ENVIRONMENTAL RESTORATION PROGRAM

FINAL
NO FURTHER RESPONSE ACTION PLANNED
DECISION DOCUMENT

SITE 10 – WASTE STRIPPER TANK NO. 61, BUILDING 370

106TH RESCUE WING
NEW YORK AIR NATIONAL GUARD
FRANCIS S. GABRESKI AIRPORT
WESTHAMPTON BEACH, NEW YORK

SEPTEMBER 2005

PEER CONSULTANTS, P.C.
EST. 1978

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SEPTEMBER 2005

Prepared by

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Prepared for the

Air National Guard/CEVR
Andrews Air Force Base, Maryland
Under National Guard Bureau Contract DAHA-92-01-D-0004
Delivery Order 0011

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LIST OF ACRONYMS

ABB-ES	ABB–Environmental Services, Inc.
ALM	Adult Lead Methodology
ANG	Air National Guard
ANG/CEVR	Air National Guard/Environmental Restoration Branch
BEHP	bis(2-ethylhexyl) phthalate
BGS	Below Ground Surface
BTEX	Benzene, toluene, ethylbenzene, and xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	Contaminant of Potential Concern
CRP	Community Relations Plan
DD	Decision Document
DRO	Diesel Range Organics
EPA	Environmental Protection Agency
ERP	Environmental Restoration Program
GRO	Gasoline Range Organics
HAZWRAP	Hazardous Waste Removal Actions Program
HMTC	Hazardous Materials Technical Center
HSA	Hollow Stem Auger
LIRR	Long Island Railroad
MCL	Maximum Contaminant Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NFRAP	No Further Response Action Planned
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
106^{th} RQW	106^{th} Rescue Wing
PA	Preliminary Assessment
PAHs	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethylene (perchloroethylene)
PEER	PEER Consultants, P.C.
PID	Photoionization Detector
RAG	Risk Assessment Guidance
RBC	Risk-Based Concentration
RI	Remedial Investigation
RSCO	Recommended Soil Cleanup Objective
SARA	Superfund Amendments and Reauthorization Act
SI	Site Investigation
SCDHS	Suffolk County Department of Health Services
TAL	Target Analytes List
TAGM	Technical Assistance Guidance Memorandum
TD	Total Depth
TOGS	Technical and Operational Guidance Series

LIST OF ACRONYMS (Continued)

TPH	Total Petroleum Hydrocarbons
TRW	Technical Review Workgroup
ULBC	Upper Limit of Background Concentrations
UST	Underground Storage Tank

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DECLARATION

Site Name and Location:

Environmental Restoration Program
Site 10 – Waste Stripper Tank No. 61, Building 370
106th Rescue Wing
New York Air National Guard
Francis S. Gabreski Airport
Westhampton Beach, New York

Statement of Basis and Purpose:

This Decision Document (DD) presents the selected remedial action for Site 10 – Former Waste Stripper Tank No. 61, at the 106th Rescue Wing (RQW), New York Air National Guard, Francis S. Gabreski Airport, Westhampton Beach, New York. This decision is based on the results of a 1994 Site Investigation (SI), and a Remedial Investigation (RI) conducted from 2000 through 2001 under the Environmental Restoration Program (ERP), with the cooperation and support of the New York State Department of Environmental Conservation (NYSDEC), the New York State Department of Health, and the Suffolk County Department of Health Services (SCDHS).

Description of the Selected Remedy:

Site 10 has been selected for No Further Response Action Planned (NFRAP) based upon the findings of field investigations and evaluation of scientific data. Site 10 is the former location of an underground storage tank (UST) that was used for collection of spent stripper waste. The tank was reportedly removed in 1997 and granted closure by the NYSDEC. Closure documentation was requested from NYSDEC and the 106th RQW, but was not available. The integrity of the former tank at this site was unknown, and there was a potential for spent solvents to have leaked

or overflowed from it in the past. Therefore, Site 10 was investigated during both the 1994 SI and the 2000 – 2001 RI.

The 1994 SI found detections of the volatile organic compound tetrachloroethylene [perchloroethylene (PCE)] in unsaturated subsurface soil samples and groundwater. None of the detected concentrations of PCE exceeded action levels for soil or groundwater. No semivolatile organics were detected. Chromium was detected in subsurface soil, but did not exceed New York State recommended soil cleanup objectives, and was less than the average concentration of chromium in New York State background soils. Chromium in groundwater was attributed to the sampling methodology. The SI identified no contaminants of potential concern (COPCs) in surface soil or groundwater.

Spent stripper contaminant concentrations were detected during the RI at Site 10; however no COPCs were identified in subsurface soil or groundwater. The RI determined that chromium occurs naturally in soils and groundwater at the base, and chromium was therefore eliminated as a COPC. However, the RI identified polynuclear aromatic hydrocarbons (PAHs) and lead as COPCs in surface soil. As part of the RI, a baseline risk assessment was conducted for concentrations of the PAHs benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene and chrysene in surface soil. During the risk assessment, PAHs were eliminated as COPCs since complete exposure pathways were not identified for on-site or off-site receptors. Risks associated with lead in soil were assessed using the U. S. Environmental Protection Agency (EPA) Technical Review Workgroup (TRW) Adult Lead Methodology (ALM), which indicated that lead risks are acceptable at Site 10.

Therefore, based on the current conditions at Site 10, it has been determined that contaminant levels at the site pose no significant risk or threat to public health or the environment. No Further Response Action Planned under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), is required at this site.

Declaration Statement:

This Category III DD has been prepared in accordance with the June 1995 U.S. Air Force NFRAP Guide. According to the June 1995 U.S. Air Force NFRAP Guide, a Category III NFRAP decision is appropriate for a geographically contiguous area or parcel of real property where environmental evidence demonstrates that hazardous substances or petroleum products or their derivatives have been stored, released, or disposed of, but are present in quantities that require no response action to protect human health and the environment. This DD presents the selected action for Site 10 developed in accordance with CERCLA, as amended, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). It also satisfies the requirements of the National Environmental Policy Act (NEPA) that apply to CERCLA response actions. It has been determined that the selected remedy of no further action is protective of human health and the environment, attains federal and state requirements that are applicable or relevant and appropriate, and is cost effective. The statutory preference for further treatment is not applicable because contaminant levels at the site have been determined to present no significant threat to human health or the environment; therefore, no further treatment is necessary.

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New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau A, 11th Floor
625 Broadway, Albany, New York 12233-7015
Phone: (518) 402-9625 • **FAX:** (518) 402-9022
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

September 8, 2005

Mr. Lance McDaniel
Environmental Remediation Branch
Air National Guard/CEVR
3500 Fetchet Avenue
Andrews AFB, MD 20762-5157

RE: Suffolk County Air National Guard Gabreski Airport
Draft Final No Further Response Action Planned Decision Documents
Sites 1, 2, 5, 10, 11, and 12

Dear Mr. McDaniel:

The New York State Department of Environmental Conservation and the New York State Department of Health have reviewed the Site 1, 2, 5, 10, 11, and 12 draft Final No Further Response Action Planned Decision Documents (NFRAP DD) at the Suffolk County Air National Guard Base. The Sites listed above are not listed in the New York State Registry of Inactive Hazardous Waste Disposal Sites.

The State concurs with the findings of the Site 1, Site10, Site 11, and Site 12 Decision Documents, however some revisions will need to be made to the Site 2 and Site 5 documents to reflect consistency with State guidance criteria.

Separate comments will be forwarded for Sites 2 and 5 by the project manager for the site, Ms. Heather Bishop. The State will concur with the Final Site 2 and 5 NFRAP Decision Documents after additional work is completed. If you have any questions, please contact Mr. John Swartwout, of my staff, at (518) 402-9620.

Sincerely,

Chittibabu Vasudevan

Chittibabu Vasudevan, Ph.D., P.E.
Director
Remedial Bureau A

cc: A. Klavans, ANG/CEVR

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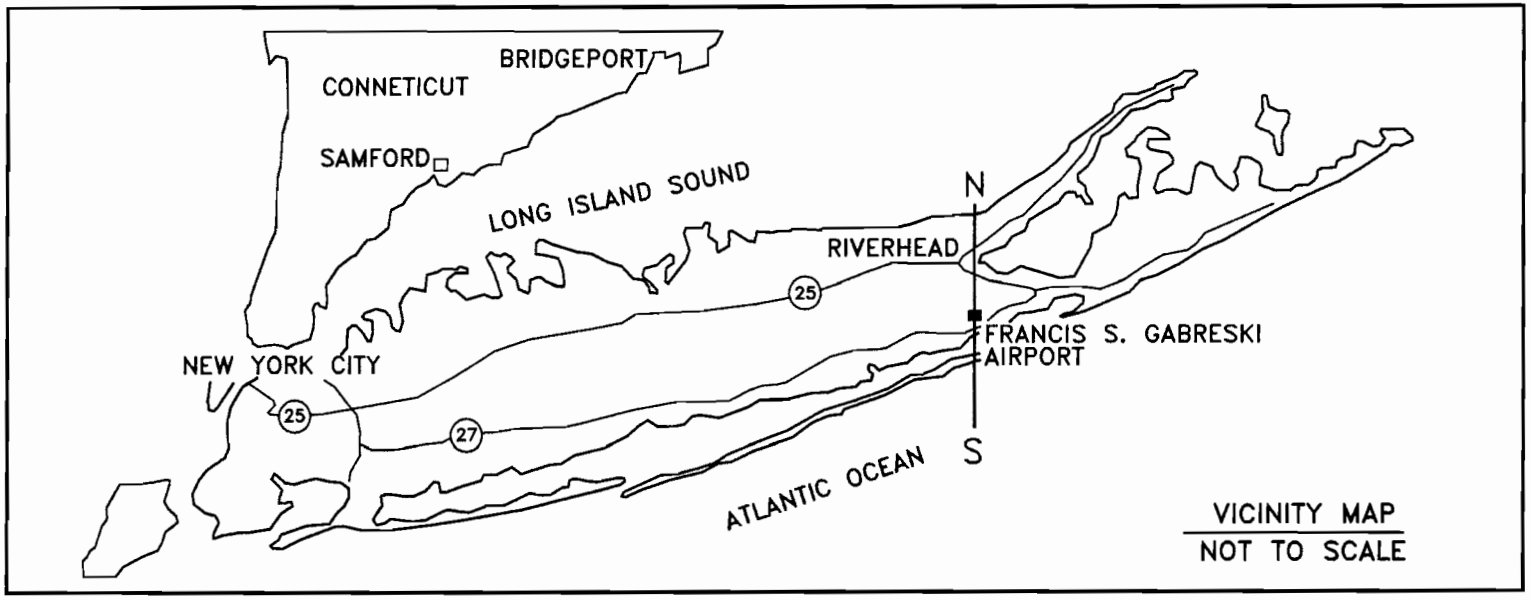
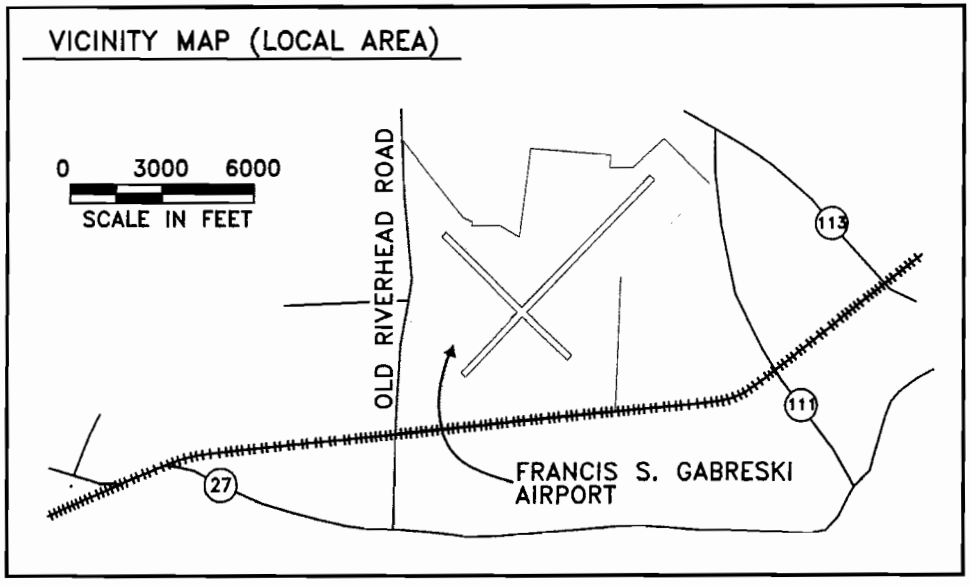
DECISION SUMMARY

1.0 INTRODUCTION

This Decision Document (DD) supports a No Further Response Action Planned (NFRAP) decision for Site 10, the Former Waste Stripper Tank No. 61, Building 370, at the 106th Rescue Wing (RQW), New York Air National Guard (ANG), Francis S. Gabreski Airport, in the town of Westhampton Beach, New York. Francis S. Gabreski Airport is located on the eastern end of Long Island in Suffolk County, New York, as shown on Figure 1.1. Francis S. Gabreski Airport, formerly known as Suffolk County Airport, is on Old Riverhead Road, approximately 2 miles north of the Atlantic Ocean shoreline and the town of Westhampton Beach. As shown on Figure 1.2, Site 10 is located in the east-central portion of the base, on the northwest side of the northern corner of Building 370.

The purpose of this Category III DD (as specified in the June 1995 U.S. Air Force NFRAP Guide) is to summarize the existing data for the site, to evaluate the risk to human health and the environment, and to provide the ANG's rationale for making the NFRAP decision for this site. According to the June 1995 U.S. Air Force NFRAP Guide, a Category III NFRAP decision is appropriate for a geographically contiguous area or parcel of real property where environmental evidence demonstrates that hazardous substances or petroleum products or their derivatives have been stored, released, or disposed of, but are present in quantities that require no response action to protect human health and the environment.





SOURCE: PEER 2003

PEER PROJ./3005-011 GAB3005/Site10 NFRAP/FIG 1.1	FRANCIS S. GABRESKI AIRPORT AND ANG BASE LOCATION 106th RESCUE WING, NEW YORK ANG WESTHAMPTON BEACH, NEW YORK	FIGURE 1.1

Data used to prepare this DD is summarized from the following sources:

- *Phase I Records Search, Suffolk County Air Force Base (Retired)*, by Dames & Moore, 1986;
- *Installation Restoration Program, Phase I – Records Search for 106th Aerospace Rescue and Recovery Group,* Hazardous Materials Training Center (HMTC), 1987;
- *Site Investigation Report, 106th Rescue Group,* by ABB-Environmental Services (ABB-ES), May 1997; and
- *Final Remedial Investigation Report for Sites 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, and 12, 106th Rescue Wing,* by PEER Consultants, P.C. (PEER), June 2004.

A description of Site 10 and its surrounding area is provided in Section 1.1. Information on the history of Site 10, including any enforcement actions, is presented in Section 1.2. Highlights of the base's community participation efforts are presented in Section 1.3. The scope of the response action at the base is discussed in Section 1.4. A discussion of the characteristics of Site 10, including information on the physiography, geologic setting, climatology, and environmental media, the nature and extent of contamination, and receptors at the site, is presented in Section 2.0. An evaluation of the risks to human health and the environment posed by the site are presented in Section 3.0. Section 4.0 presents the selected action for Site 10 and the rationale for the selection of this action. Appendix A provides a list of the references that were used to prepare this DD.

1.1 SITE NAME, LOCATION, AND DESCRIPTION

Sections 1.1.1 through 1.1.5 present an overview of Site 10, including a description of the site; the topography of the area; and information on critical environments, adjacent land uses, and nearby populations. Sections 1.1.6 and 1.1.7 provide information on the general surface water and groundwater resources and surface and subsurface features of the area.

1.1.1 Site Description

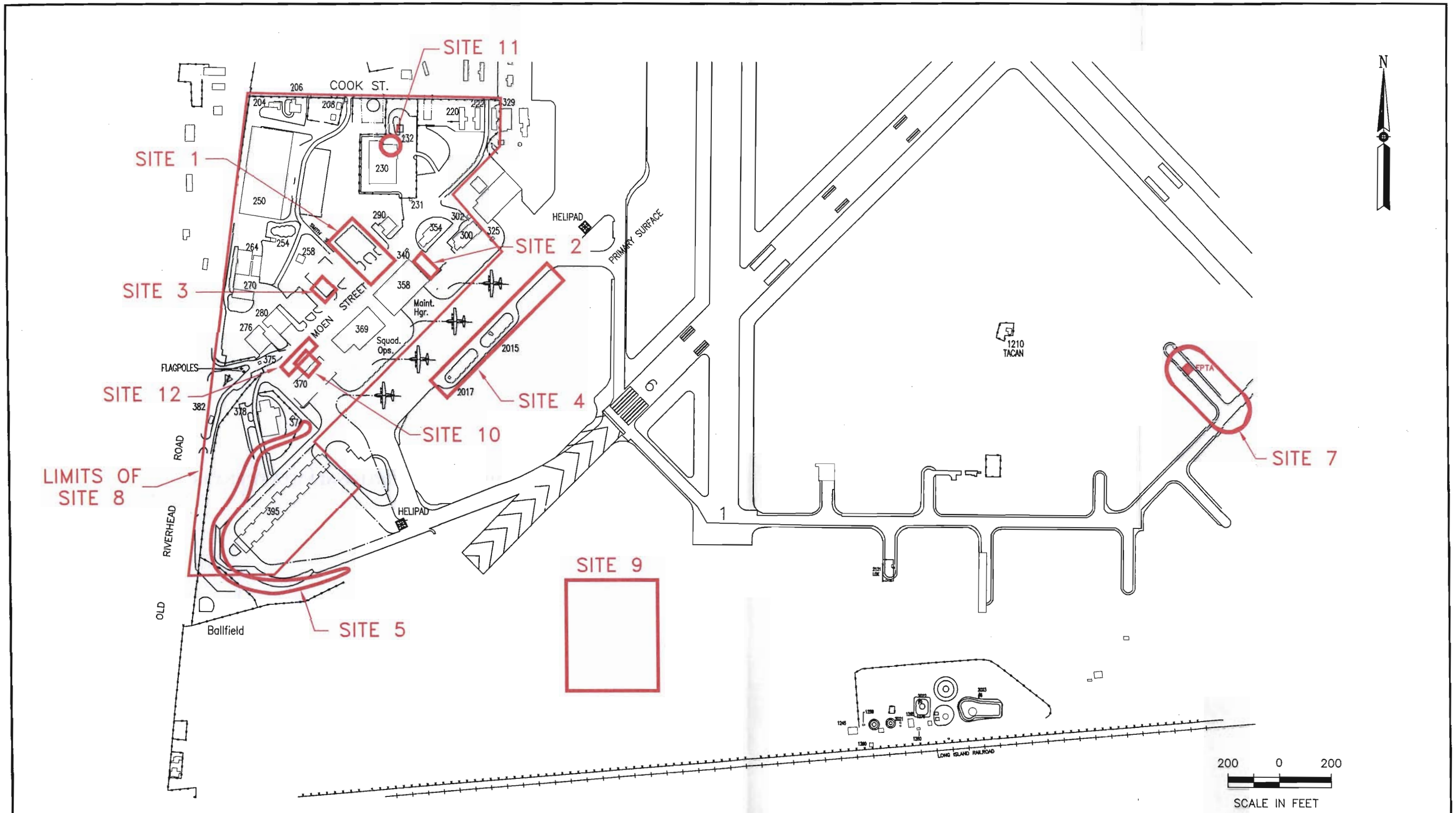
Site 10 – Former Waste Stripper Tank No. 61 is located on the Francis S. Gabreski ANG Base on the northwest side of the northern corner of Building 370. Site 10 consisted of a former 1200-gal underground storage tank (UST) that was located about 10 ft northwest of Building 370. The tank had been used to store spent solvents, but may have contained fuel or oil at one time (ABB-ES 1997). The tank was reportedly removed in 1997 and granted closure by the New York State Department of Environmental Conservation (NYSDEC). Closure documentation was requested from the NYSDEC and the 106th RQW, but was not available. The integrity of the former tank at this site was unknown, and there was a potential for spent solvents to have leaked or overflowed in the past.

1.1.2 Topography

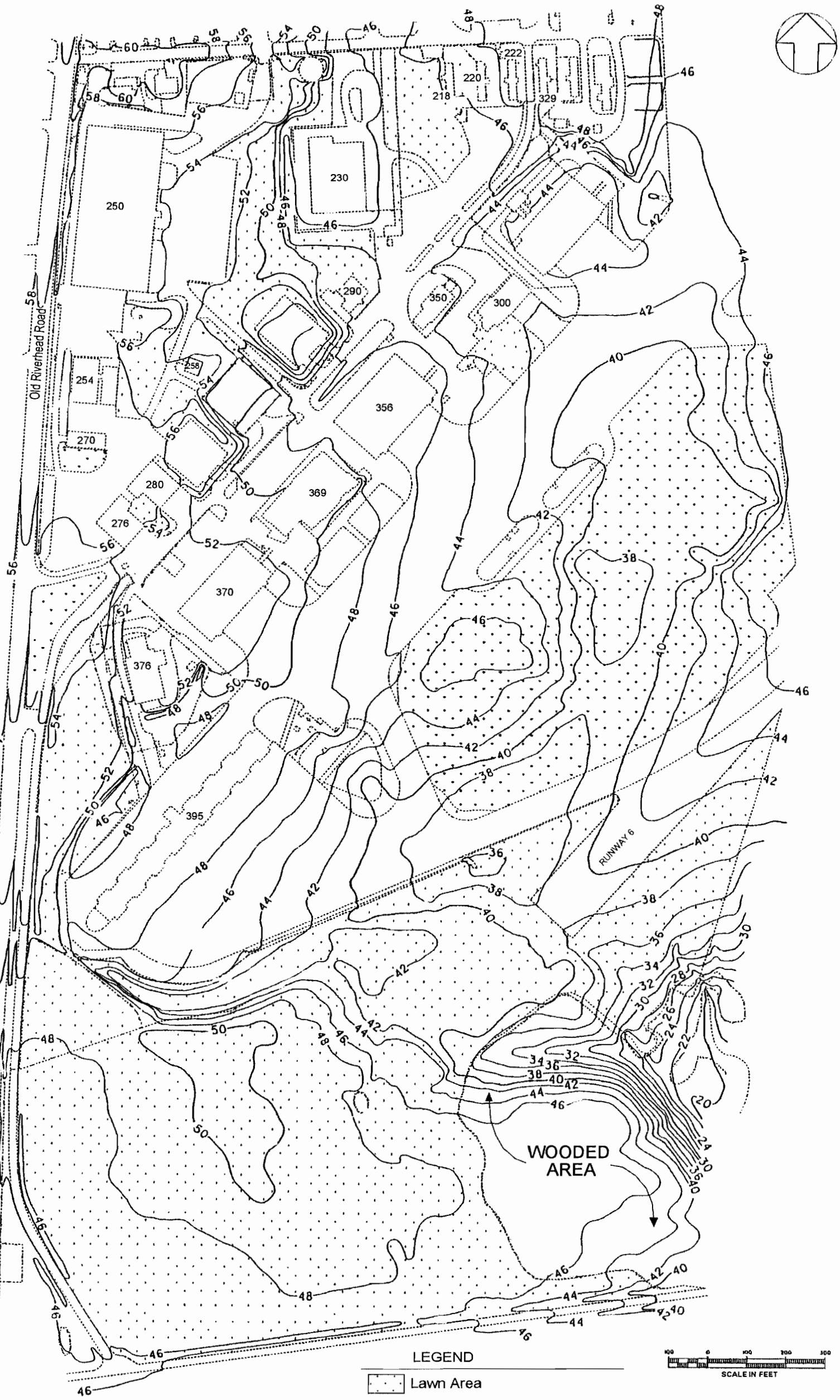
Francis S. Gabreski Airport is situated on a glacial outwash plain south of the Ronkonkoma terminal moraine, which formed during the Wisconsin glaciation. Relief is characteristically flat with subtle rolling terrain and steeper stream channels (ABB-ES 1997). Figure 1.3 shows the topography of the base. Site 10 has little surface relief, being only slightly sloped so as to promote drainage of storm water.

1.1.3 Critical Environments

For the purpose of this DD, critical environments are defined to include all lands and waters that are specifically recognized or managed (by federal, state, or local government agencies or private organizations) as rare, unique, unusually sensitive, or important natural resources. These areas include permanent and seasonal habitats of federally designated endangered species, nature preserves (including federal and state parks), wilderness areas, wildlife sanctuaries, and wetlands, but they do not include parks established solely for historic preservation or recreation.



PEER PROJ./003005.011 GAB3005/NFRAP/SITE10/FIG 1.2	LOCATION OF ERP SITES INCLUDING SITE 10 – WASTE STRIPPER TANK NO. 61, BUILDING 370 106th RESCUE WING, NEW YORK ANG FRANCIS S. GABRESKI AIRPORT WESTHAMPTON BEACH, NEW YORK	FIGURE 1.2



PEER PROJ./003005-011 GAB3005-011/NFRAP/FIG1.3	BASEWIDE TOPOGRAPHY 106 th RESCUE WING, NEW YORK ANG FRANCIS S. GABRESKI AIRPORT WESTHAMPTON BEACH, NEW YORK	FIGURE 1.3

The Francis S. Gabreski Airport is located within the Long Island Pine Barrens which are characterized by open, sunlit woodlands dominated by pitch pine interspersed with white and scarlet oak. In the immediate area of the airport, the Pine Barrens are characterized by a transition from 30 to 80 ft tall pitch pines. The Quogue Wildlife Refuge, adjacent to the east side of the airport, is characterized by dwarf pitch pines ranging from 3 to 6 ft tall. The airport is surrounded by wooded areas consisting of 25 ft pitch pines and scattered scrub oak (Dames & Moore 1986).

The following are the Threatened and Endangered species potentially located within a 4-mile radius of the site (ABB-ES 1997):

- Northern Harrier (*Circus cyaneus*)
- Osprey (*Pandion haliaetus*)
- Tiger Salamander (*Ambystoma tigrinum tigrinum*)
- Eastern Mud Turtle (*Kinosteron subrabrum subrubum*)

A more detailed description of the vegetation and animal life in the area is provided in the Phase I Records Search (Dames & Moore 1986).

1.1.4 Adjacent Land Uses

The Francis S. Gabreski Airport is owned by Suffolk County. The airport is bounded to the north by undeveloped land, to the east by the Quogue Wildlife Refuge, to the south by the Long Island Railroad (LIRR), and to the west by Old Riverhead Road. As of July 8, 1958, the airport occupied approximately 2500 acres of relatively flat terrain (Anthony J. Vasell, pers. comm. 2001). The *Francis S. Gabreski Airport Master Plan* reports the current area of the airport as 1,486 acres (Latino 2002). The 106th RQW leases approximately 70 acres of runways, hangars, and maintenance/service facilities near the southwest corner of the airport. The airport surrounds the base on all sides except the west, where the base is adjacent to Old Riverhead Road. Further to the west, across Old Riverhead Road, is a mixed area of undeveloped Pine Barrens, residential

areas, and small businesses. To the south, across the LIRR, is an area of mixed industrial, business, and residential properties.

1.1.5 Nearby Populations

The base has a total population of over 900 employees (during unit training assembly weekends), which includes nearly 300 full-time staff, and over 600 traditional Guardsmen. The base is located about 2 miles northwest of the center of the town of Westhampton Beach, New York. The population of the Westhampton Beach area is approximately 1,900 people (PEER 2000).

1.1.6 General Surface Water and Groundwater Resources

Surface Water Resources

Surface water is not a significant resource at the base. The nearest surface water is Aspatuck Creek, which is not used for drinking water. Aspatuck Creek flows through the Quogue Wildlife Refuge, which is adjacent to the airport on the east.

Groundwater Resources

Groundwater is the only water supply source for Suffolk County. The majority of the public water supply in Westhampton Beach area is obtained from the Upper Glacial Aquifer; while the rest is obtained from the Magothy and Lloyd aquifers. Hydrogeology is discussed further in Section 2.6.

At present, Suffolk County Water Authority supplies the majority of the water in the Westhampton Beach area; the rest is supplied by several smaller companies. Suffolk County Water Authority operates 18 wells in 4 well fields within a 4-mile radius of the site, and their nearest public supply well field is located 0.61 miles southeast of Francis S. Gabreski Airport. Table 1.1 provides information pertaining to the public drinking water supply wells. Figure 1.4 shows the location of identified public drinking water supply wells.

Table 1.1
Public Drinking Water Supply Well Information
106th Rescue Wing
New York Air National Guard
Westhampton Beach, New York

Well Field Identification	Distance from Site (miles)	Aquifer Tapped	Well Number	Screened Interval (ft BGS)	Total Depth (ft BGS)	Population Served (Approximate)
Meeting House Road	0.6	Upper Glacial	20	55-75	78	6,500
			22	74-104	104	
			15A	31-51	53	
Quogue-Riverhead Road	1.2	Magothy	1	386-447	449	2,200
Spinny Road	1.7	Upper Glacial	1	85-115	118	190
			2	118-158	163	
Old Country Road	2.2	Upper Glacial	1	60-75	76	1,800
			2	NA	70	
			3	128-157	161	

Source: Dames & Moore 1986
BGS Below Ground Surface
NA Not available

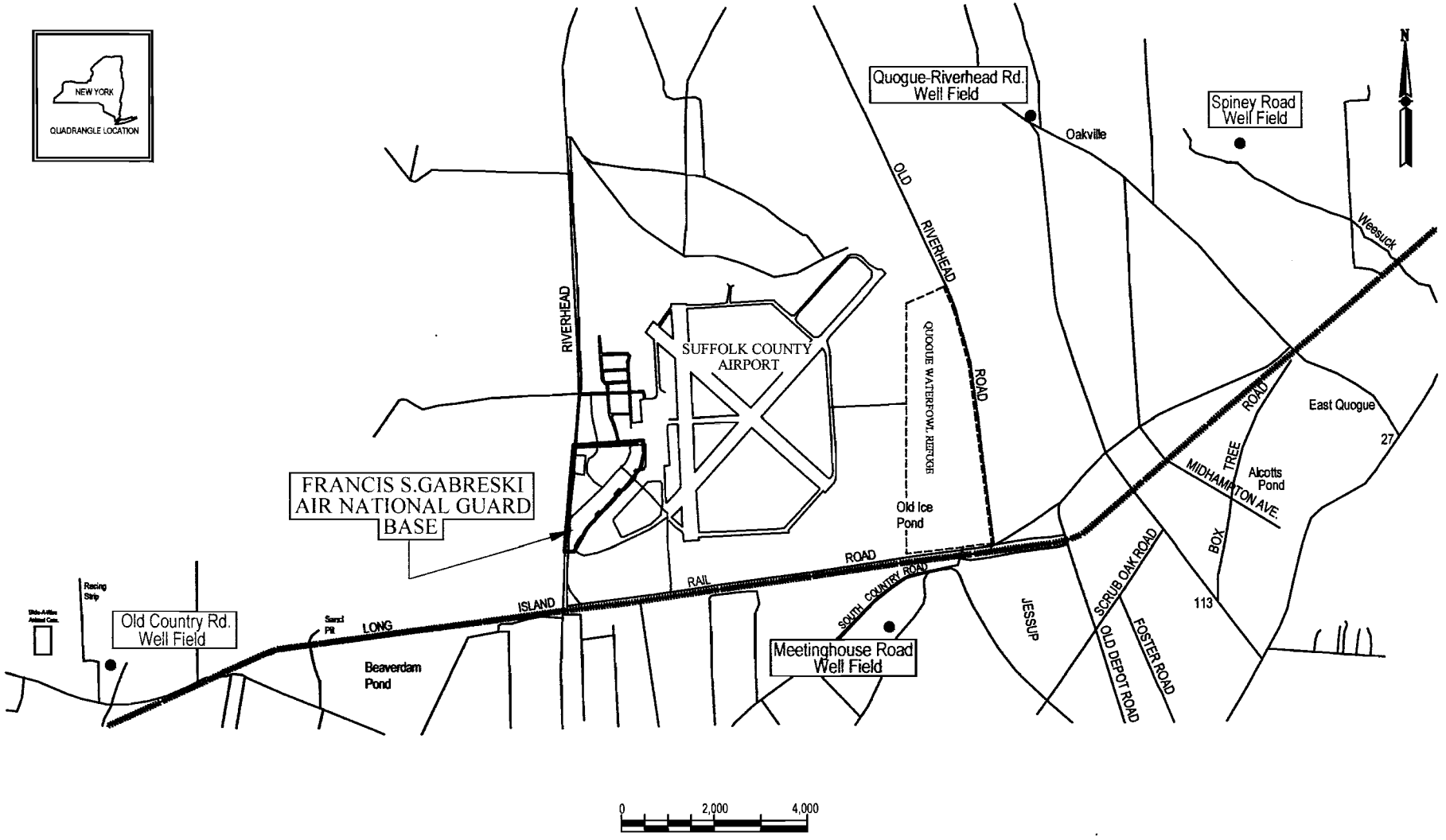
A number of domestic water wells are located within 1 mile of the base boundary, south of the airport (ABB-ES 1997). Due to concerns about groundwater contamination from Site 6 (the Petroleum, Oils and Lubricants Facility), most or all of the residences utilizing private water wells were provided with access to the public water supply through the Suffolk County Water Authority in the early- to mid-1980s (Anthony J. Vasell, pers. comm. 2003).

1.1.7 Surface and Subsurface Features

Aside from underground utilities such as water, electric and sanitary sewer, no subsurface features, or structures are believed to exist at Site 10. The site is located directly adjacent to Building 370, on the northwest side of the building, near the building's northern corner.

1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Sections 1.2.1 and 1.2.2 present a history of Site 10. Further details concerning analytical results of soil and groundwater samples are provided in Section 2.4.



SOURCE: USGS 7.5 minute series quadrangle maps for Eastport and Quogue, New York dated 1956

PEER PROJ./003005-011 GAB3005/NFRAP/SITE10/FIG 1.4	PUBLIC DRINKING WATER SUPPLY WELL LOCATIONS 106th RESCUE WING, NEW YORK ANG FRANCIS S. GABRESKI AIRPORT WESTHAMPTON BEACH, NEW YORK	FIGURE 1.4

1.2.1 Site History

Site 10 is the location of former waste stripper storage tank No. 61. The tank was reportedly removed in 1997 and granted closure by the NYSDEC, although no closure documentation was available. When the tank was in use, spent stripper solvents were stored in it, and may have escaped through leaks or overflows.

The site was not addressed in the Phase I Records Search (Dames & Moore 1986). This site was added to the Environmental Restoration Program (ERP) (then known as the Installation Restoration Program) in 1992, after completion of the Phase I Assessment (ABB-ES 1997). A Site Investigation (SI) was performed in 1994 (ABB-ES 1997), and Remedial Investigation (RI) field work was completed by PEER in 2001 (PEER 2004).

1.2.2 Regulatory Agency Involvement

There is no history of Environmental Protection Agency (EPA) involvement at Site 10. The NYSDEC has been involved in the planning of the 2000 - 2001 RI activities, review, and revision of plans and reports, and approval of final documents. There have been no enforcement activities at Site 10, and there are no permits or agreements that govern response action at the site. Since the UST was reportedly granted closure by the NYSDEC, a spill number has likely been assigned to the site, but no documentation is currently available.

1.3 COMMUNITY PARTICIPATION

A Community Relations Plan (CRP) was completed for the base in April 1999. The final versions of the CRP and all other ERP documents are available for public review at the Westhampton Beach Public Library.

1.4 SCOPE OF RESPONSE ACTION

Section 1.4.1 describes the SI, completed in 1994. Section 1.4.2 describes the most recent response activity, the RI completed in 2001.

1.4.1 1994 Site Investigation

The SI at Site 10 was performed by ABB-ES from August to December, 1994 (ABB-ES 1997). In May 1997, ABB-ES submitted the *Site Investigation Report* documenting the results of their 1994 field activities. The 1994 SI activities included direct-push soil and groundwater sampling and analyses.

To investigate the suspected release of stripper waste, and to assess the possible impact of liquids from the former 1200-gal UST on subsurface soils and groundwater, four direct-push soil borings were performed during the 1994 SI. The borings were designated as DP-073 through DP-076. Three of the borings were completed at 30 ft below ground surface (BGS) and the fourth (DP-075) was completed at 60 ft BGS. Action levels used during the SI included:

- NYSDEC Recommended Soil Cleanup Objectives (RSCOs), as per the NYSDEC Technical Assistance Guidance Memorandum (TAGM # 4046, NYSDEC 1994);
- Upper Limits of Background Concentrations (ULBCs), as calculated by ABB-ES, following NYSDEC guidelines set forth in the Technical and Operational Guidance Series (TOGS, NYSDEC 1991);
- New York State (NYS) Class GA Groundwater (TAGM # 4046, NYSDEC 1994), and
- Federal Maximum Contaminant Levels (MCLs), as set forth by the EPA (EPA 1995).

Tables 1.2 and 1.3 summarize the analytes detected above action limits at Site 10 in soil and groundwater, respectively. Figure 1.5 presents the sample locations from the 1994 SI, and includes soil and groundwater results that exceeded action levels.

Chromium and tetrachloroethylene [perchloroethylene (PCE)] were detected in subsurface soil and groundwater samples. PCE did not exceed its NYSDEC action level in either soil or groundwater. No semivolatile organic compounds, including those typically associated with solvent or fuel contamination, were detected in soil samples collected from this site.

Table 1.2
1994 Site Investigation
Direct-Push Subsurface Soil Sample Results
Chromium Concentrations Exceeding Action Level
106th Rescue Wing, New York Air National Guard
Westhampton Beach, New York

Sample Location	Depth (ft BGS)	NYSDEC RSCO	ULBC	Chromium Concentration
DP-074	12 – 14	10 or SB	0.84	1.4

Notes:
BGS Below Ground Surface
NYSDEC New York Department of Environmental Conservation
RSCO Recommended Soil Cleanup Objectives
SB Site Background
ULBC Upper Limit of Background Concentrations
Source: *Site Investigation Report*, ABB-ES 1997.
All concentrations in mg/kg

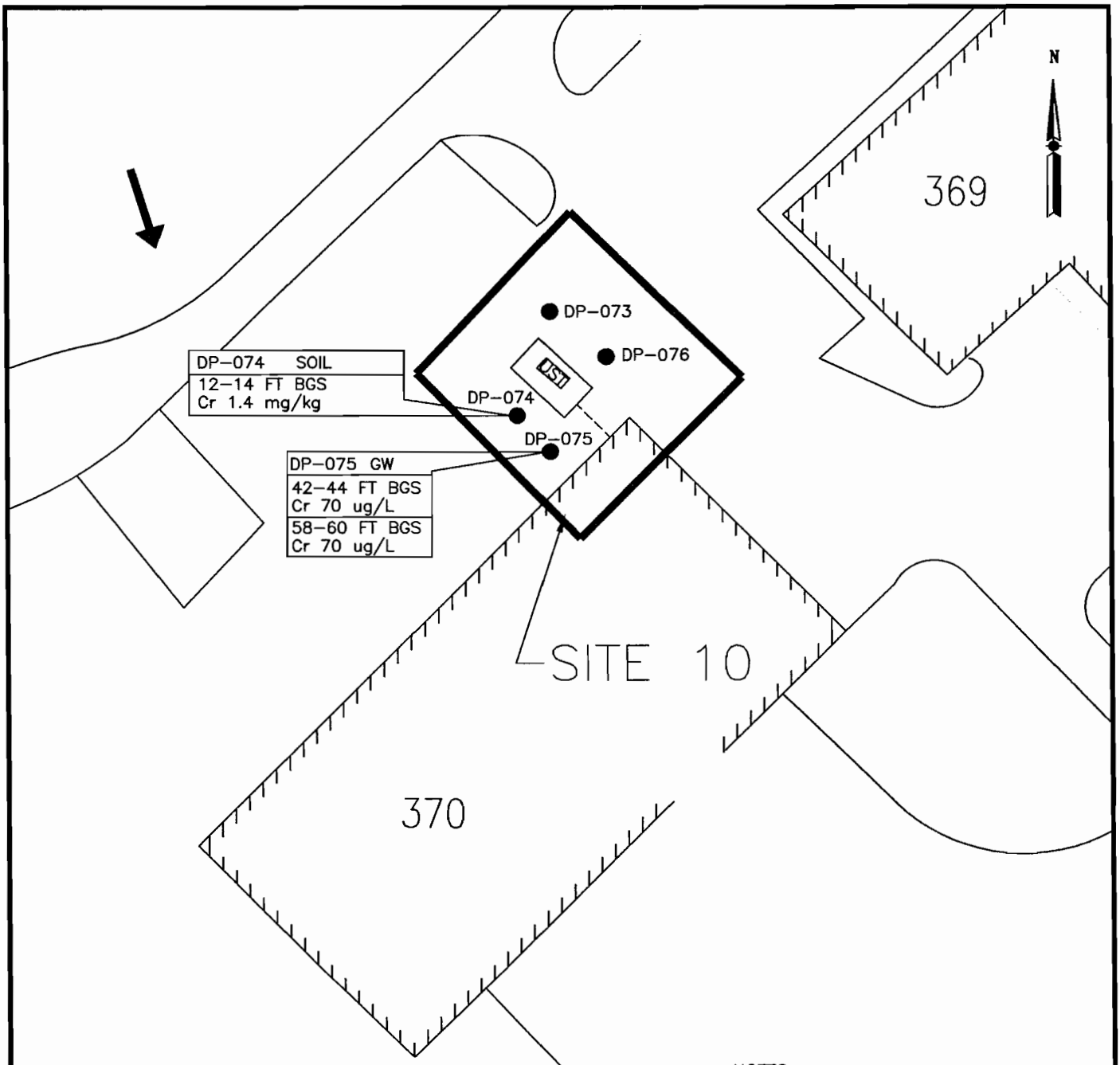
Table 1.3
1994 Site Investigation
Direct-Push Groundwater Sample Results
Chromium Concentrations Exceeding Action Level
106th Rescue Wing, New York Air National Guard
Westhampton Beach, New York

Sample Location	Depth (ft BGS)	MCL[a]	NYSDEC Action Level[b]	Chromium Concentration
DP-075	42 – 44	100	50	70
DP-075	58 – 60	100	50	70

Notes:
a) Federal Maximum Contaminant Level
b) NYS Class GA Groundwater
BGS Below Ground Surface
Source: *Site Investigation Report*, ABB-ES 1997.
All concentrations in mg/L.

Chromium was the only analyte detected above action levels in subsurface soils collected from Site 10 during the 1994 SI. The chromium concentration of 1.4 mg/kg exceeded the ULBC of 0.84 mg/kg. However, the level detected was below the average range of concentrations detected in NYS background soils. The SI concluded that chromium in soils was naturally occurring (ABB-ES 1997).

PCE was detected in three unsaturated soil samples at 7, 14, and 16 ft BGS, and in groundwater. PCE was not detected in soil samples collected at 30 ft BGS, which the 1994 SI suggested that the overlying soils may not be the source of PCE in groundwater at Site 10. None of the detected concentrations of PCE exceeded applicable guidance levels (ABB-ES 1997).



LEGEND

- ● DIRECT PUSH BORING
- BGS BELOW GROUND SURFACE
- GW GROUNDWATER
- → APPROXIMATE GROUNDWATER FLOW DIRECTION (12/94)

NOTES:

1. INORGANIC COMPOUND RESULTS FOR SUBSURFACE SOIL COMPARED TO BACKGROUND LEVELS (ABB-ES 1997)
2. GROUNDWATER RESULTS COMPARED TO FEDERAL AND NEW YORK STATE DRINKING WATER STANDARDS.

50 0 50

SCALE IN FEET

SOURCE: ABB-ES, 1997

PEER PROJ./003005-011 GAB/DF NFRAP/SITE10/FIG1.5	SITE 10 – 1994 SITE INVESTIGATION DIRECT PUSH SOIL AND GROUNDWATER RESULTS 106th RESCUE WING, NEW YORK AIR NATIONAL GUARD FRANCIS S. GABRESKI AIRPORT WESTHAMPTON BEACH, NEW YORK	FIGURE 1.5

Chromium was the only analyte detected above NYS Class GA groundwater action levels, but did not exceed the Federal MCL. Because samples were collected from a direct-push boring, and not from a properly installed monitoring well, the 1994 SI attributed the chromium detections to sampling methodology, which caused high levels of suspended sediments (ABB-ES 1997). The 1994 SI recommended no further action at Site 10.

1.4.2 2000-2001 Remedial Investigation

The most recent response action was the performance of an RI which was conducted by PEER in 2000 and 2001. The 2000 - 2001 RI activities at Site 10 were intended to:

- Determine the presence or absence of chromium contamination in subsurface soils;
- Define the extent of chromium contamination in soils, if detected;
- Determine the presence of PCE and lead contamination in subsurface soils;
- Determine the presence or absence of chromium contamination in both shallow and deep groundwater;
- Define the extent of chromium contamination in groundwater, if detected.
- Determine the presence of PCE contamination in both shallow and deep groundwater; and;
- Screen surface soil, subsurface soil, and groundwater for any contaminants of potential concern (COPCs).

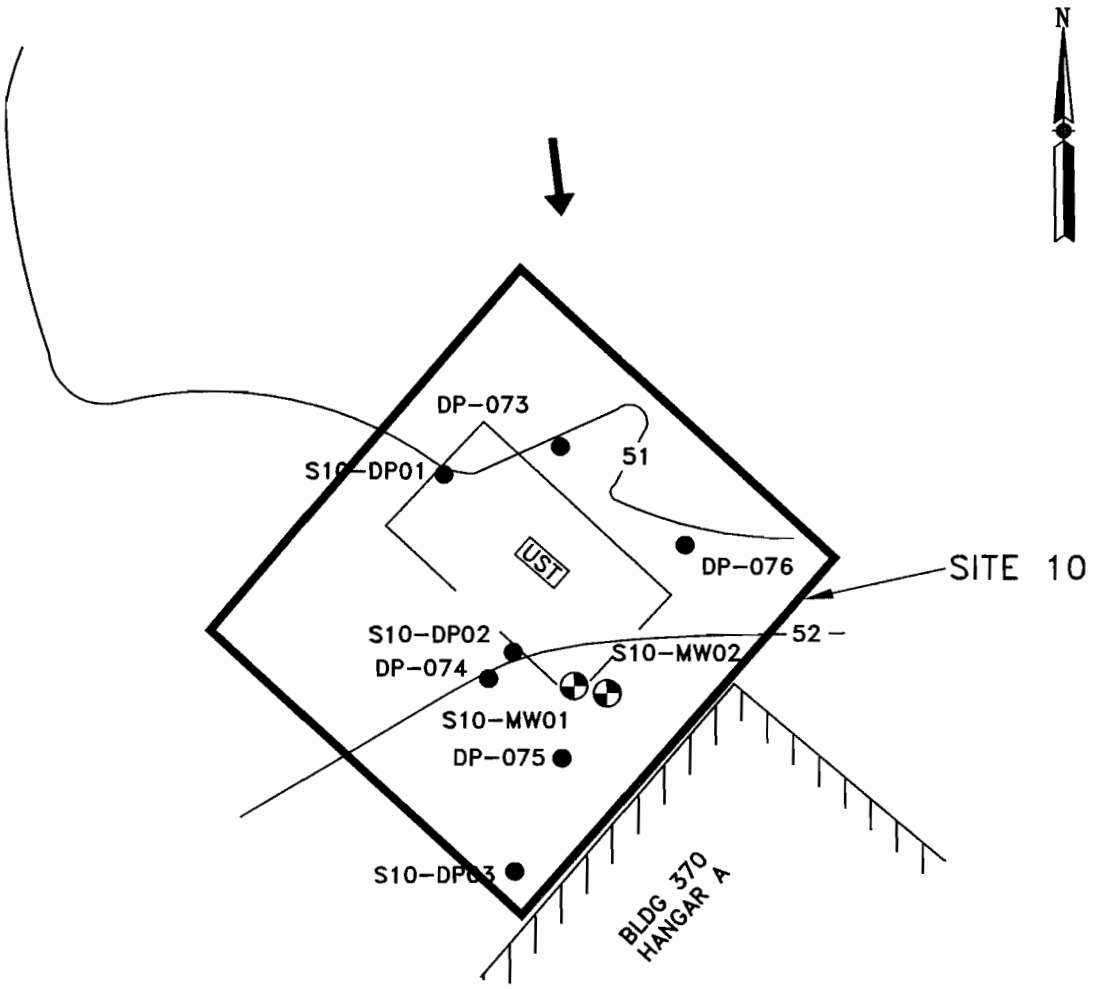
During the 2000 - 2001 RI field investigation of Site 10, three direct-push borings were sampled for soil and groundwater, one surface soil sample was collected, and two new monitoring wells were installed and sampled. The samples collected at Site 10 are summarized in Table 1.4, and sample locations are shown on Figure 1.6.

Table 1.4
Summary of 2000 - 2001 Remedial Investigation
Samples Collected and Analyses Performed
Francis S. Gabreski ANG Base
Westhampton Beach, New York

Date	Sample ID	Ft BGS	Type	BTEX-F	BTEX-B	VOCs	SVOCs	Metals	DRO	GRO	CH_4	Alkalinity	Chloride	SO_4
11/19/00	GAB-10-DP03-01	0 to 2	Soil Probe	X		X	X	X						
11/19/00	GAB-10-DP03-02	39 to 42	Soil Probe	X		X	X	X						
11/19/00	GAB-10-DP03-SS01	0 to 0.25	Soil Surface	X		X	X	X						
11/19/00	GAB-10-PW03-01	39 to 43	GW Screening	X		X	X							
11/20/00	GAB-10-DP01-01	0 to 2	Soil Probe	X		X	X	X						
11/20/00	GAB-10-DP01-02	35 to 38	Soil Probe	X		X	X	X						
11/20/00	GAB-10-DP02-01	0 to 2	Soil Probe	X		X	X	X						
11/20/00	GAB-10-DP02-21	0 to 2	Soil Probe	X		X	X	X						
11/20/00	GAB-10-PW01-01	38 to 42	GW Screening	X		X	X							
11/21/00	GAB-10-DP02-02	35 to 38	Soil Probe	X		X	X	X						
11/21/00	GAB-10-PW02-01	38 to 42	GW Screening	X		X	X							
1/30/01	GAB-10-SB01-01	0 to 2	Soil Split Spoon			X	X	X						
1/30/01	GAB-10-SB01-02	16 to 18	Soil Split Spoon			X	X	X						
1/30/01	GAB-10-SB01-03	38 to 40	Soil Split Spoon			X	X	X						
2/14/01	GAB-10-S10MW01-01	38 to 47	GW Monitoring		X	X	X	X	X	X	X	X	X	X
2/14/01	GAB-10-S10MW02-01	60 to 75	GW Monitoring			X	X	X						
5/25/01	GAB-10-S10MW01-02	38 to 46	GW Monitoring		X	X	X	X	X	X	X	X	X	X
5/25/01	GAB-10-S10MW02-02	60 to 75	GW Monitoring			X	X	X						
5/25/01	GAB-10-S10MW02-22	60 to 75	GW Monitoring			X	X	X						

Notes:

BGS	Below Ground Surface
BTEX-F	Field screening analyses for Benzene, Toluene, Ethylbenzene and Xylenes
BTEX-B	Laboratory analyses for Bioremediation Parameters Benzene, Toluene, Ethylbenzene and Xylenes
VOCs	Volatile Organic Compounds
SVOCs	Semi-volatile Organic Compounds
PCBs	Polychlorinated Biphenyls
DRO	Diesel Range Organics
GRO	Gasoline Range Organics
CH_4	Methane
SO_4	Sulfate
X	Analysis Performed



LEGEND

- DIRECT PUSH BORING
- NEW MONITORING WELL
- 47 — GROUND SURFACE CONTOUR ELEVATIONS (FT ABOVE MEAN SEA LEVEL)
- UST — FORMER UST LOCATION
- APPROXIMATE GROUNDWATER FLOW DIRECTION (12/94)

20 0 20
SCALE IN FEET

SOURCE: EWELL W. FINLEY P.C. SURVEYORS, 2001, AND ABB-ES, 1997

PEER PROJ./003005-011 GAB/DF NFRAP/SITE10/FIG1.6	SITE 10 - 2000-2001 REMEDIAL INVESTIGATION - LOCATIONS OF MONITORING WELLS AND DIRECT PUSH BORINGS 106th RESCUE WING, NEW YORK AIR NATIONAL GUARD FRANCIS S. GABRESKI AIRPORT WESTHAMPTON BEACH, NEW YORK	FIGURE 1.6

Three direct-push borings were installed as follows:

- S10-DP01 was located near the center of the former UST pit, and advanced to the top of the water table, to a total depth (TD) of 38 ft BGS.
- S10-DP02 was located slightly downgradient of the former UST, and advanced to the top of the water table, to a TD of 38 ft BGS.
- S10-DP03 was located about 20 ft downgradient (southeast) of the former UST, and advanced to the top of the water table, to a TD of 42 ft BGS.

Soil samples were collected from the direct-push borings using a 4-ft Strata Probe™ direct-push sampling device. Sample collection commenced at the surface and proceeded continuously to completion of the borings. Field screening was performed using a photoionization detector (PID). There were no significant detections of organic vapors during field screening with the PID. Eight soil samples were collected from the three direct-push borings for PID field screening, geologic description, screening analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX), and confirmatory laboratory analysis of volatile and semivolatile organic compounds, and Target Analyte List (TAL) metals. Analytical samples were collected from the surface (one sample), the shallow zone (four samples), and the top of the saturated zone (three samples). Three direct-push groundwater samples were collected from the three borings, and submitted for screening analysis of BTEX and confirmatory laboratory analysis of volatile and semivolatile organics.

Two new monitoring wells, designated S10-MW01 and S10-MW02, were installed at Site 10:

- Shallow monitoring well S10-MW01 was installed about 10 ft downgradient (southeast) of the former UST to monitor the top of the groundwater, and was screened from 31 to 46 ft BGS.
- Deep monitoring well S10-MW02 was installed as a pair to the shallow well. This well was screened below the top of the saturated zone from 60 to 75 ft BGS.

Soil boring S10-SB01, advanced for the installation of monitoring well S10-MW01, was sampled for geologic description and PID screening. Three split-spoon samples were analyzed for volatile and semivolatile organics and TAL metals. The new deep and shallow monitoring wells were developed, purged, and sampled in Rounds 1 and 2 for volatile and semivolatile organic compounds, and TAL metals. Well S10-MW01 was sampled for bioremediation monitoring parameters in both rounds. Bioremediation parameters analytes included BTEX, total petroleum hydrocarbons – gasoline-range organics/diesel-range organics (TPH-GRO/DRO), alkalinity, chloride, methane, and sulfate. No previously existing monitoring wells were located or sampled at Site 10. The results of the 2000 – 2001 RI soil investigation at Site 10 are presented in Section 2.4, and the results of the RI groundwater investigation are provided in Section 2.7.

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2.0 SUMMARY OF SITE CHARACTERISTICS

Section 2.0 provides a summary of the characteristics of Site 10, including information on the physiography, geology, hydrogeology, surface water hydrology, soil, climatology, environmental media, the nature and extent of contamination, and receptors at the site (Dames & Moore 1986).

2.1 PHYSIOGRAPHY

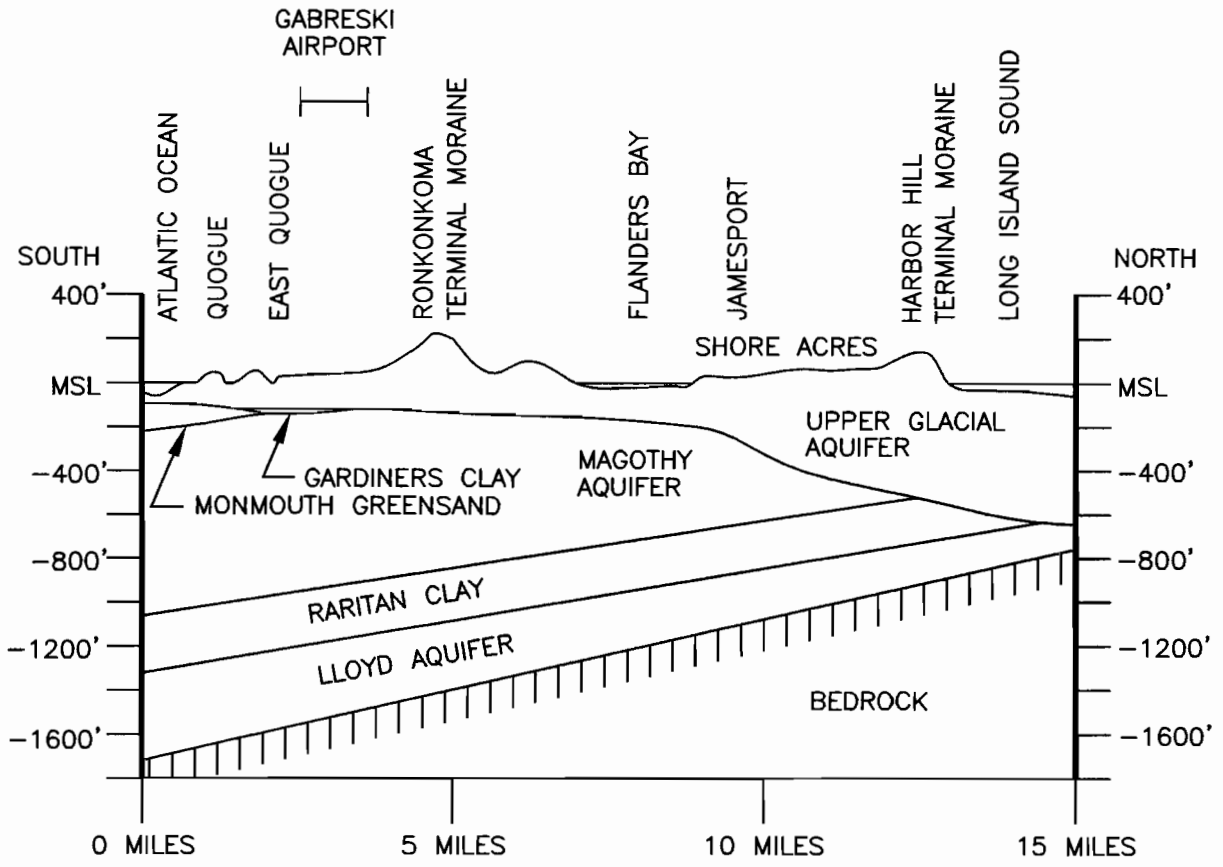
The base is located on the eastern end of Long Island. Long Island is included in the Atlantic Coastal Plain physiographic province. The island is characterized by glacial landforms related to the Wisconsin Glaciation. The island is located at the southern limit of glaciation, and exhibits a series of terminal moraines, which form low hills running from the west-southwest to the east-northeast, along the spine of the island. The base is located on the gently sloping outwash plain formed south of the terminal moraines when the glaciers retreated northwards, and melt water flowed southward towards the Atlantic Ocean. The melt water carried sand and gravel sediment southwards, and deposited it as a stratified outwash plain. The outwash plain slopes southward from the terminal moraine to the bays and barrier islands along the Atlantic Ocean shoreline.

2.2 GEOLOGY

Five unconsolidated formations occur at Francis S. Gabreski Airport. These units dip generally to the south, with the thicker units very widespread and underlying most of Suffolk County. Figure 2.1 depicts the regional stratigraphy using a north-south-trending cross-section of the geologic formations present. The cross-section location is shown on Figure 1.1.

2.2.1 Upper Glacial Deposits

The upper Pleistocene glacial deposits are of greatest importance in regards to Site 10. These deposits form the soil surface across the base, makeup all of the subsurface soils of interest regarding Site 10, and form the matrix for the Upper Glacial Aquifer, described in Section 2.6.1.



SOURCE: ABB-ES 1997

SCALE: 1 IN = APPROXIMATELY 3 MILES

PEER PROJ./003005-011 GAB3005/NFRAP/SITE10/FIG2.1	REGIONAL STRATIGRAPHY AND HYDROGEOLOGY 106th RESCUE WING, NEW YORK ANG FRANCIS S. GABRESKI AIRPORT WESTHAMPTON BEACH, NEW YORK	FIGURE 2.1

The unconsolidated sediments are composed of glacial outwash deposits; lacustrine and marine deposits; and terminal, ground, and ablation-moraine till deposits. The sediments at the airport are mostly outwash deposits consisting of stratified fine to coarse sand and gravel of light- to dark-brown, tan, and yellowish-brown color. The sand consists primarily of sub- to well-rounded quartz, with trace amounts of feldspar and rare lithic fragments. The gravel is also primarily quartz, with slightly higher proportions of feldspar and lithic fragments. The sediments are framework supported, loose to dense, with little or no cement or interstitial material. Approximately 100 to 120 ft of these sediments are found below the airport and above the underlying Gardiners clay. Till deposits known as the Ronkonkoma Terminal Moraine are expressed as hills approximately 2 miles north of the base.

2.3 SOIL CHARACTERISTICS

Descriptions of the soil associations and characteristics at Site 10 are presented in Sections 2.3.1 and 2.3.2, respectively.

2.3.1 Soil Associations

Surface soils in the vicinity of the airport belong to either the Riverhead-Plymouth-Carver Association or the Plymouth-Carver Association. These soil associations are characteristically similar, with only subtle variations between them. The former occurs over 95 % of the installation, and is characterized by deep, nearly level to gently sloping, well-drained to excessively drained, moderately coarse textured and coarse-textured soils. The latter is generally rolling and hilly, with deep excessively well drained, coarse-textured soils on moraines. These glacially derived soils have characteristically low soil moisture content, are unsuitable for most agricultural purposes, and support limited types of native vegetation (Dames & Moore 1986).

2.3.2 Soil Descriptions

The soils encountered during the 2000 - 2001 RI direct-push and hollow-stem auger (HSA) borings conformed to the description of Riverhead-Plymouth-Carver Association glacial outwash

sands and to descriptions reported in previous investigations. Sieve analyses of four Shelby tube samples collected during the 2000 - 2001 RI found sand from 76.8 % to 95.4 %, gravel from 1.3 % to 14.6%, and fines (silt/clay) from 2.3 % to 8.6 % (PEER 2004). Permeability (k) for the tested soils ranged from 1.27×10^{-1} centimeters per second (cm/sec) from 4 to 6 ft BGS at Site 1, to 1.76×10^{-2} cm/sec from 20 to 21.5 ft BGS at Site 2. Natural soil density ranged from 90.3 to 96.1 pounds per cubic ft (lbs/ft^3) dry, and from 94.8 to 103.6 lbs/ft^3 wet. Overall, the soils are well-sorted medium sands, with some gravel and traces of fines (PEER 2004). The geology of the soils encountered during the 2000 - 2001 RI is described below .

The primary stratigraphic unit of interest at the base is the Pleistocene-age Upper Glacial Sand and Gravel. This unit consists of unconsolidated sands and gravels deposited as glacial outwash during the Wisconsin glaciation. This is the only unit that outcrops locally, and makes up the entire native surface soils found at the site. The surface soils are well drained to excessively drained and moderately-coarse to coarse, with low soil moisture content. The Upper Glacial sediments are well sorted, very porous, and highly permeable. These soils and sediments cause a high proportion of precipitation to infiltrate without significant runoff. The Upper Glacial unit is from 100 to 120 ft thick at the site.

The Gardiners Clay underlies the upper glacial unit in the vicinity of the Francis S. Gabreski Airport and the base. This unit is approximately 40 ft thick, and consists of clay, silt, and clayey and silty sand. Consequently, the Gardiners Clay has lower permeability than the Upper Glacial unit and the underlying Magothy formation, and forms an aquitard between these units. The Gardiners Clay was not encountered in 2000 - 2001 RI soil borings (PEER 2004).

Sand

The sands encountered were commonly medium, with some coarse and fine, and rarely very fine sands. The sands were commonly well sorted, with some poorly sorted and often contained trace to common amounts of fine to coarse gravel. Sand densities were commonly loose to very loose from the surface to about 20 to 25 ft BGS; with some medium dense sands from 25 ft to 40 ft. BGS. Moisture content was low in the vadose zone, with surface soils being dry, followed by

slightly moist soils starting approximately 1 to 2 ft BGS, extending downward to about 2 ft above saturation. Moist soils were rarely encountered more then 2 ft above the top of saturation. The capillary zone was usually less than 2 ft in thickness. Saturation was encountered at 36 to 39 ft BGS at Site 10. Bedding was sub-horizontal to horizontal, consistent with glacial outwash sands. Well-sorted coarse sand with traces of fine gravel was found occasionally, while fine to very fine sands were rare, and were often more moist and compact than adjacent medium sand layers (PEER 2004).

Gravel

Gravel occurred at trace to common frequency in medium to coarse, poorly to well sorted sands. Soils containing gravel were mostly gravely sands, with rare sandy gravels. Gravel was commonly fine to large in size, with rare cobbles. Gravel was usually poorly sorted, well rounded to sub-spherical, and rarely sub-angular to angular (PEER 2004).

Silt and Clay

Silts were very rare, usually occurring in the subsurface as isolated, thin layers of silty sand and clayey silty sand mixtures. Pure silts and sandy silts were extremely rare. Topsoil usually contained some silt, which was limited to the upper 0.5 ft BGS. Clay was extremely rare in native soils, and only occurred as isolated, thin layers of clayey silty sand (PEER 2004).

2.4 SOIL CONTAMINATION INVESTIGATION RESULTS

The soil investigation activities conducted during the 2000 - 2001 RI at Site 10 are described in Section 1.4.2. Figure 1.6 depicts the 2000 - 2001 RI sampling locations and results. The findings of the soil investigation at Site 10 are discussed in the following subsection.

2.4.1 Geologic Results

Geologic information at Site 10 was obtained from three direct-push borings and two HSA well borings. Typical light gray to pale yellow medium sand with some gravel and traces of fine and coarse sand were encountered at Site 10. Possible fill material was encountered at direct-push boring S10-DP01 from 12 to 13 ft BGS and from 0 to 9.5 ft BGS at S10-DP03. Rare iron staining was noted. No odors, chemical stains, or elevated PID readings were noted from any of the soil borings. Depths to the top of saturation ranged from 37 ft BGS at S10-DP01 to 38.2 ft BGS at S10-DP03. Groundwater elevations were consistent with those recorded during the basewide groundwater investigation. Vertical gradients between the deep and shallow monitoring wells were insignificant.

2.4.2 Soil Screening Samples

During direct-push sampling, soil-screening samples were submitted for expedited turnaround time analysis of BTEX at the on-site field laboratory. No BTEX compounds were detected in any of the samples. The soil samples were also screened during using the PID, with no significant organic vapors detected.

2.4.3 Confirmatory Soil Samples

Confirmatory soil samples were collected at Site 10 from three direct-push borings, S10-DP01, S10-DP02, and S10-DP03; and well borings S10-SB01. The samples were analyzed for volatile and semivolatile organic compounds, and TAL metals. The results of the volatile and semivolatile organic compound confirmatory soil analyses are summarized on Table 2.1. The sample analyses showed that:

- No volatile organic compounds were detected in soil samples, other than acetone and methylene chloride, both of which were considered laboratory-introduced contaminants, as described in Appendix J of the *Final RI Report* (PEER 2004).

Table 2.1
2000-2001 Remedial Investigation
Confirmatory Soils Analytical Results
Volatile and Semivolatile Organics
106th Rescue Wing, New York Air National Guard
Westhampton Beach, New York

Parameter	Action Levels[a]		Sample Location/Depth/Type, and Concentration										
	Saturated [b]	Unsaturated [b]	SB01-01 (0-2 ft) -U	SB01-02 (16-18 ft) -U	SB01-03 (38-40 ft) -S	DP01-01 (0-2 ft) -U	DP01-02 (35-38 ft) -S	DP02-01 (0-2 ft) -U	DP02-21 (0-2 ft) -U	DP02-02 (35-38 ft) -S	DP03-SS01[c] (0-0.2 ft) -SS	DP03-01 (0-2 ft) -U	DP03-02 (39-42 ft) -S
Volatile Organic Compounds (µg/kg)													
Toluene	15	1500	2 BJ	ND	ND	ND	ND	ND	ND	6 J	ND	ND	ND
Total Xylenes	12	1200	4 BJ	ND	2 BJ	ND	ND	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/kg)													
Acenaphthene	330	50,000	ND	ND	ND	ND	10 J	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	330	300	**2300**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	330	1100	**2200**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	330	1100	**1400 J**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(ghi)perylene	8000	50,000	340 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	330	330	**1500 J**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	4350	50,000	530 J [d]	98 J [d]	2200 [d]	ND	220 BJ [d]	ND	ND	ND	ND	94 J [d]	69 J [d]
Chrysene	400	400	**2200**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	19,000	50,000	1800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ideno(1,2,3-cd)pyrene	32	3200	480 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	360	36,000	ND	ND	ND	ND	28 J	ND	ND	ND	ND	ND	ND
Phenanthrene	2200	50,000	ND	ND	ND	ND	38 J	ND	ND	ND	ND	ND	ND
Pyrene	6650	50,000	2600	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

a) Recommended Soil Cleanup Objectives, NYSDEC, TAGM 4046.
b) Soil sample type: SS = surface soil; S = saturated (soil in direct contact with groundwater); U = unsaturated (greater than 5 ft above the water table).
c) Location "DP0X-SS0X" refers to surface soil sample at direct-push location 0X, at depth specified in feet below ground surface (BGS): DP01-SS01 is direct-push surface soil sample (first sample) at location DP01 at depth of 0-0.3 ft BGS.
d) Detected concentrations are less than 10 times the detection limit of the associated laboratory method blank sample, and are therefore considered laboratory contamination; see Appendix J of the *Final RI Report* (PEER 2004).

B Analyte is also found in associated blank.
J Estimated value.
ND Not detected.
-- No applicable Action Level.
Shading and bolding indicate exceedance of Action Levels.

- The PAHs (semivolatile organic compounds) benzo(a)anthracene, benzo(b)fluoranthene, and chrysene were detected above NYSDEC Action Levels in the soil interval of 0 to 2 ft BGS from S10-SB01. This sample was collected directly beneath asphalt, a potential source of PAHs. Benzo(k)fluoranthene and benzo(a)pyrene were also detected above NYSDEC Action Levels, but the concentrations were estimated values. The semivolatile organic bis(2-ethylhexyl)phthalate (BEHP) was detected at S10-SB-01 in the soil interval from 38 to 40 ft BGS at a concentration of 2200 µg/kg, but was below the NYSDEC saturated soil RSCO of 4350 µg/kg. Other BEHP detections were considered sampling artifacts, as discussed in Appendix J of the *Final RI Report* (PEER 2004).

Table 2.2 summarizes the results of the TAL metals analysis for confirmatory soil samples at Site 10. Sample locations where analytes exceeded action levels at Site 10 are shown on Figure 2.2. TAL metals analyses showed that:

- Chromium was detected above the ULBC in the saturated soil interval of 38 to 40 ft BGS from S10-SB01, but did not exceed the NYSDEC RSCO. Chromium was determined to be naturally occurring during the RI, based on background sample results (PEER 2004).
- Lead was detected above the ULBC and RSCO in the shallow soil sample from S10-SB01. The concentration detected did not exceed the surface soil concentration from the background site.
- Lead was detected above the ULBC and RSCO in the surface and shallow soil samples at S10-DP03. The concentrations detected did not exceed the concentration from the background site.
- Lead was detected in the subsurface soil interval from 39 to 42 ft BGS at S10-DP03, but did not exceed the ULBC for subsurface soil.

2.5 SURFACE WATER HYDROLOGY

The topography of the Francis S. Gabreski Airport area is such that surface water runoff flows in a southerly and southeasterly direction. The majority of precipitation at the airport percolates

Table 2.2
2000-2001 Remedial Investigation
Confirmatory Soils Analytical Results-Metals
106th Rescue Wing, New York Air National Guard
Westhampton Beach, New York

Parameter	Action Levels		Sample Location/Depth [a] Concentration										
	NYSDEC [b] RSCO	BKG [c] or ULBC [d]	SB01-01 (0-2 ft)	SB01-02 (16-18 ft)	SB01-03 (38-40 ft)	DP01-01 (0-2 ft)	DP01-02 (35-38 ft)	DP02-01 (0-2 ft)	DP02-21 (0-2 ft)	DP02-02 (35-38 ft)	DP03-SS01 (0-0.25 ft)	DP03-01 (0-2 ft)	DP03-02 (39-42 ft)
Metals (mg/kg)													
Aluminum	SB	33,000	2600	290	470	800	263	620	500	340	2800	2400	163
Barium	300 or SB	15 - 600	6.8	1.2	3.2	2.8	1.0	1.2	1.3	1.7	11	4.8	ND
Calcium	SB	130 - 35,000	850	ND	ND	ND	ND	ND	ND	ND	2400	260	ND
Chromium	10 or SB	6.1/0.84 [d]	4.5	ND	**2.9**	ND	ND	ND	ND	ND	5.1	2.8	ND
Copper	25 or SB	1 - 50	4.8	2.5	2.6	ND	ND	ND	ND	ND	9.1	2.9	ND
Iron	2000 or SB	2000 - 550,000	3000 E	1200 E	1100 E	1800	460	770	910	720	3500	2200	320
Lead	SB [e]	4.4/2.7 [d, e]	**9.0**	ND	ND	ND	ND	ND	NA	ND	**29**	**7.5**	0.69
Magnesium	SB	100 - 5000	310	34	120	91	64	100	83	74	500	210	35
Manganese	SB	50 - 5000	30	13	23	33	7.2	16	9.9	16	31	12	2.1
Vanadium	150 or SB	1 - 300	6.2	1.3	1.6	2.7	ND	1.6	1.6	2.0	7.7	4.8	ND
Zinc	20 or SB	9 - 50	11	2.0	3.1	6.2	2.6	2.8	2.8	2.8	39	11	3.4

Notes:

a) Location "DP0X-SS0X" refers to surface soil sample at direct-push location 0X, at depth specified in feet below ground surface (BGS): DP03-SS01 is direct-push surface soil sample (first sample) at location DP03 at depth of 0-0.25 ft BGS. Location "DP0X-0X" refers to sample number collected at location DP0X, at depth specified in ft BGS; DP02-02 is the second direct-push sample collected from location DP02 at a depth of 35 - 38 ft BGS.

b) New York State (NYS) Recommended Cleanup Objectives, NYSDEC, TAGM #4049.

c) Eastern USA Background, NYSDEC, TAGM #4049.

d) Upper limits of background concentration for surface/subsurface metals in soils; see Section 6.0.

e) Background levels for lead vary widely. Average levels in undeveloped, rural areas may range from 4 to 61 ppm (mg/kg). Average background levels in metropolitan or suburban areas or near highways are much higher and typically range from 200 to 500 ppm (mg/kg) (TAGM #4046).

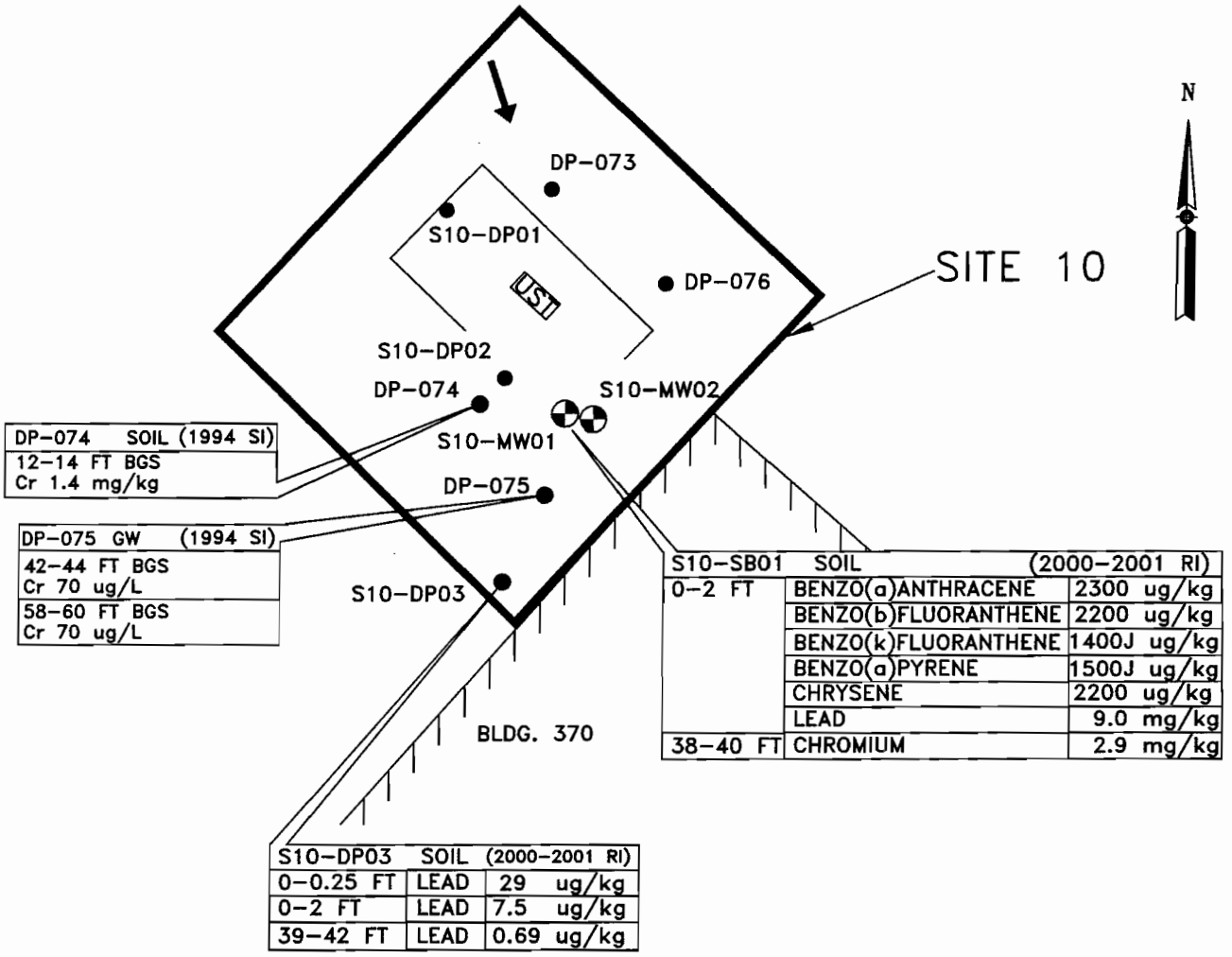
E Estimated value or not reported due to the presence of interferences.

ND Not detected.

SB Soil background

-- No applicable Action Level.

Shading and bolding indicate exceedance of Action Levels.



LEGEND

- DIRECT PUSH BORING
- NEW MONITORING WELL
- UST FORMER UST LOCATION
- APPROXIMATE GROUNDWATER FLOW DIRECTION (05/01)
- J ESTIMATED CONCENTRATION

NOTES:

(1) NYSDEC TAGM #4046

(2) INORGANIC COMPOUND RESULTS FOR SUBSURFACE SOIL COMPARED TO BACKGROUND LEVELS (ABB-ES 1997)

(3) GROUNDWATER RESULTS COMPARED TO FEDERAL AND NEW YORK STATE DRINKING WATER STANDARDS.

ACTION LEVELS			
ANALYTE	SURFACE SOIL(1) (mg/kg)	SUBSURFACE SOIL(1) (mg/kg)	SOIL(1) (UNSATURATED) (ug/kg)
LEAD	4.4	2.7	–
CHROMIUM	6.1	0.84	–
BENZO(a)ANTHRACENE	–	–	300
BENZO(b)FLUORANTHENE	–	–	1100
BENZO(k)FLUORANTHENE	–	–	1100
BENZO(a)PYRENE	–	–	330
CRYSENE	–	–	400

20 0 20
SCALE IN FEET

SOURCE: EWELL W. FINLEY P.C. SURVEYORS, 2001, AND ABB-ES, 1997

PEER
PROJ./003005-011
GAB/DF NFRAP/SITE10/FIG 2.2

SITE 10 - 2000-2001 REMEDIAL INVESTIGATION - DIRECT PUSH SOIL AND GROUNDWATER SAMPLE RESULTS
106th RESCUE WING, NEW YORK AIR NATIONAL GUARD
FRANCIS S. GABRESKI AIRPORT
WESTHAMPTON BEACH, NEW YORK

FIGURE 2.2

into the extremely well drained soil and moves in the subsurface aquifers although some may move short distances as runoff.

The limited surface water run off from the base drains to Aspatuck Creek located near the southeast corner of the airport. Aspatuck Creek flows into Quantuck Bay, a tidal estuary which is separated from the Atlantic Ocean by a narrow barrier island (ABB-ES 1997).

In the vicinity of Site 10, run off occurs during precipitation events due to the presence of asphalt and concrete paving, but no sediment is generated. Surface run off is channeled by the storm sewer system to nearby unpaved surface areas, where it infiltrates rapidly. Consequently, there is no surface water or sediment associated with Site 10. Therefore, no surface water or sediment sampling was performed in association with Site 10.

2.6 HYDROGEOLOGY

Three aquifers and two aquitards are present in the region around the Francis S. Gabreski Airport. Overlying the bedrock is the Lloyd Aquifer. The Lloyd Aquifer correlates to the Lloyd sand member of the Raritan formation. Overlying the Lloyd is the Raritan clay member, an aquitard which is the upper member of the Raritan formation. Overlying the Raritan clay is the Magothy aquifer, a water-bearing unit which correlates to the Magothy formation. Overlying the Magothy is the Gardiners Clay, an aquitard present beneath and south of the airport. Overlying the Gardiners Clay Aquitard at the airport and overlying the Magothy north of the airport is the Upper Glacial Aquifer, a predominantly sand and gravel unit deposited during the Wisconsin glaciation (Dames & Moore 1986).

The Upper Glacial Aquifer and Gardiners Clay Aquitard are of the greatest hydrogeologic interest with respect to Site 10. General characteristics of the hydrogeologic units present are summarized on Table 2.3. Since they are of the most interest, the hydrologic properties of the Upper Glacial Aquifer and the Gardiners Clay Aquitard are further discussed below.

Table 2.3
Hydrologic Properties of Regional Aquifers
106th Rescue Wing, New York Air National Guard
Westhampton Beach, New York

Unit	Texture	Thickness (ft)	Hydraulic Conductivity (gpd/ft^2) (cm/s)	Estimated Transmissivity (gpd/ft) (cm^2/s)
Upper Glacial	Sand and gravel	120	2,000 (9.4 x 10^{-2})	200 (2.9 x 10^{-1})
Gardiners Clay	Clay and silt	40	Aquitard	Aquitard
Magothy Formations	Sand, clayey sand	930	380 (1.8 x 10^{-2})	300 (4.5 x 10^{-1})
Raritan Clay	Clay and silt	200	Aquitard	Aquitard
Lloyd Sand	Sand and gravel	400	300 (1.4 x 10^{-2})	75 (1.1 x 10^{-1})
Bedrock	Granitic gneiss	--	Aquiclude	Aquiclude

Source: Dames & Moore 1986, and ABB-ES 1997.

2.6.1 Upper Glacial Aquifer

This aquifer correlates to the saturated interval of the glacial outwash deposits of the Wisconsin glaciation. This water-bearing unit is an unconfined (water table) aquifer present in the upper glacial sediments beneath the base and airport. Groundwater elevations are approximately 15 to 19 ft above the National Geodetic Vertical Datum, but may fluctuate due to seasonal variations.

The clean, coarse sand and gravel of this unit is very porous and highly permeable. It makes a porous soil, so that a high proportion of rainfall infiltrates where it falls, and there is virtually no surface runoff. The unit stores large quantities of water and, due to high porosity and permeability, yields large quantities of water to wells. The Upper Glacial Aquifer is the source of nearly all the groundwater pumped in central Suffolk County. There are no effective barriers to the movement of water anywhere in the unit, but there may be substantial variation in permeability over short distances. Hydraulic conductivity of the glacial deposits was estimated to be about 2000 gpd/ft^2 (9.4 x 10^{-2} cm/s) (ABB-ES 1997), and transmissivity is approximately 200 gpd/ft (2.9 x 10^{-1} cm^2/s) (Dames & Moore 1986).

The direction of groundwater movement within the Upper Glacial Aquifer at the base is toward the south-southeast. Depth to groundwater averages 35 to 40 ft BGS. Slug tests performed on base monitoring wells and piezometers, screened in the upper glacial aquifer, indicated hydraulic conductivities ranging from 1.6 x 10^{-2} to 5.2 x 10^{-2} cm/sec (Dames & Moore 1986). A

potentiometric surface map for the area of the base, based on measurements recorded during the 2000 – 2001 RI on May 15-16, 2001, is shown on Figure 2.3 (PEER 2004). The upward gradient of groundwater from the underlying Magothy Aquifer would cause the Upper Glacial Aquifer groundwater to flow horizontally toward surface water discharge points. Migration of contaminants downward into lower aquifers is very unlikely (Dames & Moore 1986).

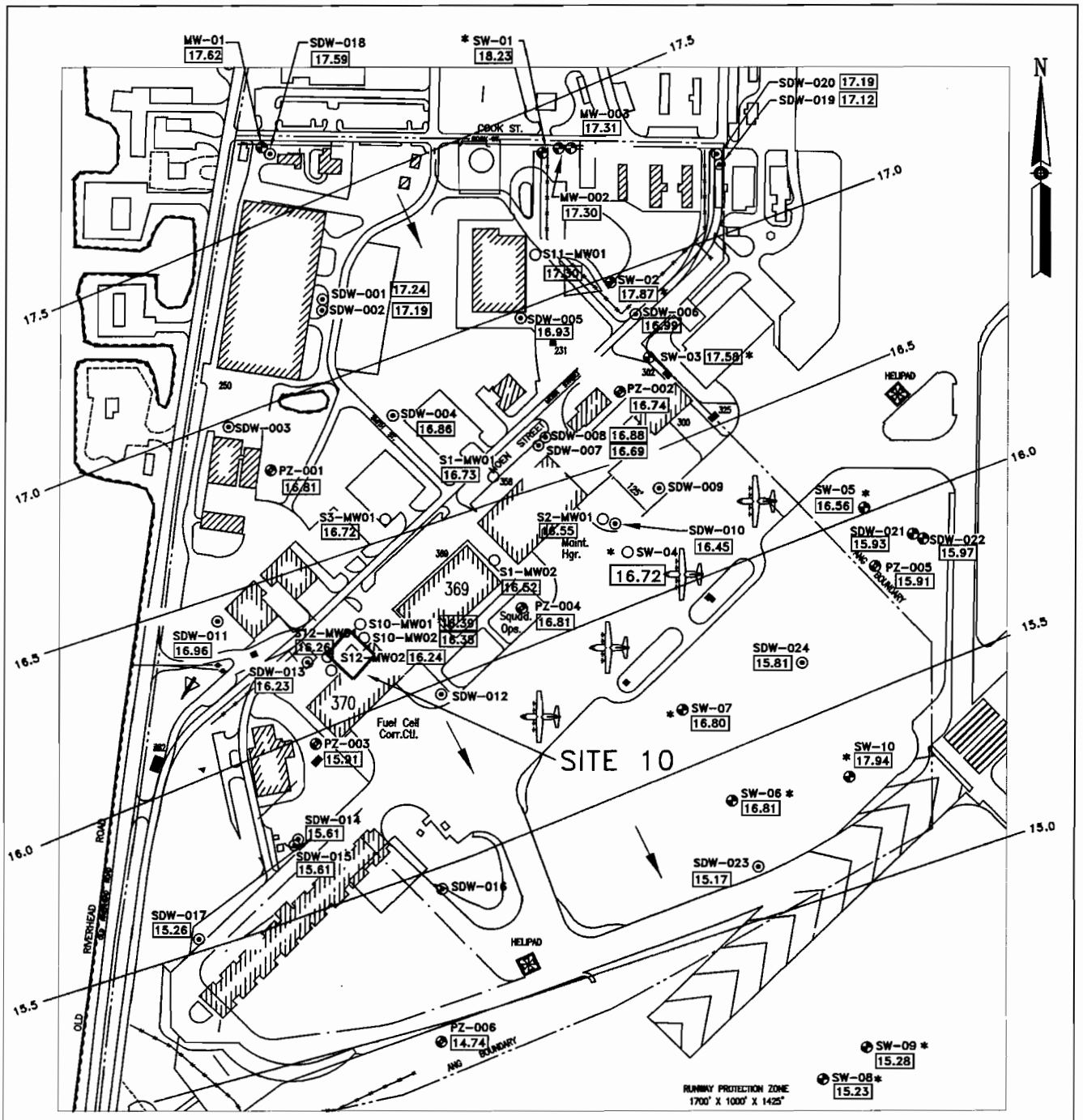
2.6.2 Gardiners Clay

This clay is poorly permeable and acts as an aquitard between the Upper Glacial Aquifer and the underlying Magothy Aquifer. The Gardiners Clay also constitutes a confining layer for the Magothy aquifer, which has a potentiometric surface above that of the Upper Glacial Aquifer. At the base, the beds of clay and sand within the Gardiners clay are an effective barrier to the movement of groundwater to and from the lower aquifers. The combination of low permeability, with the generally upward movement of water within the Magothy aquifer tends to prevent downward migration of contamination from the Upper Glacial Aquifer into the lower aquifers (Dames & Moore 1986).

2.7 GROUNDWATER CONTAMINATION INVESTIGATION RESULTS

During the SI completed in 1994, chromium was detected at a concentration that exceeded the NYSDEC action level, but below the Federal MCL, in two groundwater-screening samples collected from direct-push boring DP-075. The 1994 SI results were summarized in Section 1.4.1. Chromium was subsequently determined to be naturally occurring during the RI, and was not considered a COPC.

The 2000 - 2001 RI groundwater investigation included collection of both screening and confirmatory groundwater samples, as discussed below in Sections 2.7.1 and 2.7.2. Screening and confirmatory samples were collected from direct-push borings S10-DP01, S10-DP02, and S10-DP03, and two rounds of confirmatory groundwater samples were collected from newly installed monitoring wells S10-MW01 and S10-MW02.



LEGEND

- PRE-EXISTING SMALL DIAMETER WELL
- PRE-EXISTING WELL
- PRE-EXISTING PIEZOMETER
- NEW MONITORING WELL (RI, 2000-2001)
- 15.5 POTENTIOMETRIC SURFACE CONTOUR
- GROUNDWATER FLOW DIRECTION
- 12.51 GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL
- * INDICATES GROUNDWATER ELEVATION IS CONSIDERED ANOMALOUS AND THE WELL WAS EXCLUDED IN CONSTRUCTING CONTOURS

0 200 400
SCALE IN FEET

SOURCE: BASE MAP AND ABB-ES, 1997

NOTE: WELL LOCATIONS APPROXIMATE

PEER

PROJ./003005-011

GAB3005/NFRAP/SITE10/FIG 2.3

BASEWIDE POTENTIOMETRIC SURFACE MAP, MAY 15-16, 2001
106th RESCUE WING, NEW YORK AIR NATIONAL GUARD
FRANCIS S. GABRESKI AIRPORT
WESTHAMPTON BEACH, NEW YORK

FIGURE 2.3

2.7.1 Groundwater Screening Samples

During direct-push sampling, groundwater screening samples were submitted for expedited turnaround time analysis of BTEX at the on-site field laboratory. No BTEX compounds were detected in the groundwater screening samples.

2.7.2 Direct-Push Confirmatory Groundwater Samples

Direct-push groundwater confirmatory samples were collected from direct-push borings S10-DP01, S10-DP02, and S10-DP03, and submitted for confirmatory analysis of volatile and semivolatile organic compounds. As summarized on Table 2.4, benzene was detected in sample PW02-01 from boring S10-DP02 at a concentration of 2 µg/L, exceeding the NYSDEC Action Level of 0.7 µg/L, but less than the Federal MCL of 5 µg/L. However, the direct-push detection of benzene was not confirmed by subsequent Site 10 groundwater monitoring samples. PCE was detected in PW03-01 from boring S10-DP03, but did not exceed action levels. No other compounds were detected above the action levels in the direct-push groundwater confirmatory samples.

2.7.3 Groundwater Monitoring Samples

Groundwater monitoring samples were collected from newly installed monitoring wells S10-MW01 and S10-MW02 during Rounds 1 and 2, and analyzed for volatile organic compounds, semivolatile organic compounds, and TAL metals. Additionally, Round 1 and 2 samples were collected from S10-MW01 for analysis of bioremediation indicator parameters, including BTEX, TPH-DRO/GRO, methane, alkalinity, chloride, and sulfate. The analytical results for volatile and semivolatile organic compounds, and metals in groundwater monitoring samples at Site 10 are summarized in Tables 2.5 and 2.6, respectively. No volatile organic compounds or TAL metals were detected above the action levels. The semivolatile organic compound BEHP was detected, but is considered a sampling artifact. BEHP is discussed further in the RI Report (PEER 2004).

Table 2.4
2000 – 2001 Remedial Investigation
Direct-Push Confirmatory Groundwater Samples –Analytical Results
Volatile and Semivolatile Organic Compounds
106th Rescue Wing, New York Air National Guard
Westhampton Beach, New York

Parameter	Action Levels		Location Depth and Concentration [a]		
	NYS [b]	MCL [c]	PW01-01 (38-42 ft)	PW02-01 (38-42 ft)	PW03-01 (39-43 ft)
Volatile Organic Compounds (µg/L)					
Benzene	0.7	5	ND	2	ND
Carbon Disulfide	50	--	0.4 J	ND	0.4 J
Chloromethane	--	--	ND	0.4 J	ND
Tetrachloroethene (PCE)	5	5	ND	ND	1
Semivolatile Organic Compounds (µg/L)					
Benzyl Alcohol	--	--	0.3 J	ND	ND
Di-n-octyl phthalate	50 [d]	--	2 J	ND	ND

Notes:
a) Location "PW0X-0X" refers to sample number collected at location PW0X, at depth specified in ft BGS; PW01-01 is the first direct-push sample collected from location DP01 at a depth of 38-42 ft BGS.
b) New York State (NYS), Class GA Groundwater; NYSDEC TAGM #4046.
c) Maximum Contaminant Level (MCL), United States Environmental Protection Agency.
d) Guidance values.
J Estimated value.
NA Not analyzed.
ND Not detected.
PCE Tetrachloroethylene (perchloroethylene).
-- No applicable Action Level.

No BTEX compounds or TPH-GRO were detected in the bioremediation samples from S10-MW01 during either round. TPH-DRO was detected in S10-MW01 during Round 1 at 0.16 mg/L, but was not detected during Round 2. NYSDEC has no action level for TPH-DRO.

2.8 CLIMATE

The average annual rainfall in the Westhampton Beach area is about 45 in. The highest average rainfall is in March, and the lowest is in October (Dames & Moore 1986).

2.9 AIR

Air sampling was not conducted at Site 10. The contaminants detected at Site 10 are non-volatile and would not be of concern since the majority of this site is covered in lawn and asphalt.

Table 2.5
2000 – 2001 Remedial Investigation
Rounds 1 and 2 Groundwater Monitoring Analytical Results
Volatile and Semivolatile Organic Compounds
106th Rescue Wing, New York Air National Guard
Westhampton Beach, New York

Parameter	Action Levels		Sample Locations and Concentrations [a]				
	NYS [b]	MCL [c]	S10MW01-01	S10MW01-02	S10MW02-01	S10MW02-02	S10MW02-22 D
BTEX (µg/L)							
All Analytes	--	--	ND	ND	NA	NA	NA
Volatile Organic Compounds (µg/L)							
Chloroform	7	80	ND	ND	0.3 J	ND	0.5 J
All Remaining Analytes	--	--	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/L)							
All Analytes	--	--	ND	ND	ND	ND	ND
TPH-GRO (µg/L)	--	--	ND	ND	NA	NA	NA
TPH-DRO (mg/L)	--	--	0.16	ND	NA	NA	NA

Notes:

a) "-01" refers to Round 1 sampling, February - March 2001; "-02" refers to Round 2 sampling, May - June 2001; "D" indicates a duplicate sample.
b) New York State (NYS), Class GA Groundwater; NYSDEC TAGM #4046.
c) Maximum Contaminant Level (MCL), United States Environmental Protection Agency.
BTEX Benzene, toluene, ethylbenzene, and xylenes.
J Estimated value.
NA Not analyzed.
ND Not detected.
TPH-DRO Total petroleum hydrocarbons - diesel range organics.
TPH-GRO Total petroleum hydrocarbons - gasoline range organics.
-- No applicable action level.

2.10 RECEPTORS

Site 10 is located within the boundaries of the ANG facility, a secured government installation. The Francis S. Gabreski Airport, which surrounds the base, is a secure facility. The site surface is 95 % covered with asphalt or concrete paving. The shallow groundwater in the immediate vicinity of the site is not used for water supply, and groundwater occurs at approximately 36 to 39 ft BGS; therefore, there is no potential exposure route for groundwater at Site 10.

Exposure to off-site receptors via surface water runoff is considered highly unlikely due to the soil characteristics at the site. The soils at the base are highly porous and permeable, and precipitation rapidly infiltrates to the subsurface. Little to no runoff occurs, and has no potential to reach off-site receptors. Consequently, the only exposure likely to occur in connection with Site 10 would be to construction workers or base personnel who could become exposed to

Table 2.6
2000 – 2001 Remedial Investigation
Rounds 1 and 2 Groundwater Monitoring Analytical Results - Metals
106th Rescue Wing, New York Air National Guard
Westhampton Beach, New York

Parameter	Action Levels		Location [a]				
	NYSDEC [b]	MCL [c]	S10MW01-01	S10MW01-02	S10MW02-01	S10MW02-02	S10MW02-22
Metals (µg/L)							
Aluminum	--	--	ND	1900	ND	1200	1800
Arsenic	25	50 [d]	ND	ND	ND	ND	ND
Barium	--	--	18	36	52	41	46
Cadmium	10	5.0	ND	ND	ND	ND	1.2
Calcium	--	--	6200	4900 N	11,000	9100 N	9300 N
Chromium	50	100	2.6	7.6	ND	2.9	4.9
Cobalt	--	--	ND	ND	ND	ND	ND
Copper	--	1300 [e]	ND	ND	ND	ND	ND
Iron	--	--	180	3700	64	2100	3200
Lead	25	15 [e]	ND	ND	ND	ND	ND
Magnesium	--	--	1600	1500	1700	1800	1900
Manganese	--	--	5.2	29 N	8.8	130 N	180 N
Nickel	--	--	ND	ND	ND	ND	ND
Potassium	--	--	680	1200	1600	1200	1300
Sodium	--	--	13,000	62,000 N	34,000	32,000 N	33,000 N
Thallium	--	--	ND	ND	ND	ND	ND
Vanadium	--	--	ND	6.3	ND	ND	ND
Zinc	--	--	ND	ND N	30	57 N	100 N

Notes:
a) "MW" refers to monitoring well; "-01" refers to Round 1 sampling, February - March 2001; "-02" refers to Round 2 sampling, May - June 2001.
b) New York State (NYS), Class GA Groundwater; NYSDEC TAGM #4046.
c) Maximum Contaminant Level (MCL), United States Environmental Protection Agency.
d) Federal MCL is under review.
e) Treatment Technique Action Level. Federal MCL is concentration in water collected from tap.
ND Not detected.
-- No applicable action level.

impacted soil during excavation activities at the site. During excavation activities, a potential exposure pathway would be through dermal absorption of contaminants. However, routine safety procedures and good work practices as required in the Base Master Plan will provide adequate protection from exposure for construction workers; this potential exposure route is therefore considered incomplete for on-site receptors. Human receptors and exposure pathways are discussed in greater detail in Section 3.2.

Potential endpoint ecological receptors that were considered for the ecological assessment included endangered species that could potentially be found within a 4-mile radius of the base.

These included the Northern Harrier, the Osprey, the Tiger Salamander, and the Eastern Mud Turtle. There are no endangered plant species within a 4-mile radius of the base. Accordingly, plant species were not considered potential end point receptors for the ecological assessment. The base does not provide habitat to any known federally protected, threatened, or endangered animal species (Dames & Moore 1986).

All of the endangered species feed and reside almost exclusively in the vicinity of surface water bodies (Macwhirter, et al., 1996 and NYSDEC 2002). Therefore, the most likely of the exposure pathway would be exposure of endangered species through impacted surface water. Surface water bodies in the vicinity of the site include Aspatuck Creek, Old Ice Pond, and North Pond. Additionally, the Quogue Waterfowl Refuge is located approximately 7,000 ft east of Site 10 and 2,000 ft east of the airport. Potential mechanisms for transport of contaminants from the site include surface water run off. Surface water may be potentially impacted by contaminated surface water runoff from Site 10.

Contamination of nearby surface water bodies due to impacted surface water runoff from the base is not likely. The only surface water body downgradient of Site 10 is Aspatuck Creek. Aspatuck Creek receives surface water runoff from the base, but infiltration rates at the base are relatively high and little surface water leaves the base as runoff. Aspatuck Creek is located approximately 1,500 ft southeast of Site 10. Additionally, Site 10 is covered with 95 % asphalt and concrete paving, with the remainder being a small area of grassy lawn. This effectively eliminates, or significantly limits erosion of impacted soils by surface runoff during high rainfall events. On this basis, it is not likely that surface water bodies in the vicinity of the base will be impacted by contaminants from the base. Therefore, since surface water bodies in the vicinity of the base are not likely to be impacted by contaminated surface runoff from the Site 10, exposure of endangered species to contaminants from the site is not expected.

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3.0 BASELINE RISK ASSESSMENT

A baseline risk assessment was conducted for Site 10 in accordance with guidelines in the EPA Risk Assessment Guidance (RAGs) document (EPA 1989), except for lead detected in site surface soils. The COPCs evaluated included lead and the PAHs benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, and chrysene. Risks associated with lead in surface soil were evaluated using the EPA Technical Review Workgroup (TRW) Adult Lead Methodology (ALM) (EPA 1999), as presented below in Section 3.1. PAHs were evaluated according to standard risk assessment procedures (EPA 1989), as presented below in Section 3.2.

Quantitative evaluation of risks associated with lead are not technically feasible using the standard risk assessment equations (EPA 1989). Even though the health effects of exposure to lead are well known, no toxicity factors (i.e., reference doses or cancer slope factors) are available. Therefore, the TRW ALM was employed since it provides a scientifically defensible approach for assessing risks associated with lead in soil. This methodology is currently only applicable to lead.

Lead, which was identified as a COPC at Site 10, is classified as an inorganic metal. Metals naturally occur in soil and groundwater, and tend to persist in the environment. Metals may slowly undergo speciation to a more insoluble sulfate, sulfide, or oxide compound, but do not degrade beyond the elemental state. They tend to adsorb to soils and do not readily dissolve in water. Metals may leach from soils to groundwater, but may also be retained in surface soils especially those containing large quantities of organic materials (EPA 2001a). Consequently, metals have a low potential for mobility in soils. In groundwater, metals migrate primarily by way of advection. Metals in surface soils may be transported in surface water runoff during rainfall events due to erosion and transportation of sediments.

3.1 EVALUATION OF LEAD IN SURFACE SOIL

The TRW ALM was used to evaluate potential risks to human health posed by lead in surface soils at Site 10. The decision to use the TRW ALM was based on the following factors:

- The methodology is the most current available and is recognized by the EPA.
- The approach provides a scientifically defensible approach for assessing adult lead risks associated with site-specific, non-residential exposure scenarios.
- The TRW ALM uses a simplified representation of lead biokinetics to predict blood lead concentrations in fetuses carried by women who have relatively steady patterns of site exposure to lead-contaminated soil, since they would be the highest risk population.
- The approach utilizes conservative assumptions that are applicable to circumstances in effect (non-residential use), and expected to remain in effect per the Base Master Plan (GRW Engineers, Inc., 1995), at the base and airport.
- There are no current residential facilities on the base and, according to the Base Master Plan (GRW Engineers, Inc., 1995), there are no plans for any part of the base to ever be used for residential purposes (Lt Col Jerry Webb, Base EM, personal communication, January 30, 2002).
- Future plans call for the airport to remain active indefinitely, and preclude residential use scenarios.
- Access to the sites on the base are restricted to base personnel and authorized civilians only, limiting exposure.

Equations allow calculation of fetal risks from adult exposures to specified levels of soil lead contamination, to support the EPA's goal of limiting exposure risk, which can also be applied in a "forward" manner to predict baseline risks resulting from measured concentrations. The EPA has set the blood level of concern based on the current Office of Solid Waste and Emergency Response guidance, which calls for the establishment of cleanup goals to limit childhood risk of exceeding 10 μg/dL blood lead level to 5 %, also known as the 95^{th} percentile (EPA 1994).

The risk assessment methodology in the ALM is based on a lognormal probability model for blood levels in adult women exposed to lead-contaminated soils, coupled with an estimated constant of proportionality between fetal and maternal blood levels. These relationships specify that the distribution of fetal blood lead levels also follows a lognormal distribution:

$$PbB_{fetal} = Lognormal(GM, GSD)$$

Where:

GM	=	Geometric Mean (or central blood lead concentration)
GSD	=	Geometric Standard Deviation [an estimated (dimensionless) value]

Estimation of the probability that fetal lead levels will exceed the EPA blood level of concern is a two-step process:

(1) Calculate the geometric mean (central) fetal blood lead concentration. The equation used for this purpose has the following form:

$$PbB_{fetal,GM} = R_{fetal/maternal} \times \left[PbB_{adult,0} + \frac{Pb_S \times BKSF \times IR_S \times AF_S \times Ef_s}{AT} \right] \quad \text{(Equation 1)}$$

Where:

$PbB_{fetal,GM}$	=	Central estimate of blood lead concentrations (µg/dL) for fetuses carried by women who have site exposures to soil lead at concentration, PbS.
$R_{fetal/maternal}$	=	Constant of proportionality between fetal and maternal blood lead concentrations.
$PbB_{adult,0}$	=	Typical blood lead concentration (µg/dL) in adults (i.e., women of child-bearing age) in the absence of exposures to the site that is being assessed.
PbS	=	Soil lead concentration (µg/g) (appropriate average concentration for individual).
BKSF	=	Biokinetic slope factor relating the (quasi-steady state) increase in typical adult blood lead concentration to average daily lead uptake (µg/dL blood lead increase per µg/day lead uptake).
IR_S	=	Intake rate of soil, including both outdoor soil and the soil-derived component of indoor dust (g/day).
AF_S	=	Absolute gastrointestinal absorption fraction for ingested lead in soil and lead in dust derived from soil (dimensionless).

EF_S = Exposure frequency for contact with assessed soils and/or dust derived in part from these soils (days of exposure during the averaging period); may be taken as days per year for continuing, long-term exposures.

AT = Averaging time; the total period during which soil contact may occur, 365 days/year for continuing long-term exposures.

(2) Determine the probability that the blood lead level for a fetus carried by a woman exposed to lead at a site exceeds 10 µg/dL. This calculation uses the fetal geometric mean (GM) blood lead from Equation 1 and the geometric standard deviation (GSD) value appropriate for the risk assessment. Note that because of the assumption of proportionality between fetal and maternal blood levels, the adult GSD and the fetal GSD are equal.

The following formula allows the calculation of probability. The logarithm of a lognormal variable follows a normal probability distribution. Exceedance probabilities for the lognormal model can be determined from standard normal model statistical tables after the GM, GSD, and exceedance criterion are converted to log scale values and a "standard normal deviate" or "z-value" is calculated:

$$z = \left[\frac{\ln(10) - \ln(GM)}{\ln(GSD)} \right] \quad \text{(Equation 2)}$$

A statistical program or a normal probability table can then be used to determine the exceedance probability, p, that a standard normal variable has a value less than z. The probability that the fetal blood lead level exceeds 10 µg/dL is obtained from the expression 1-p.

To calculate the probability, p, that fetal blood lead will exceed the blood lead target of concern, the EPA TRW has provided a spreadsheet (EPA 2001b) that calculates p using the equations and assumptions presented in the ALM. Table 3.1 summarizes the default parameters used.

Using the EPA TRW spreadsheet, site-specific probabilities have been calculated using the highest detected lead concentration for Site 10 (29 mg/kg). The results of the calculation are presented in Table 3.2. Figure 3.1 presents the EPA TRW ALM spreadsheet used in the calculation for lead in surface soil at Site 10. In order to obtain reasonably conservative risk estimates, the values assigned to the parameter of $GSD_{i,adult}$ was 2.1, representing a heterogeneous population, and the value assigned to $PbB_{adult,0}$ was 2.0 µg/dL, representing the middle portion of the range. The calculated probability that $PbB_{fetal,0.95}$ will exceed the PbB_t at Site 10 is 1.1. Probabilities of 5 % or less are considered acceptable levels of risk.

Table 3.1
Summary of Default Parameter Values for the Risk Estimation Algorithm (Equations 1 through 4)
106th Rescue Wing, New York Air National Guard
Westhampton Beach, New York

Parameter	Unit	Value	Comment
$PbB_{fetal,\ 0.95,goal}$	µg/dL	10	For estimating RBRGs based on risk to the developing fetus.
$GSD_{i,adult}$	--	1.8 2.1	Value of 1.8 is recommended for a homogeneous population while 2.1 is recommended for a more heterogeneous population.
$R_{fetal/maternal}$	--	0.9	Based on Goyer (1990) and Graziano et al. (1990).
$PbB_{adult,0}$	µg/dL	1.7-2.2	Plausible range based on NHANES III phase 1 for Mexican American and non-Hispanic black, and white women of child-bearing age (Brody et al., 1994). Point estimate should be selected based on site-specific demographics.
BKSF	µg/dL per µg/day	0.4	Based on analysis of Pocock et al. (1983), and Sherlock et al. (1984) data.
IR_S	g/day	0.05	Predominantly occupational exposures to indoor soil-derived dust rather than outdoor soil; (0.05 g/day = 50 mg/day).
EF_S	day/yr	219	Based on EPA (1993) guidance for average time spent at work by both full-time and part-time workers.
AF_S	--	0.12	Based on an absorption factor for soluble lead of 0.20 and a relative bioavailability of 0.6 (soil/soluble).

Notes:
RBRGs Risk-based remediation goals.
Source: EPA 1996b.

Table 3.2
Calculation of Blood Lead Concentrations and Probability of Risk
106th Rescue Wing, New York Air National Guard Base
Westhampton Beach, New York

PbS	$PbB_{adult, central}$	$PbB_{fetal, 0.95}$	PbB_t	P
29	2.1	6.2	10 µg/L	1.1 %

Notes:

PbS	Highest detected lead concentration in surface or shallow soils in µg/g, which is equivalent to mg/kg.
$PbB_{adult, central}$	Central estimate of blood lead concentrations (µg/dL) in adults (i.e., women of child-bearing age) that have site exposure to soil lead at concentrations, PbS.
$PbB_{fetal, 0.95}$	Central estimate of blood lead concentrations (µg/dL) for fetuses carried by women who have site exposures to soil lead at concentrations, PbS. Assumes GSDi is 2.1 (heterogeneous population).
PbB_t	Target blood level of concern.
P	Probability that $PbB_{fetal, 0.95}$ will exceed PbB_t; if P < 5 % then the risk is acceptable.

3.2 BASELINE RISK ASSESSMENT FOR PAHs IN SURFACE SOIL

A baseline risk assessment is generally conducted in three steps. These three steps include conducting an exposure assessment, conducting a toxicity assessment, and characterizing risks. Together, the results of these three phases are used to reach conclusions about the likelihood of adverse effects. If at any stage of the process, the assessment indicates that risks are not present, then the process is considered complete.

3.2.1 Exposure Assessment

Exposure is defined as contact of an organism with a chemical agent (EPA 1998 and 1989). In order for exposure to contamination to occur, four factors must exist: (1) a source(s) of contaminants; (2) a migration pathway(s); (3) an exposure mechanism(s); and (4) receptors. Without all these factors, the exposure pathway is not complete. Exposure assessments are conducted to estimate the magnitude of actual and/or potential exposures, the frequency and duration of these exposures, and the pathways by which organisms are potentially exposed.

Figure 3.1
Site 10 - 2000 - 2001 Remedial Investigation - Risk Assessment
Adult Lead Risk Calculation Spread Sheet
U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

[redacted]

Version date 8/14/01

Exposure Variable	PbB Equation[1] 1*	2**	Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario: Using Equation 1 GSDi = 1.8	Using Equation 1 GSDi = 2.1	Using Equation 2 GSDi = 1.8	Using Equation 2 GSDi = 2.1
PbS	X	X	Site 10 soil lead concentration	ug/g or ppm	29	29	29	29
$R_{fetal/maternal}$	X	X	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	X	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4	0.4	0.4
GSD_i	X	X	Geometric standard deviation PbB	--	1.8	2.1	1.8	2.1
PbB_0	X	X	Baseline PbB	ug/dL	2.0	2.0	2.0	2.0
IR_S	X		Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050	0.050	--	--
IR_{S+D}		X	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	0.050	0.050
W_S		X	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	1.0	1.0
K_{SD}		X	Mass fraction of soil in dust	--	--	--	0.7	0.7
$AF_{S,D}$	X	X	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S,D}$	X	X	Exposure frequency (same for soil and dust)	days/yr	219	219	219	219
$AT_{S,D}$	X	X	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbB_{adult}	**PbB of adult worker, geometric mean**			**ug/dL**	**2.0**	**2.0**	**2.0**	**2.0**
$PbB_{fetal,0.95}$	**95th percentile PbB among fetuses of adult workers**			**ug/dL**	**4.8**	**6.2**	**4.8**	**6.2**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**			**ug/dL**	**10.0**	**10.0**	**10.0**	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**			**%**	**0.2%**	**1.1%**	**0.2%**	**1.1%**

[1] Equation 1 does not apportion exposure between soil and dust ingestion (excludes W_S, K_{SD}).
When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same $PbB_{fetal,0.95}$.

***Equation 1, based on Eq. 1, 2 in USEPA (1996).**

PbB_{adult} =	$(PbS*BKSF*IR_{S-D}*AF_{S,D}*EF_S/AT_{S,D}) + PbB_0$
$PbB_{fetal,0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

****Equation 2, alternate approach based on Eq. 1, 2, and A-19 in USEPA (1996).**

PbB_{adult} =	$PbS*BKSF*([(IR_{S+D})*AF_S*EF_S*W_S]+[K_{SD}*(IR_{S+D})*(1-W_S)*AF_D*EF_D])/365+PbB_0$
$PbB_{fetal,0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

Source: EPA 1996b

3.2.1.1 Exposure Settings

This section describes the physical characteristics of Site 10. Additional information concerning the physical characteristics of the base and Site 10 is provided in Sections 2.0 and 3.0 of the *Final RI Report* (PEER 2004). Access to the base is restricted to base personnel and authorized guests only. The base is fenced and Site 10 is located within the base perimeter fence. Future plans call for the base and airport to remain active indefinitely, with no future plans for any residential usage of the property.

Exposure Setting

Site 10 formerly contained a 1,200-gal UST located about 10 ft northwest of Building 370 in the central portion of the base. The site is flat and mostly covered with asphalt paving (approximately 95 %). Groundwater at the site ranges from approximately 36 ft to 39 ft BGS and flows toward the south-southeast.

The COPCs at the site include lead and the PAHs benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene and chrysene, which were identified in surface soils. No COPCs were detected in subsurface soils or site groundwater. Risks associated with lead in soil were previously assessed using the TRW ALM in Section 3.1, which concluded that lead risks were acceptable at Site 10. Therefore, only risks associated with PAHs are discussed herein. Potential receptors to the contaminated surface soils at Site 10 include base personnel, construction personnel, and site visitors. During rainfall events, surface water bodies (e.g., Aspatuck Creek) in the vicinity may be impacted by surface runoff from the site. Surface water runoff from the site may potentially contain soil particles that have been impacted due to sorption of PAHs. Runoff from the base discharges into Aspatuck Creek, which may be potentially impacted by contaminated runoff from the site. Aspatuck Creek is approximately 1,800 ft southeast of the site. Potential receptors to impacted water in Aspatuck Creek are area residents.

3.2.1.2 Identification of Exposure Pathways

When identified for a potential receptor, an exposure pathway describes the mechanism(s) by which a potential receptor may be exposed to contaminants at the site, and/or the mechanism(s) by which a potential receptor may be exposed to contaminants that have been transported from the site. In this section, the pathways by which the previously discussed potential receptors may be exposed are evaluated and identified. Depending on the results of the evaluations, some of the previously identified potential receptors may be excluded from further consideration at the site.

Exposure pathways are identified based on consideration of the sources, types, and locations of contaminants at Site 10, in this case, PAHs in surface soil. The likely environmental fate of the contaminants, including persistence, partitioning, and transport, and the locations of the potential receptors are evaluated. Exposure points (points of potential contact with the contaminants) and routes of exposure (e.g., ingestion, inhalation) are identified for each exposure pathway.

Exposure Pathway Evaluation

Impacted media at Site 10 is limited to surface soil which contains elevated concentrations of PAHs. Potential on-site receptors were previously identified as base personnel, construction personnel, and site visitors that might be exposed to impacted surface soil. Potential off-site receptors were previously identified as area residents that might be exposed to surface water impacted by contaminated runoff from the site.

Potential exposure routes for on-site receptors include ingestion of impacted soil, dermal contact with impacted soil, and inhalation of impacted fugitive dust. Currently, the site is 95 % covered with asphalt or concrete, which effectively eliminates the potential for ingestion or direct contact with impacted surface soils, or inhalation of fugitive dust from the site unless construction activities that involve excavation occur at the site. Limited underground utilities are located in the area, and there are no plans for future construction activities at the site. Should construction activities that involve excavation become necessary at the site, adequate protection for

construction workers would be provided by following routine safety procedures and good work practices as required for any on-base construction activity by the Base Master Plan (GRW Engineers, Inc., 1995). Since routine safety procedures and required good work practices will provide adequate protection from exposure for construction workers, this potential exposure rout is incomplete for on-site receptors.

Potential exposure routes for off-site receptors include ingestion of impacted surface water, or dermal contact with impacted surface water due to runoff from the base. Surface water runoff from the site may potentially contain soil particles that have been impacted due to adsorption of PAHs. Infiltration rates at the base are relatively high and little surface water leaves the base as runoff. Currently, the site is mostly covered with asphalt and concrete which effectively caps the majority of surface soil at the site, and the remainder is covered with grass. If excavation activities occur at the site in the future, then exposed surface soils may have a higher potential for reaching downgradient surface water (Aspatuck Creek) than otherwise during rainfall events. However, it is not likely that the creek would be impacted by sediments from the site due to the distances involved (approximately 1,800 ft) and the concentrations of contaminants. Therefore, there are no complete exposure pathways identified for off-site receptors.

Elevated concentrations of lead were detected in surface soil at Site 10. Risks associated with lead in soils were evaluated using the TRW ALM in Section 3.1. The results of the evaluation indicate that potential risks associated with lead in surface soils at the base are acceptable. The PAHs benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, and chrysene were identified as COPCs in surface soil at Site 10. However, they were present at a low levels and exposure would only be likely during excavation activities at the site. Potential exposure to site contaminants can be minimized or eliminated by following good work practices and required safety procedures during the excavation activities. Therefore, no exposures are expected to contaminants in surface soils at the site.

3.2.2 Future Use Risk

Information on future plans indicate that it is highly unlikely that base or airport property will ever be developed for any other use. Consequently, future scenarios that include developing base property for residential or other uses were not considered.

3.3 ECOLOGICAL ASSESSMENT

The ecological assessment characterized the risks to the environment posed by the COPCs that were identified at Site 10. Contaminants were detected in surface soil at the site, but not in saturated subsurface soil. Potential ecological receptors to the COPCs were evaluated on the basis of the transport mechanisms identified for the site. Contaminated media considered consisted of surface soils. Accordingly, potential receptors and potential exposure pathways may include:

- plant species existing at the site that may be exposed to contamination in surfaces soils;
- animal species that may pass through the site and be exposed to contamination in surface soils through direct contact with surface soils;
- animal species that may pass through the site and be exposed to contamination through ingestion of plant or animal species residing in site surface soils; and
- animal species that reside or feed in the vicinity of surface water bodies impacted by surface run off from the site.

Potential endpoint receptors that were considered for the ecological assessment included endangered species that have been identified within a 4 mile radius of the base. These include the Northern Harrier, the Osprey, the Tiger Salamander, and the Eastern Mud Turtle. There are no endangered plant species within a 4-mile radius of the base. Accordingly, plant species were not considered as potential end point receptors for the ecological assessment. The base does not provide habitat to any known federally protected, threatened or endangered animal species (Dames & Moore 1986).

3.3.1 Evaluation of Ecological Risks

All of the endangered species feed and reside almost exclusively in the vicinity of surface water bodies (Macwhirter, et al., 1996 and NYSDEC 2002). Therefore, the most likely exposure pathway would be exposure of endangered species through impacted surface water. Surface water bodies in the vicinity of the site include Aspatuck Creek, Old Ice pond, and North Pond. Additionally, the Quogue Waterfowl Refuge is located approximately 7,000 ft east of Site 10. Potential mechanisms for transport of contaminants from the site include surface water run off.

Surface water may be potentially impacted by contaminated surface water runoff from the site with COPCs in surface soils. Groundwater beneath the base and airport generally flows toward the southeast. Contamination of surface water via the groundwater pathway is not likely since none of the surface water bodies (including the waterfowl refuge) are located hydraulically downgradient of Site 10. Contamination of nearby surface water bodies due to impacted surface water runoff from the base is not likely either. The only surface water body downgradient of the site is Aspatuck Creek. Aspatuck Creek receives surface water runoff from the base, but infiltration rates at the base are relatively high and little surface water leaves the base as runoff. Aspatuck Creek is located several hundred feet (approximately 1,500 ft) southeast of the site. Additionally, the majority of the site is covered with asphalt and grass which effectively eliminates, or significantly limits erosion of impacted soils by surface runoff during high rainfall events. On the basis of the above discussion, it is not likely that surface water bodies in the vicinity of the base will be impacted by contaminants from the base. Therefore, since surface water bodies in the vicinity of the base are not likely to be impacted by Site 10 groundwater, or by contaminated surface runoff, exposure of endangered species to contaminants from the site is not expected.

4.0 SELECTED ACTION: NO FURTHER RESPONSE ACTION PLANNED

A NFRAP decision is proposed for Site 10 on the basis that the site poses no significant risks to human health and the environment. This decision was developed in accordance with the June 1995 U.S. Air Force NFRAP Guide; Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA); and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

According to the June 1995 U.S. Air Force NFRAP Guide, a Category III NFRAP decision is appropriate for a geographically contiguous area or parcel of real property where environmental evidence demonstrates that hazardous substances or petroleum products or their derivatives have been stored, released, or disposed of, but are present in quantities that require no response action to protect human health and the environment. Based on the results of the 2000 - 2001 RI conducted at Site 10, these criteria have been met.

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APPENDIX A

REFERENCES

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