes have included repair of asphalt on the northwest portion of the site by Steel Equities. This repair does not affect the protectiveness or effectiveness of the remedy.

6. **Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.** No unexpected difficulties.

7. **Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.** There are no O&M systems or media sampling performed as part of the remedy.

8. **Do you have any comments, suggestions, or recommendations regarding the project?** Maintain contact with Steel Equities as their operations continue to expand.

GM-38 — OFFSITE GROUNDWATER (OU2)

1. **What is your overall impression of the project?** Mr. Taormina indicated a positive sentiment to the progress of the project. Navy contractor H&S Environmental performs O&M on the system, and provides quarterly and annual reports on system performance to NYSDEC; these reports are available in the Administrative Record. Normal runtime is 95%; there was a 2 month shutdown in October 2013 to replace ductwork and change out carbon.

2. **What is the remedy and is the remedy functioning as expected?** Remedial elements in place include:

   - Perimeter locked fencing around GM-38 treatment plant to limit general access (functioning)
   - Operation of 2 recovery wells (RW-01 and RW-02) to recover contaminated groundwater (functioning)
   - Treatment of contaminated groundwater, consisting of 1) equalization tank; 2) air stripping tower; 3) liquid phase granular activated carbon polishing; 4) discharge of treated groundwater to a recharge basin; 5) vapor phase treatment using granular activated carbon (functioning)

3. **What does the monitoring data show?** Monitoring data indicate that mass removal in the deeper groundwater (>450 feet) has been successful; concentrations in shallow groundwater (320-450 feet) have been relatively stable since start-up and indicate a potential upgradient continuing source. An optimization evaluation is being prepared by the Navy, and will be available in 2014.

4. **Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.** H&S Environmental (Navy Remedial Action Contractor) is onsite daily. Activities include monitoring and adjustments of recovery and treatment capacities. This information is summarized in quarterly and annual reports that are available in the Administrative Record

5. **Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.** No significant changes have been made to the original design in the last 5 years.

6. **Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.** The system was shut down for 2 months in October 2013 to replace corroded duct work. No other unexpected difficulties.

7. **Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.** Daily optimization is performed by H&S Environmental. An optimization evaluation of the adjustment of RW-01 and RW-03 operation is being performed by the Navy and will be reported in 2014.

8. **Do you have any comments, suggestions, or recommendations regarding the project?** Complete the optimization report and implement engineering recommendations included in that evaluation.

Appendix B
Photo Log

Outside Soil Vapor Extraction System Building (Site 1) - Building located on Site 4

Site 1 Soil Vapor Extraction System

Condensation Tank – Site 1 SVE system

Site 1 looking north from south fence line

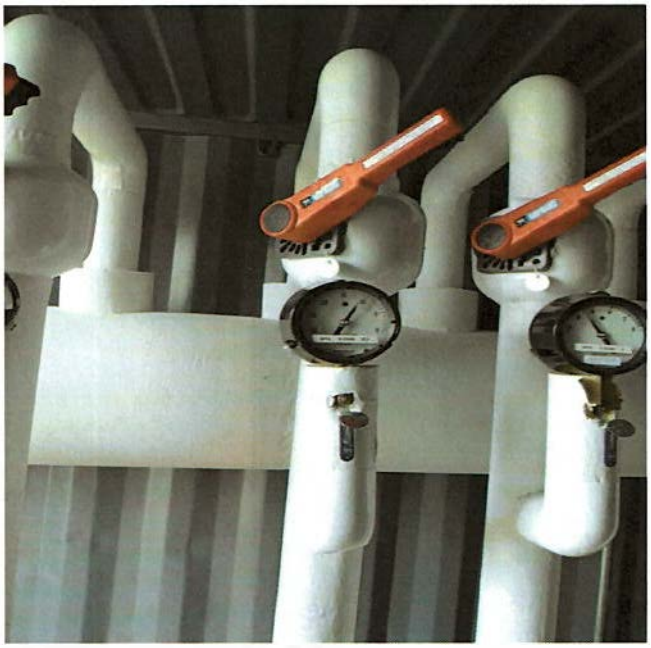
Eastern Perimeter Fence looking north - Site 1

Soil vapor extraction wells – Site 1

Soil vapor extraction wells 103I & 103D – Site 1

Soil vapor extraction well 102D – Site 1

SVE header system – Site 1



SVE lines and manifold – Site 1

SVE lines and manifold – Site 1

Conex Box that holds Site 1 SVE manifold – Site 1

Water inlet for SVE system – Site 1

Site 1 looking north from southern interior fence

Site 1 looking north from southern interior fence

Site 1 looking north from southern interior fence

Site 1 looking northeast from southern perimeter fence

Cess pool – Site 1

SVE Gauge Point SVE PM 13S –Site 1

Western interior fence looking north – Site 1

Northern perimeter fence looking northwest – Site 1

BPSI-HN- MW27I – Site 1 (needs lock)

BPSI-HN-MW27S – Site 1 (needs lock)

Cess Pool between BPSI-HN- MW27I and BPSI-HN-MW27S – Site 1

SVE extraction wells 106I&D – Site 1

SVE extraction wells 105 I&D – Site 1

Battery between SVE105 & 104 – Site 1 (needs removal)

SVE extraction wells 104 I&D – Site 1

SVE extraction wells 103 I&D – Site 1

SVE extraction wells 102 I&D – Site 1

Western recharge basin - Site 2

Road cover between east and west recharge basins – Site 2

South recharge basin looking east – Site 2

Outfall in Southern Basin – Site 2

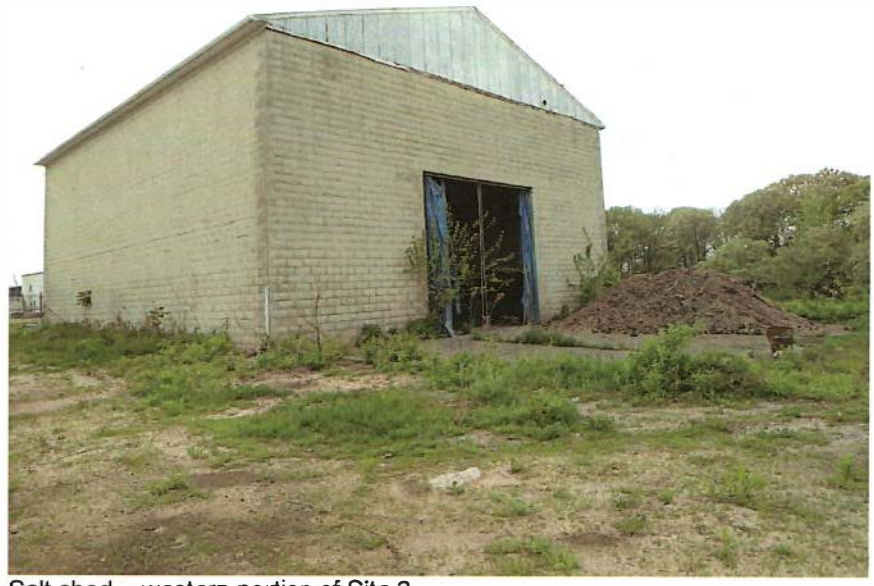
South recharge basin building looking east – Site 2

Southern Basin erosion east side – Site 2

Erosion east side of Southern Basin – Site 2

Erosion east side of Southern Basin – Site 2

South outfall Southern Basin – Site 2



Salt shed - western portion of Site 2

Valve Distribution Box for OU3 recovery system – Southern Basin Site 2

Northern Basin – Site 2

Northern Basin – Site 2

Soil Cover - Site2

Former sludge drying beds looking west – Site 2

Former sludge drying beds and soil cover, west side of Site 2

BPSI -TT MW309 D S & I - Site 2

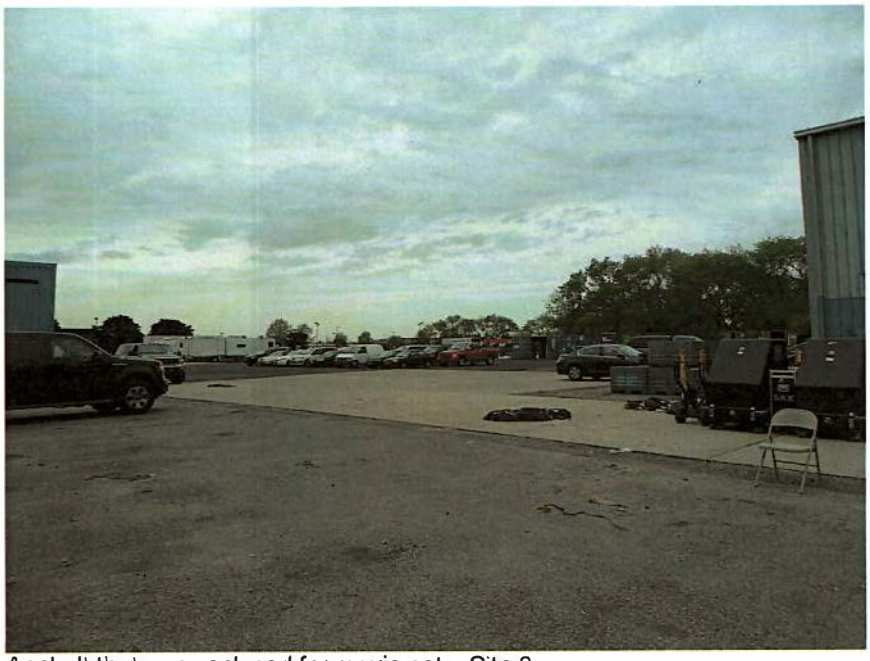
Secondary containment for county waste water treatment tanks – Site 2

Waste Storage – Site 3

County Building and boundary line between Sites 2 and 3

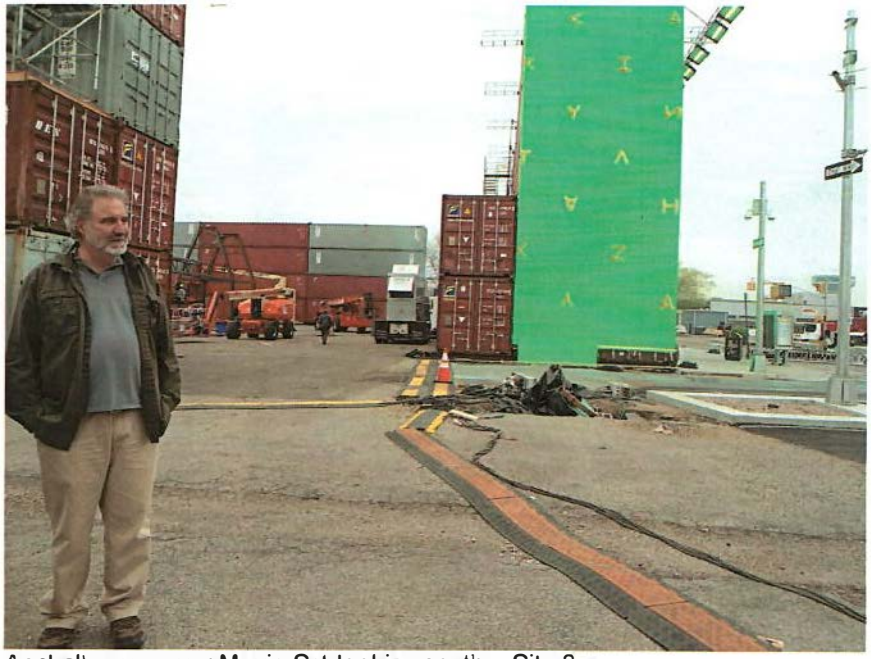
Asphalt cover – Site 3

Asphalt cover over Movie Set – Site 3



Asphalt that was replaced for movie set – Site 3

Asphalt cover over Movie Set – Site 3



Asphalt cover over Movie Set looking south – Site 3

Asphalt cover on Site 3 looking west

Asphalt cover on Site 3 looking east

PBSI TT MW 301S and northern perimeter fence – Site 3

Perimeter fencing - GM38 treatment system – OU2

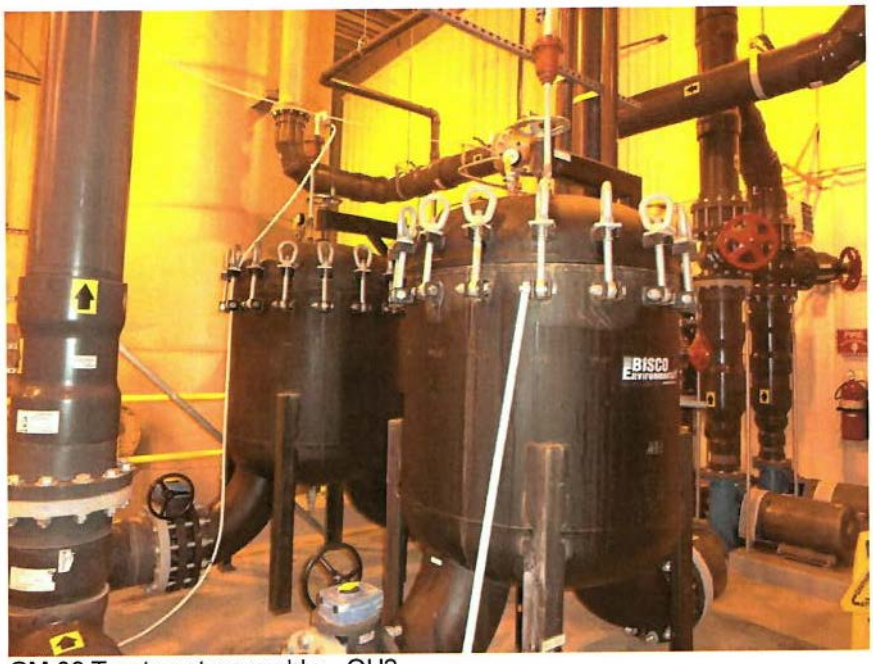
Outside GM 38 treatment system – looking south - OU2

Control room GM-38 treatment system – OU2

GM 38 Pumping system – OU2

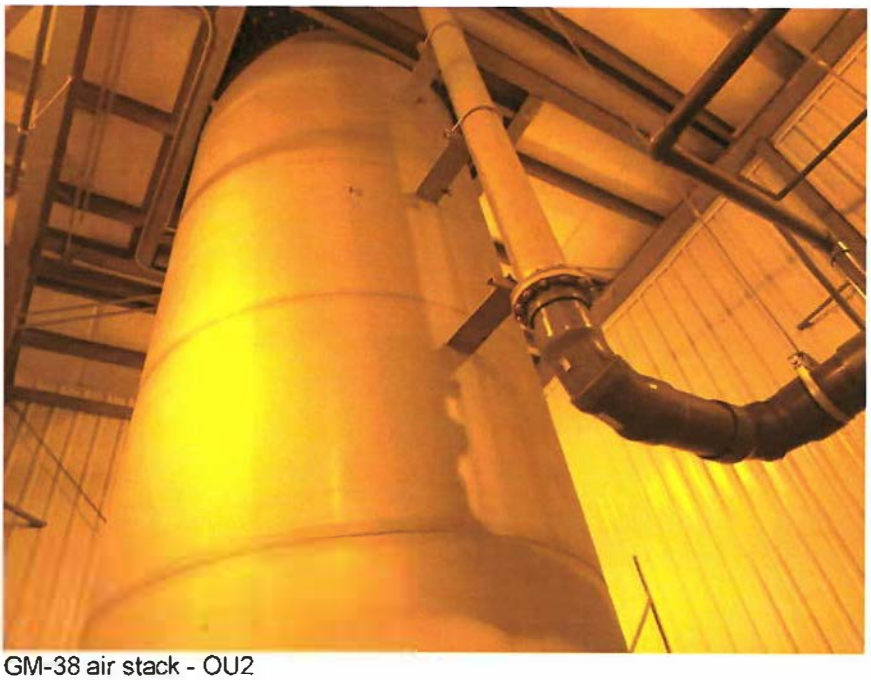
GM 38 air stripper – OU2

Grate area, GM38 operations room – OU2



GM 38 Treatment assembly – OU2

GM38 Carbon Unit – OU2



GM-38 air stack - OU2

GM 38 Main operations room – OU2

GM38 LGAC-3 stack – OU2

Eye wash station in GM 38 operations area – OU2