INSTALLATION RESTORATION PROGRAM

DRAFT FINAL

SITE INVESTIGATION REPORT

VOLUME I – REPORT

Remediation

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

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Hazardous Waste Remedial Action Program
Oak Ridge, Tennessee 37831-7606
Managed by MARTIN MARIETTA ENERGY SYSTEMS, INC.
For the U.S. DEPARTMENT OF ENERGY under contract DE-AC05-840R21400

EXECUTIVE SUMMARY

ABB Environmental Services, Inc. was contracted by Martin Marietta Energy Systems, Inc. to conduct the Site Investigation (SI) phase of the Installation Restoration Program (IRP) for the New York Air National Guard (NYANG) at a portion of the former Suffolk County Air Force Base (SCAFB). SCAFB is located in Westhampton Beach, New York and was used primarily for personnel training, aircraft maintenance, and armed forces support between 1943 and 1969. In 1969, Suffolk County purchased the site and began operation of Suffolk County Airport, now known as Francis S. Gabreski Airport (Gabreski Airport). Since 1970, Suffolk County has leased a portion of the airport to a number of tenants, including the NYANG. This report presents the results of this SI at sites within or near NYANG-leased property and recommendations for continued investigation or no further action.

In 1987, the Hazardous Materials Training Center conducted a Phase I Installation Assessment (records search) at the NYANG facility and the POL (petroleum, oil, and lubricant) Tank Farm and identified six sites (Sites 1 through 6) for further evaluation under the IRP. Site 6 was designated as the POL Tank Farm. A seventh site (Site 7) was not included in the records search because SI and Remedial Investigation/Feasibility Study (RI/FS) activities were already underway at that location. Sites 8, 10, and 11 were added to the IRP after completion of the Phase I Assessment and Site 4 was subdivided into two sites (Sites 4 and 9). Two landfill sites (Runway Disposal Area and Canine Kennel Landfill) were also identified in the Phase I Assessment as potential sites of concern. Nine of these sites were investigated as part of this SI. The nine sites are:

- Site 1 - Aviation Gasoline Spill Site
- Site 2 - Former Hazardous Waste Storage Area
- Site 3 - Former Hazardous Waste Storage Area (1984-1989)

- Site 4 - Aircraft Refueling Apron Spill Site
- Site 5 - Southwest Storm Drainage Ditch
- Site 8 - Old Base Septic Systems
- Site 9 - Ramp Drainage Outfall
- Site 10 - Waste Stripper Tank #61, Building 370
- Site 11 - Waste Oil Vessel, Building 230

Site 6, POL Tank Farm, was deleted from the SI program in July 1989 pending resolution of legal issues between the State of New York and potentially responsible parties. Due to this status, the site was not included in the scope of work for this SI. As of the writing of this report, legal issues at Site 6 have apparently been resolved. The State of New York and/or Suffolk County are currently conducting remediation efforts at the site.

Site 7, Fire-Fighting Training Area, was not included in the scope of work for this SI as SI and RI/FS activities had previously been conducted at this site by ABB-ES between 1987 and 1989. ABB-ES (1989) recommended no further investigation and action at this site. ABB-ES conducted an additional investigation of the presence of 2-butanone in groundwater samples collected during the RI/FS (ABB-ES, 1992). To address comments from the State of New York regarding the 1992 report, ABB-ES compiled the "Response to comments from the New York State Department of Law regarding the evaluation of 2-butanone in groundwater samples" report (ABB-ES, 1993). The status of the recommendation for no further action regarding 2-butanone in groundwater is pending acceptance by NYSDEC. The State of New York has requested a limited removal action at Site 7 to remove petroleum-contaminated soil prior to site closure. Site activities are pending finalization of plans.

Two landfill sites, one located at the southeast end of Runway 33 (Runway Disposal Area) and the other at the former Canine Kennel east of the runways (Canine Kennel Landfill) were identified as potential sites of concern in the Phase I Assessment as were Sites 6 and 7 but were not included in the scope of work for this SI. The sites were identified as potential concerns due to visual indications of waste disposal. In 1982, groundwater was sampled from wells installed downgradient of the Runway Disposal Area. Seven VOC compounds were detected in these samples (Dames & Moore, 1986). A number of transformers and capacitors were found at the Canine Kennel Landfill in 1984. Polychlorinated biphenyls (54 to 1,700 parts per million) were detected in several soil samples from this landfill (Dames & Moore, 1986). Aside from visual inspections and limited confirmation sampling, no further investigation of these sites has been completed to date.

The field program for the nine sites of concern to this SI began in August 1994 and was completed in December 1994. Field activities began with a geophysical survey designed to detect subsurface features at proposed sampling locations. Direct push technologies were used to expedite sampling of soil and groundwater at 74 borings and minimize investigation derived waste. A cone penetrometer was used to install 24 small diameter wells. These wells were installed at shallow and deeper intervals and augmented three existing monitor wells and six existing piezometers. Aquifer testing was conducted at monitor wells and piezometers using slug test procedures.

Two hundred and seventy nine samples were collected during this SI. These included 169 soil samples, 12 sediment samples, 97 groundwater samples, and 1 surface water sample. Field quality assurance protocol maintained during the field program included documentation, collection and analysis of 239 quality assurance samples, and equipment decontamination. A survey control provided vertical and horizontal coordinates of sampling locations and well heads. The field effort was completed with the final management of investigation derived waste.

Chemical analysis of samples for volatile (VOC) and semi-volatile (SVOC) organic compounds and metals concentrations was conducted on-site. Samples were analyzed using purge and trap gas chromatographs, gas chromatograph/mass spectrometers, and a graphite furnace atomic absorption spectrophotometer. A method detection limit study was performed by each laboratory section prior to accepting samples for analysis. Analytical results were evaluated in the field and after the field program to comply with project data quality objectives. Non-target compounds were tentatively identified, if possible. Total organic carbon was analyzed by an off-site contract laboratory. Samples were tracked using unique identification numbers, bar codes, chain of custody and analytical request forms, field and laboratory records, and data management logs.

Subsurface soils encountered during the SI consisted primarily of fine- to medium-grained sand with trace silt and/or trace to some gravel in localized areas. These soils form the glacial outwash deposits of the upper glacial aquifer at this location. Depth to groundwater ranged from more than 40 feet below ground surface in the northwest corner of the facility to less than nine feet below ground surface in the southeast corner. Direction of groundwater movement is toward the south-southeast at an average gradient of 0.0014 feet per foot. The estimated hydraulic conductivity of the upper glacial aquifer is approximately 10^{-2} centimeters per second.

Sediment, soil, surface water, and groundwater samples were analyzed for VOCs, SVOCs, and/or six of the Resource and Conservation Recovery Act metals (barium and mercury were excluded) based on the sampling analysis protocol developed for each site. The analytical results were then compared with action levels developed from New York State (NYS) guidance, background concentrations, or the range of average concentrations detected in eastern US or NYS background soils to evaluate the potential for a release at each site. Recommendations for additional work or no further action are based on VOCs, SVOCs, and/or metals concentrations which exceed these criteria and which can not be attributed to sampling methodology.

Five sites (1, 2, 3, 10, and 11) require no further action. Chromium was the only analyte detected above applicable guidance or background concentrations at these sites, but the presence of this metal at elevated concentrations in groundwater is considered a sampling artifact related to direct push sample collection. Chromium concentrations in groundwater samples obtained from 27 wells in two sampling rounds do not exceed action levels.

Additional site characterization is recommended at Site 4. Soil and groundwater samples collected at this site contained fuel-related compounds at concentrations which exceed action levels. These compounds form a plume which appears to be migrating beyond the defined Site 4 area. Additional site characterization is recommended in order to ascertain the horizontal and vertical extent of the plume and provide maximum probable concentration data for conduct of a risk assessment.

Risk assessments are recommended at three sites (5, 8, and 9). Site 5 sediments contain VOCs, SVOCs, and metals in excess of action levels; however, it appears that drainage to the ditch has adversely impacted only surface materials and that the lateral extent of contamination is generally limited to the upper two sections of the ditch. A risk assessment is recommended at this site to ascertain if the type and concentrations of hazardous constituents warrant interim remedial measures.

Six areas of potential concern were identified at Site 8. Risk assessments are recommended at three locations:

Tetrachloroethene and fuel-related compounds in groundwater at Building 230 (Cell 2): Tetrachloroethene and fuel-related compounds were detected above action levels in groundwater

samples collected north and south of Building 230. Although the lateral extent and the impact to deeper groundwater, if any, has not been defined, it appears that this plume has not migrated off NYANG-leased property because organic compounds were not detected in groundwater samples obtained from downgradient wells. A risk assessment is recommended to determine if the type and concentrations of hazardous constituents warrant additional investigation.

Tetrachloroethene in groundwater at Building 358 (Cell 3): Tetrachloroethene was detected slightly above action levels in groundwater east of Building 358. The source for this constituent appears to be a cesspool. The downgradient and vertical extent of contamination, if any, is not known; however, it appears that this compound has not migrated off NYANG-leased property because tetrachloroethene has not been detected in Site 4 groundwater. Site 4 is hydraulically downgradient of Building 358. A risk assessment is recommended to determine if the detected concentrations warrant additional investigation.

Trichloroethene in groundwater southeast of Building 276 (Cells 4 and 5): Trichloroethene in groundwater at Building 276 probably forms a small plume which migrates southeastward. The overall extent of concentrations above action levels has not been established but may be quite limited since the detected concentrations are relatively low. A risk assessment is recommended to determine if the detected concentrations warrant continued investigation. Additional work may be required to quantify vertical and horizontal extent for the risk assessment.

The presence of fuel-related compounds above action levels in saturated soils and groundwater in the northern portion of Cell 2 at Site 8 are attributed to a petroleum plume migrating southeastward from the county-operated portion of the airport. Since the county has initiated a recovery system, it is recommended that the NYANG monitor the progress of remedial activities and allow county personnel access to this cell to monitor groundwater quality at the leading edge of the plume.

The remaining two areas identified as potential concerns at Site 8, Subsites 8C and 8P at Cell 2 and Subsite 8F at Cell 4, are not recommended for further investigation but may require some action to prevent additional release. Fuel-related compounds were detected in the unsaturated soils adjacent to Buildings 276 and 280 (8F at Cell 4), and silver is present in the subsurface soils between Buildings 220 and 230 (8C and 8P at Cell 2). The source of these constituents appears to be wastewater discharged to cesspools. Since accessible soils at the surface do not contain detectable concentrations of these constituents, and groundwater has not been adversely impacted above applicable guidance, no further investigation is recommended at either location. However, it is recommended that any ongoing discharges of silver compounds or petroleum products to cesspools at Subsites 8F, 8C, and 8P be identified and discontinued.

Polynuclear aromatic hydrocarbons (PAH) compounds and metals, some of which exceed action levels, were detected in the sediments and surface soils in the upper portion of the ramp drainage ditch at Site 9. Subsurface soils do not contain metals at concentrations which exceed US or NYS background concentrations or PAH compounds in excess of actions levels. This suggests that drainage to the ditch has adversely impacted only surface materials near the outfall and a risk assessment is recommended to determine if the type, concentration, and location of the detected constituents warrant additional investigation. Fuel-related compounds in groundwater and saturated soils likely originate from a plume migrating southeastward from the Aircraft Refueling Apron Spill Site and can be investigated in conjunction with any additional evaluation of Site 4 groundwater, if necessary.

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1.0 INTRODUCTION

The Department of Defense (DOD) established the Installation Restoration Program (IRP) during the 1970's to identify and investigate contamination related to the release of toxic or hazardous materials at DOD facilities and to remediate media contaminated by those releases. The IRP is similar to the U.S. Environmental Protection Agency's Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and includes the following phases:

- Preliminary Assessment
- Site Investigation
- Remedial Investigation
- Feasibility Study
- Remedial Design/Remedial Action
- Record of Decision

These phases have been supplemented with the Decision Document (DD) to address the "no action" alternative and Focused Feasibility Study/Remedial Measures to provide a mechanism for immediate action during any stage of the IRP.

The Air National Guard (ANG) entered into an Interagency Agreement with the Department of Energy for technical assistance in implementing the IRP at ANG facilities. Martin Marietta Energy Systems, Inc. (Energy Systems) administers the IRP under the Hazardous Waste Remedial Actions Program (HAZWRAP). ABB Environmental Services, Inc. (ABB-ES) was contracted by Energy Systems to conduct the Site Investigation (SI) phase of the IRP for the New York Air National Guard (NYANG) at a portion of the former Suffolk County Air Force Base (SCAFB) now known as Francis S. Gabreski Airport (Gabreski Airport). This report presents the results of the SI and recommendations for DDs or further investigation of sites within the NYANG facility.

1.1 PURPOSE AND SCOPE

The purpose of the SI was to investigate the possibility that releases of contaminants have occurred at nine sites within the NYANG facility. The objective of the SI was to quickly compile enough information to 1) initiate remedial investigations, feasibility studies, or removal actions, as needed, 2) develop DDs for delisting of site(s) where releases have not occurred, and/or 3) plan additional sampling to complete DDs. The SI report was written for submittal to the New York State Department of Environmental Conservation (NYSDEC).

The scope of work required to fulfill SI objectives consisted of tasks which were described in the Addendum to the Sampling and Analysis Plan (SAP) for Gabreski Airport. These tasks are summarized below.

- soil and groundwater sample collection using direct push technologies
- on-site chemical analysis
- environmental data management for receipt and interpretation of analytical results
- report preparation

1.2 Report Organization

This report is organized for the logical presentation of the components, results, interpretation, and recommendations pertaining to the SI. Information regarding the purpose and scope of this SI and facility background is provided in Sections 1.0 and 2.0, respectively. Section 3.0 contains a summary of the physical setting of the facility and surrounding area. Methodologies used to conduct the field program, analytical program, and data management are presented in Sections 4.0, 5.0, and 6.0, respectively. Action levels which were developed using background analytical results and State guidance are described in Section 7.0. Site-specific geology and hydrogeology, sampling strategies, and analytical results are presented in Section 8.0. Section 9.0 contains site-specific summary and conclusions based on interpretation of the data. Section 10.0 presents the recommendations for each site. References are listed in Section 11.0. Figures and tables are included in each section, as necessary.

2.0 FACILITY BACKGROUND

2.1 FACILITY HISTORY

Gabreski Airport is located on Riverhead Road approximately two miles north of the Atlantic Ocean shoreline in Westhampton Beach, New York in the eastern portion of Long Island (Figure 2-1). The airport is bounded to the north by undeveloped land, to the east by Quogue Wildlife Refuge, to the west by Old Riverhead Road, and to the south by Long Island Railroad.

Currently, Gabreski Airport is owned by Suffolk County and consists of about 11,550 acres of relatively flat terrain formerly occupied by SCAFB. The 106th Rescue Group of the NYANG leases approximately 70 acres of runway, hangers, and maintenance and service facilities on the southwest side of the airport.

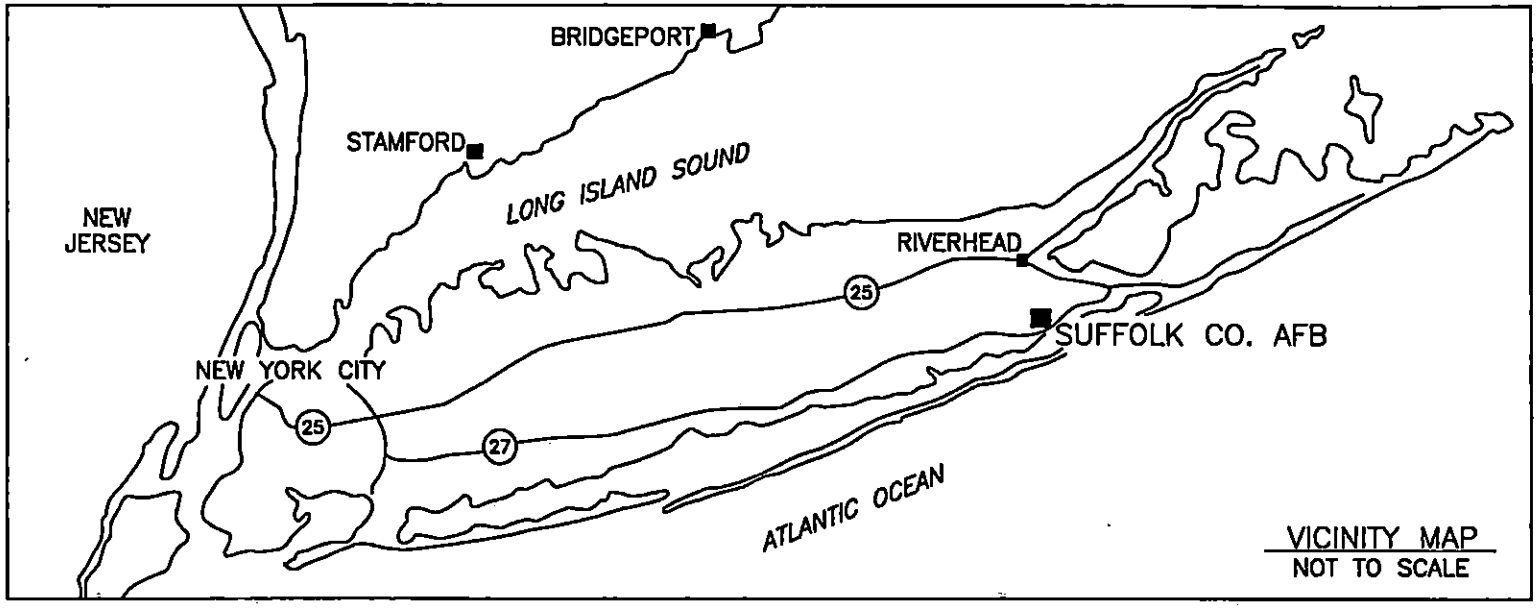
2.1.1 Airport History

In late 1941, the Civil Aeronautics Authority (CAA) began acquisition of property located between the towns of Westhampton Beach and Riverhead for construction of an airport. By the end of 1942, the CAA had obtained 11,500 acres of land. Between 1943 and 1969 the site was used primarily for personnel training, aircraft maintenance, and armed forces support. In 1969, Suffolk County purchased the property and began operation of Suffolk County Airport (now Gabreski Airport). Since 1970, Suffolk County has leased a portion of the airport to a number of tenants, including the ANG (ABB-ES, 1992b). A summary of facility operations since 1943 is provided in Table 2-1.

2.1.2 Previous Investigations

Previous investigations at the former SCAFB include an evaluation of two disposal areas located east of the ANG facility and activities associated with the IRP. These are summarized as follows:

In 1982, groundwater samples were collected from wells installed downgradient of the Runway Disposal Area, formerly referred to as Site 1. This site is located approximately one half mile east of the NYANG facility and downgradient of a fire training area burn pit. The site was used by SCAFB, Suffolk County,



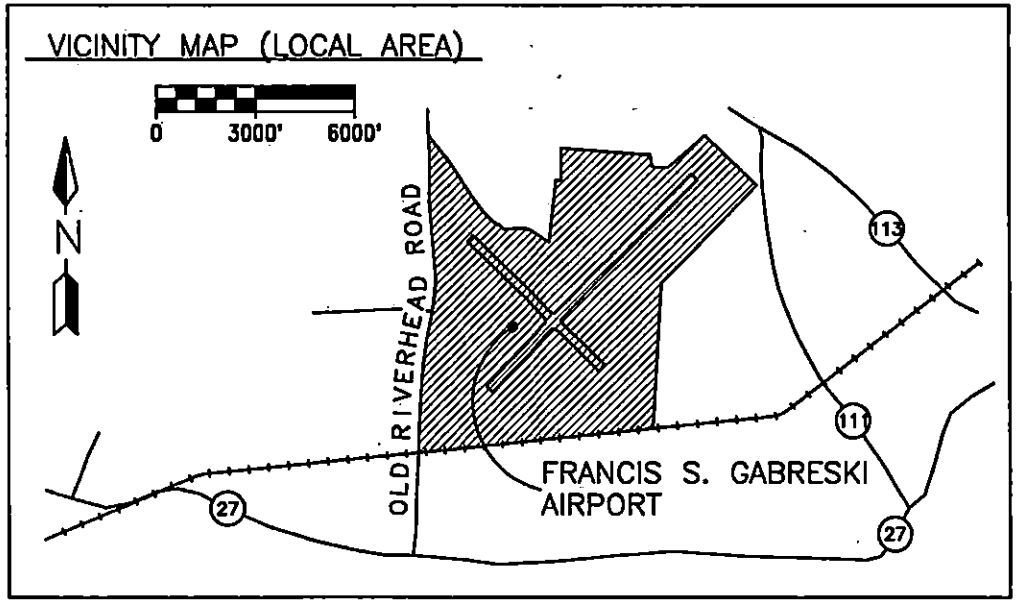


FIGURE 2–1
LOCATION MAP
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

D:\DWG\ABB\HAZWRAP\LOC_MAP\DMF\950419

Table 2-1
FACILITY OPERATIONS

106th Rescue Group, NYANG
Westhampton Beach, New York

Date	Description
1943 - 1945	Westhampton Beach Army Airfield (gunnery training base)
1948 - 1951	Arabian American Oil Company (personnel training)
1951 - 1952	103rd Fighter Interceptor Wing, Connecticut Air National Guard
1952 - 1954	77th Air Base Squadron, SCAFB
1954 - 1955	519th Air Defense Group
1955 - 1958	52nd Fighter Group (air defense interception; antisubmarine warfare; operation and maintenance; and combat personnel) maintenance of SCAFB and combat personnel
1958 - 1963	6th Air Defense Missile Squadron
1963-1969	52nd Fighter Wing
1969	Base deactivation. Suffolk County and private sector purchase former base land.
1970	ANG reactivates facility on leased land south of Cook Street on the west side of the airport
1970 - 1972	106th Air Refueling Wing
1972 - 1975	106th Fighter Interceptor Wing
1975 - present	106th Rescue Group (aerospace rescue and recovery)
1990	Suffolk County Airport name changed to Francis S. Gabreski Airport

and Suffolk County tenants and contractors for disposal of concrete rubble and construction debris. Seven volatile organic compounds (VOCs) were detected in the samples (Dames & Moore, 1986).

In 1984, a number of transformers and capacitors were discovered at the Canine Kennel Landfill, formerly referred to as Site 2, located east of the runways. This site was used by SCAFB for the burial of inert wastes during base deactivation. Polychlorinated biphenyls (54 - 1,700 parts per million) were detected in several soil samples (Dames & Moore, 1986).

In 1986, Dames & Moore completed a Phase I Installation Assessment (records search) and evaluation of historic waste disposal practices at the Runway Disposal Area and Canine Kennel Landfill sites. A second basewide Phase I records search by Dynamac Corporation identified six sites for further investigation (HMTC, 1987). These sites are listed below. A seventh site (Site 7 - Fire Training Area) was not included in the HMTC records search because SI and RI/FS activities were already underway at this location.

- Site 1 - AVGAS Spill Site (currently referred to as the Aviation Gasoline Spill Site)
- Site 2 - Former Hazardous Waste Storage Area
- Site 3 - Current Waste Storage Facility (currently referred to as the Former Hazardous Waste Storage Area (1984-1989)
- Site 4 - Aircraft Refueling Apron (currently referred to as the Aircraft Refueling Apron Spill Site)[1]
- Site 5 - Southwest Storm Drainage Ditch, and
- Site 6 - POL (petroleum, oil, and lubricant) Tank Farm

In 1988, Tracer Research Corporation conducted a tracer leak test of JP-4 storage tanks, pipelines, and hydrants at Sites 4 and 6. Potential leak areas were identified in the fuel lines northwest of the distribution pumps and in one tank at the farm (Tracer Research Corporation, 1988).

[1] Surface drainage from Site 4 discharges to a drainage ditch at an outfall located approximately 800 ft south of the refueling apron. In 1990, the outfall and ditch were annexed to Site 4 as Site 4B-Ramp Drainage Outfall, and the refueling apron was renamed Site 4A(ABB-ES, 1990). Sometime later, Site 4B became Site 9 - Ramp Drainage Outfall and Site 4A was renamed Site 4.

In 1989, ABB-ES (formerly E.C. Jordan Co.) completed the site characterization report of the Fire Training Area (Site 7), located approximately 2500 ft east of the ANG facility (E.C. Jordan Co., 1989). Although a Phase I records search was not conducted at this site, concerns regarding the potential impact of fuels used for fire-training activities on groundwater caused this site to be included in the IRP. The results of this study showed insignificant fuels contamination, and an additional investigation of 2-butanone in groundwater samples (ABB-ES, 1992a) concluded that this compound was a sampling artifact. Therefore, ABB-ES/HAZWRAP recommended no further action at this site.

In August 1991, ABB-ES initiated a survey of cesspools and septic tanks, designated sub-sites 8A through 8L. Sludge and liquid samples were collected from 29 structures (cesspools, septic tanks, distribution boxes, dry wells, and an oil and grease trap), and the samples were screened using field methods. VOCs and semi-volatile organic compounds (SVOCs) were detected in some samples (ABB-ES, 1991). The results of this survey prompted the ANG to add all remaining cesspool/septic tank system sub-sites to the IRP as part of Site 8.

In September 1991, ABB-ES conducted a limited soil-gas survey at Sites 1 through 4 as a precursor to SI activities. Concentrations of selected compounds were analyzed using a field gas chromatograph (GC). The results were not published. The following month, ABB-ES supervised the installation of three monitor wells, designated MW-01, MW-02, and MW-03 (currently referred to as MW-001, MW-002, and MW-003), and six piezometers, PZ-001 through PZ-006. The results of these activities were used to develop conceptual models for the conduct of the SI.

Sites 10 (Waste Stripper Tank #61 at Building 370) and 11 (Waste Oil Vessel at Building 230) were added to the IRP in December 1992. Neither site was addressed in the Phase I records searches.

2.2 SITE DESCRIPTIONS

Nine sites within or near the ANG facility were investigated during this SI. These include the first five sites identified in the second Phase I records search, and Sites 8 through 11 (Figure 2-2). Site 6 (POL Tank Farm) will be evaluated under a separate program and Site 7 (Fire Training Area) was investigated as previously discussed. SI site designations, locations and descriptions are as follows:

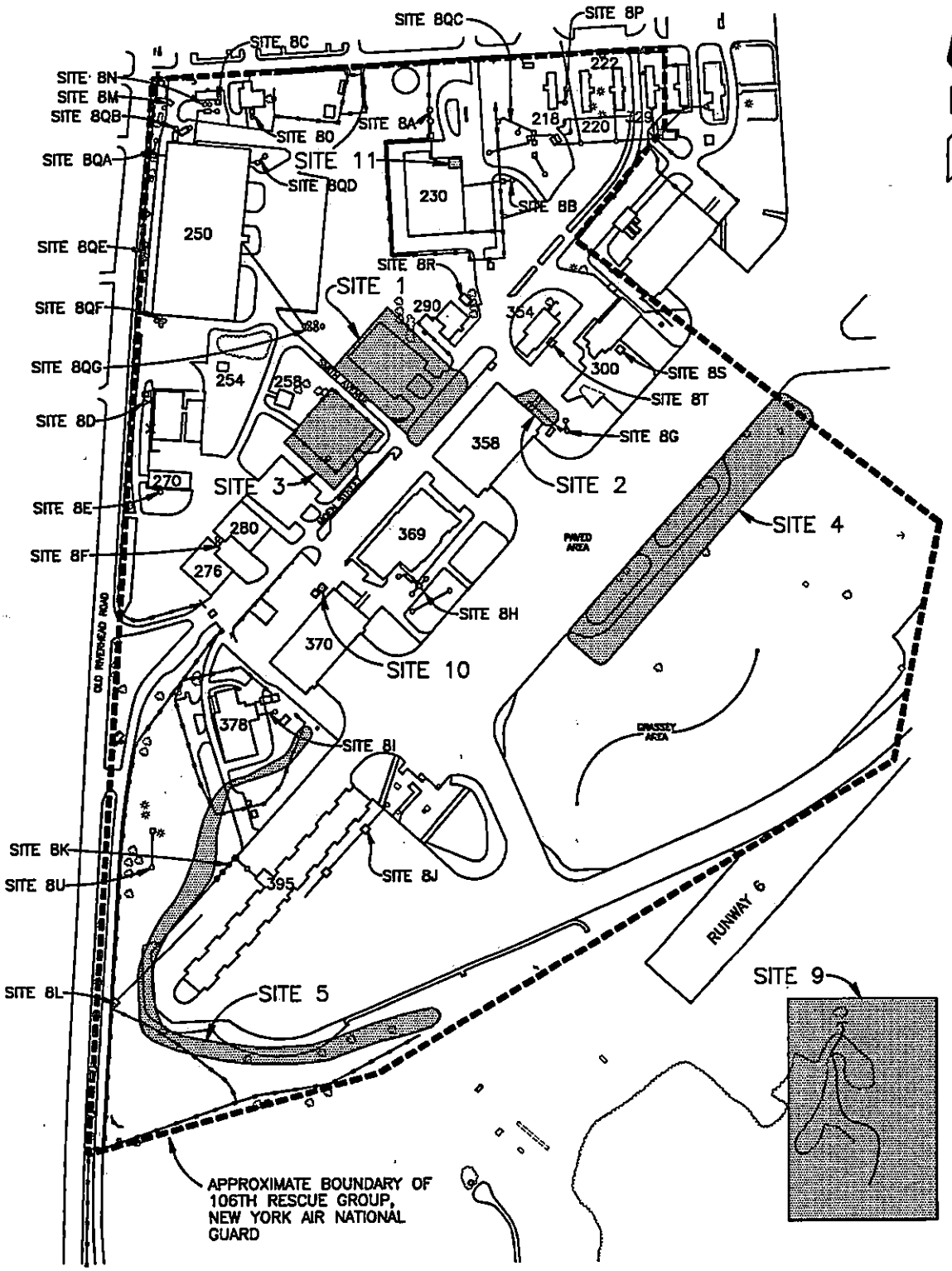


FIGURE 2–2
SITE LOCATION PLAN
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

Site 1 - Aviation Gasoline Spill Site

Site 1 is located northeast of Smith Avenue on both sides of Moen Street. In 1965, a tanker parked in an elevated parking lot northwest of Moen Street released a maximum of 5,000 gallons of aviation gasoline. It is believed that this release took place in a short time frame, probably overnight. The fuel accumulated in a drainage swale where it evaporated or infiltrated the subsurface. None of the fuel was recovered.

Site 2 - Former Hazardous Waste Storage Area

Site 2 is located adjacent to a loading dock along the northeast wall of Building 358. The site consists of grass-covered areas, concrete, and asphalt. Shop wastes and recovered fuels and oils were stored outside in drums from 1970 until 1984. Although spills have not been reported at this site, stained surface soils were observed during the second records search. HMTC (1987) estimated that less than 500 gallons of fluids from minor spills would have been released at this site.

Site 3 - Former Hazardous Waste Storage Area (1984 - 1989)

Site 3 is located in the southeast corner of a paved parking lot at the intersection of Moen Street and Smith Avenue. The site consists of a gravel area which used to be the floor of Building 282. Shop wastes, recovered oils, and waste fuels were stored in drums at this site from 1984 to 1989. The drums were placed on the gravel floor of the former building. Although spills have not been reported at this site, discolored gravel and soil were observed during the second records search, and HMTC (1987) estimated that the cumulative volume of any potential releases would have been less than 1,000 gallons.

Site 4 - Aircraft Refueling Apron Spill Site

Site 4 encompasses the grassy areas adjacent to the refueling apron southeast of Building 358. The refueling apron was used from the 1950s through the 1980s. Fuel was pumped from the POL Tank Farm, located approximately 3,000 feet (ft) southeast of the refueling apron, to fuel outlets in a depressed concrete area at the apron. The depressed area was constructed to prevent potential surface releases from migrating onto the grassy area. Unused fuel was pumped back to the tank farm. Although hydraulic oil (50 gallons/year), trichloroethene(30 gallons/year), and fuel were spilled here (HMTC, 1987), much of this material probably drained to catch basins along the edge of the apron.

Site 5 - Southwest Storm Drainage Ditch

Site 5 is a storm drainage ditch that originates as a subsurface outfall on the southwest side of Building 370. Drainage flows southwest along the ditch for about 280 ft before it is directed below ground south of Building 378. The drainage resurfaces approximately 50 ft farther south and flows southwest for nearly 200 ft before it is directed below ground again. The drainage flows another 450 ft below ground surface (bgs), then resurfaces and flows east for approximately 550 ft. Because the ditch does not have a discharge point it is assumed that water in the ditch infiltrates the subsurface.

A second outfall shown south of Building 395 in the SAP does not exist based on field observations. The drain line connected to this outfall appears to discharge to a cesspool located northeast of Building 395 instead.

The ditch receives rainwater from roof drains and runoff from paved areas in the southwestern portion of the facility. An oily sheen has been observed on water in the ditch during periods of heavy rain and stressed vegetation is present in apparently localized areas (ABB-ES, 1994). HMTC (1987) considered it unlikely that more than 500 gallons of material could have accumulated in the ditch since 1971.

Site 8 - Old Base Septic Systems

Site 8 is a composite of cesspools, septic tanks, distribution boxes, oil/mud traps, and dry wells which constitute the sewage treatment system of the facility . These structures received or receive discharges from one or more buildings where industrial and/or equipment maintenance activities have occurred. VOCs and SVOCs have been detected in sludge and liquid samples obtained from some structures (ABB-ES 1994). Site 8 is listed on the New York State Registry of Inactive Hazardous Waste Sites (ID No. 152148).

Due to the large number of septic system structures and their widespread distribution across the facility, the base was divided into five investigative areas or cells designated Cells 1 through 5 (see Figure 8-26). Among these cells, the underground structures were further divided into 21 subsites designated 8A through 8U. Subsite 8Q was still further subdivided into seven separate units associated with Building 250 (i.e., 8QA through 8QG).

Site 9 - Ramp Drainage Outfall

Site 9 is located approximately 1,100 ft south of the refueling apron. The site consists of an outfall, which receives drainage from the refueling apron and several hangars, and a drainage ditch. Surface drainage from the refueling apron is collected at five catch basins near the fuel outlets and then directed through underground pipes to the drainage outfall at the north end of Site 9. The drainage extends approximately 400 ft south of the outfall point, where it infiltrates into the subsurface.

Site 10 - Waste Stripper Tank #61, Building 370

Site 10 consists of a 1,200-gallon underground tank located approximately 10 ft northwest of Building 370. The tank was used to store spent solvent but may have contained fuel or oil at one time.

Site 11 - Waste Oil Vessel, Building 230

Site 11 is an underground steel vessel located beneath Building 230 near the northeast corner. The building is used for heavy equipment maintenance. The vessel is approximately 2.5 ft in diameter and 18 ft deep and has a solid bottom. A pipe-like opening in the side of the vessel, approximately six ft above the bottom, may connect with piping from elsewhere in the garage. The vessel was partially filled with probable waste motor or hydraulic oil during one site visit and may have been associated with an hydraulic-lift.

Table 2-2
SEWAGE TREATMENT SYSTEM

106th Rescue Group, NYANG
Westhampton Beach, New York

Cesspool/Septic Tank ID	Building Served	Comments
Cell 1		
8M	200	Cesspool
8N	204	Cesspool
8O	206	Inaccessible
8QA	250	Cesspool
8QB	250	Cesspool
8QC	250	Stairs lead several feet down into a vault and gravel was present at the bottom.
8QD	250	Cesspool Septic tank
8QE	250	Septic tank
8QE-1	250	Full of gravel
8QE-2	250	Cesspool
8QE-3	250	Cesspool
8QE-4	250	Cesspool
8QF	250	Cesspool Septic tank
8QG	250	Septic tank and two manhole covers which were inaccessible
Cell 2		
8A	230	Cesspool
8B	230	Cesspool; inaccessible
8C	218, 220, 222,329, Terminal	Cesspools
8P	218	Cesspool
Cell 3		
8G	358	Cesspools
8R	290	Cesspool
8S	300	No manhole cover found for cesspool
8T	354	Cesspool
Cell 4		
8D	264	Cesspool
8E	270	Cesspool
8F	276, 280	Cesspool
8H-1	369	Cesspool
8H-2	369	Cesspool
8H-3	369	Cesspool
8H-4	369	Cesspool
8H-5	369	Cesspool
Cell 5		
8I	378	Cesspool
8U	Unknown	Cesspool
8J	395	Drywell
8K	370	Cesspool
8L	Unknown	Cesspool

3.0 PHYSICAL SETTING

3.1 LAND USE AND DEMOGRAPHICS

The Town of Southampton surrounds most of Gabreski Airport. The Village of Westhampton Beach is located to the southwest and the Village of Quogue is to the southeast of the airport. Suffolk County leases the southwest portion of the airport to NYANG and the northwest portion to various small businesses which currently occupy buildings used by SCAFB. These businesses include aviation-related companies, storage space, automobile repair facilities, and construction companies. Runways are located in the eastern portion of the airport.

North of the airport, the land is predominately undeveloped pine barrens zoned for industry. The area west of the airport is nearly undeveloped with some businesses located on Riverhead Road. To the south, the villages of Westhampton Beach and Quogue contain residences and commercial properties including an automobile salvage yard, a closed landfill, a maintenance facility, and a sand and gravel quarry. The Quogue Wildlife Refuge is a 200-acre state-operated wildlife management area to the east of the airport. An estimate of the population within a four mile radius of the site was conducted by Claritas, Inc., of Ithica, New York. Table 3-1 provides the results of the population survey.

Table 3-1
POPULATION SURVEY DATA

106th Rescue Group, NYANG
Westhampton Beach, New York

DISTANCE (miles)	POPULATION
0 - 1/4	74
> 1/4 - 1/2	278
> 1/2 - 1	1478
> 1 - 2	2366
> 2 - 3	2603
> 3 - 4	3900

3.2 NATURAL RESOURCES

Gabreski Airport is located within the Long Island pine barrens. The pine barrens are characterized by open, sunlit woodlands dominated by pitch pine interspersed with white and scrub oak. Of the wildlife, birds are the most abundant in the area. Few mammals inhabit the region. Of those that do, the most common are the white-tail deer and red fox. Large animals generally do not inhabit the airport but may pass through. The following is a list of the Endangered and Threatened species located within a four mile radius of the site (ABB-ES, 1995).

- 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 1986 records search (Dames & Moore, 1986).

3.3 CLIMATE

The climate of the area surrounding Gabreski Airport is humid-continental with a maritime influence characterized by periods of freeze-free temperatures, a reduced range in diurnal and annual temperature, and heavy precipitation in winter relative to that in summer. The winter season lasts about three months with the coldest temperatures generally ranging from 0 degrees Fahrenheit (°F) to 10 °F. Temperatures of 90 °F or higher occur on an average of 4 to 6 days per year during summer. The freeze-free growing season is about 200 to 210 days per year in much of Suffolk County. Net precipitation at the base is 14.5 inches per year, and dry periods during June and July are common (Dames & Moore, 1986). The 2 year, 24 hour rainfall total for the base is 3.5 inches (Department of Commerce, 1963). Table 3-2 provides a

summary of climatalogical data recorded at Riverhead, New York, approximately 7 miles north of the airport.

Table 3-2
TEMPERATURE AND PRECIPITATION DATA AT
RIVERHEAD, SUFFOLK COUNTY, NEW YORK

106th Rescue Group, NYANG
Westhampton Beach, New York

	Temperature					Precipitation			
			7 years in 10 will have -			*3 years in 10 will have -*		*Snowfall*	
Month	Average Daily Max. °F	Average Daily Min. °F	Maximum temperature equal to or higher than - °F	Minimum temperature equal to or lower than - °F	Average Monthly Total Inch	More than - Inch	Less than - Inch	Average Monthly Total Inch	4 years in 10 will have more than - Inch
January	38	24	52	11	3.6	3.8	2.9	7	6
February	39	25	51	13	3.3	3.9	2.4	7	7
March	46	31	61	21	4.2	5.0	3.0	6	5
April	58	39	74	30	3.6	4.2	2.9	(1)	2
May	69	49	81	39	3.5	4.6	2.0	0	(2) [1]
June	78	58	90	47	2.7	3.5	1.9	0	
July	83	64	90	55	3.3	4.0	2.1	0	
August	81	64	87	53	4.3	4.8	2.4	0	
September	75	57	84	44	3.1	3.7	1.6	0	
October	65	48	79	35	3.1	4.0	2.3	0	(1 2)
November	54	38	66	26	4.5	5.8	3.1	(1)	(1) [2]
December	42	28	57	14	4.2	5.5	2.9	6	7
Year	61	44	92	7	43.4	46.5	40.6	26	28

[1] One year in 10 will have more
[2] Trace
°F Degrees Fahrenheit

Reference:
Dames & Moore, 1986.

3.4 TOPOGRAPHY

Gabreski Airport is situated on a glacial outwash plain south of the Ronkonkoma terminal moraine, which formed during Wisconsin glaciation. The outwash plain slopes southward from the terminal moraine to the bays and barrier islands along the Atlantic Ocean shoreline. Relief is characteristically flat with subtle

rolling terrain and steeper stream channels (Figure 3-1). Figure 3-2 shows regional drainage in the area around the airport.

3.5 REGIONAL GEOLOGY

3.5.1 Soils

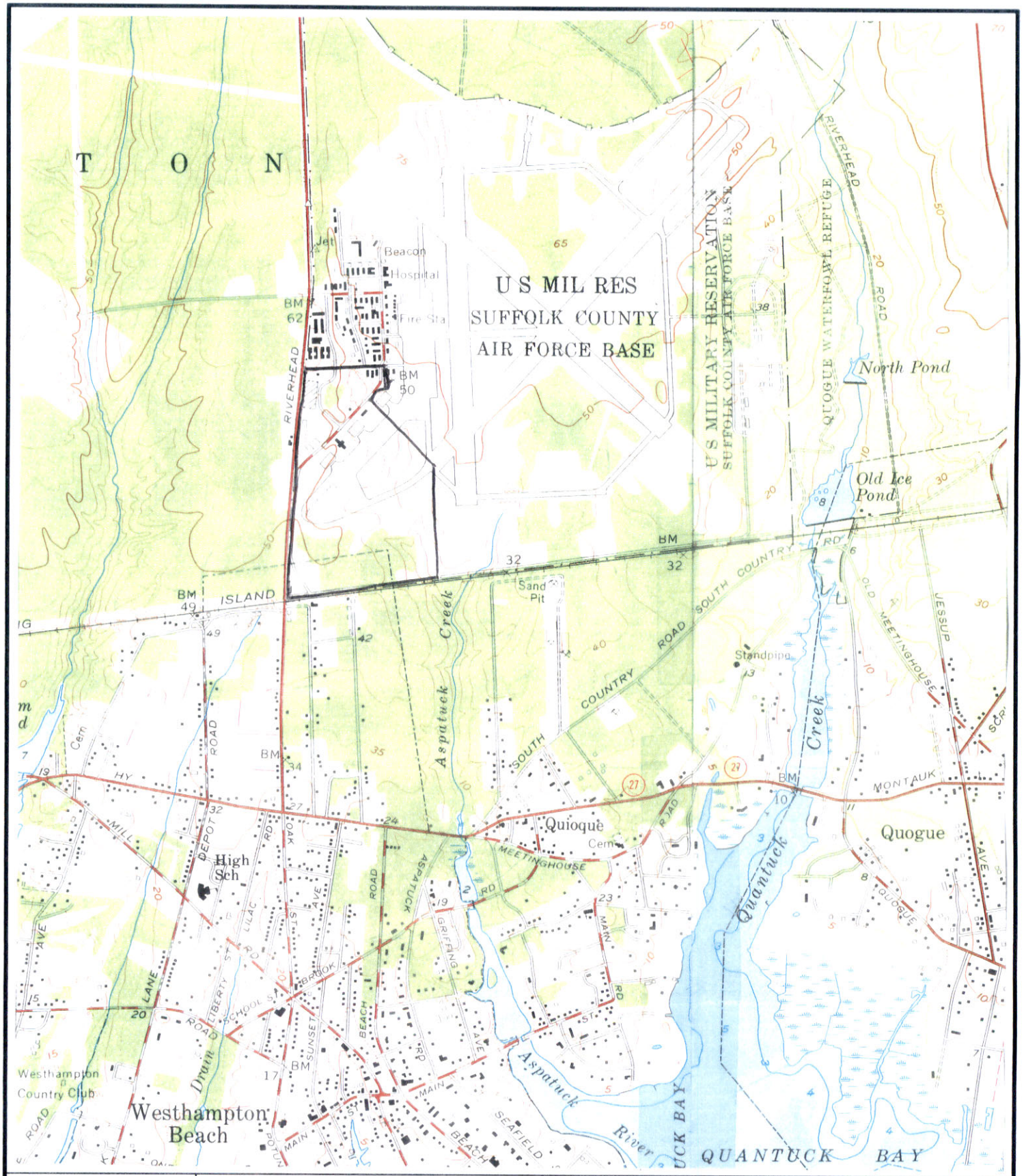
Surface soils in the vicinity of the airport belong to either the Riverhead-Plymouth-Carver Association or the Plymouth-Carver Association (Figure 3-3). As the names suggest, both soil associations are characteristically similar with only subtle variations between them.. The former is characterized by 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 which are not suitable for most agricultural purposes, and therefore supporting only limited types of native vegetation (Dames & Moore, 1986).

3.5.2 Geology

Five unconsolidated formations are found below, or near, Gabreski Airport. These units dip generally to the south with the thicker units very widespread and underlying most of Suffolk County. Figure 3-4 is a generally north-south-trending cross-section of the geologic formations present in the region. Figure 3-5 shows a generalized stratigraphic column of the regional geology.

Bedrock

The bedrock that underlies the unconsolidated deposits includes hard, dense schist, gneiss, and granite similar in character to that which underlies much of the mainland in nearby parts of New York and Connecticut. Elevation of the bedrock is approximately 1,600 ft below MSL. These rocks are either



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



QUADRANGLE LOCATION

N

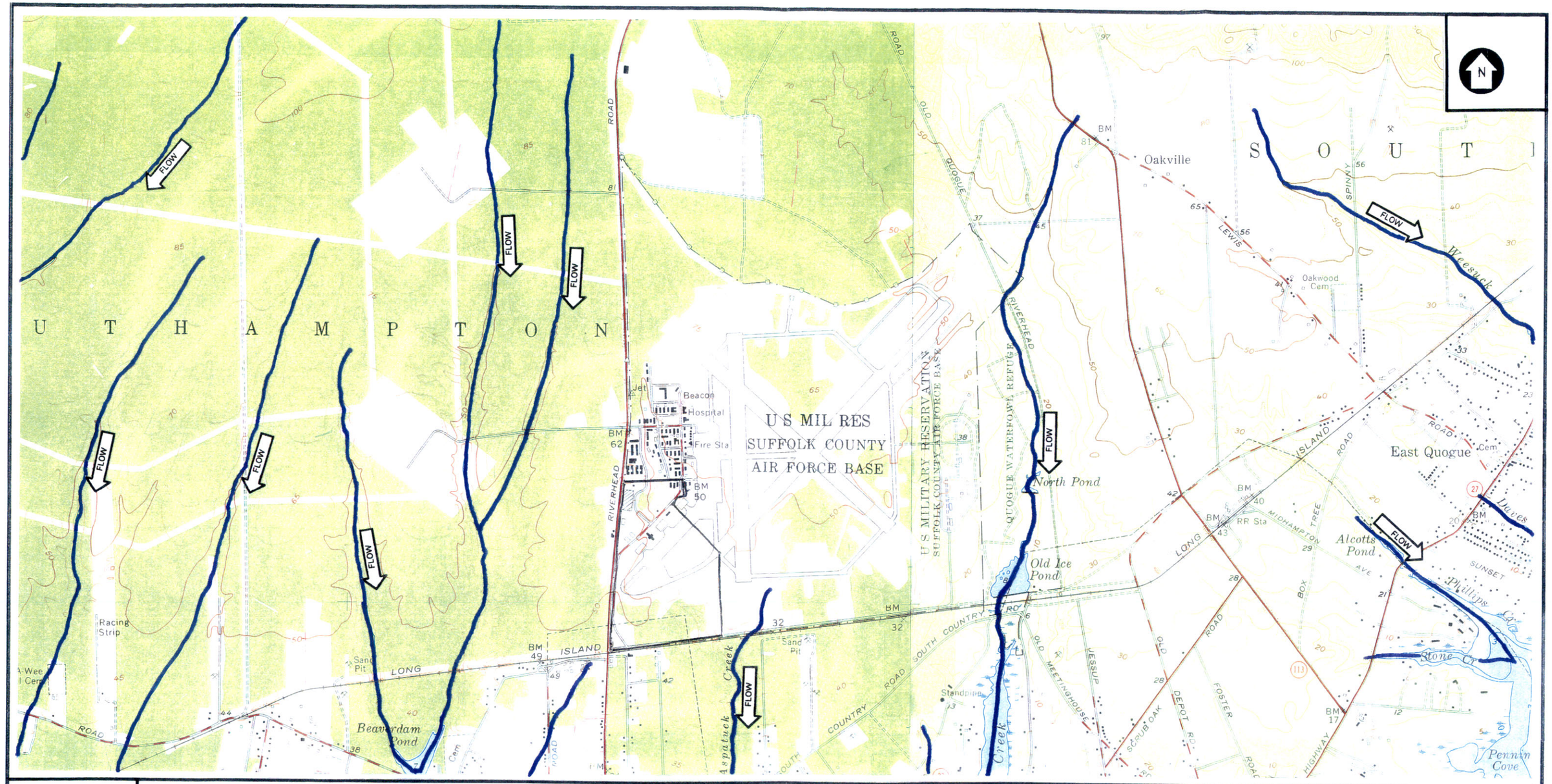
0 2,000 4,000

SCALE IN FEET

FIGURE 3-1
TOPOGRAPHIC MAP
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

ABB Environmental Services, Inc.

K9503014/6943.30/G006



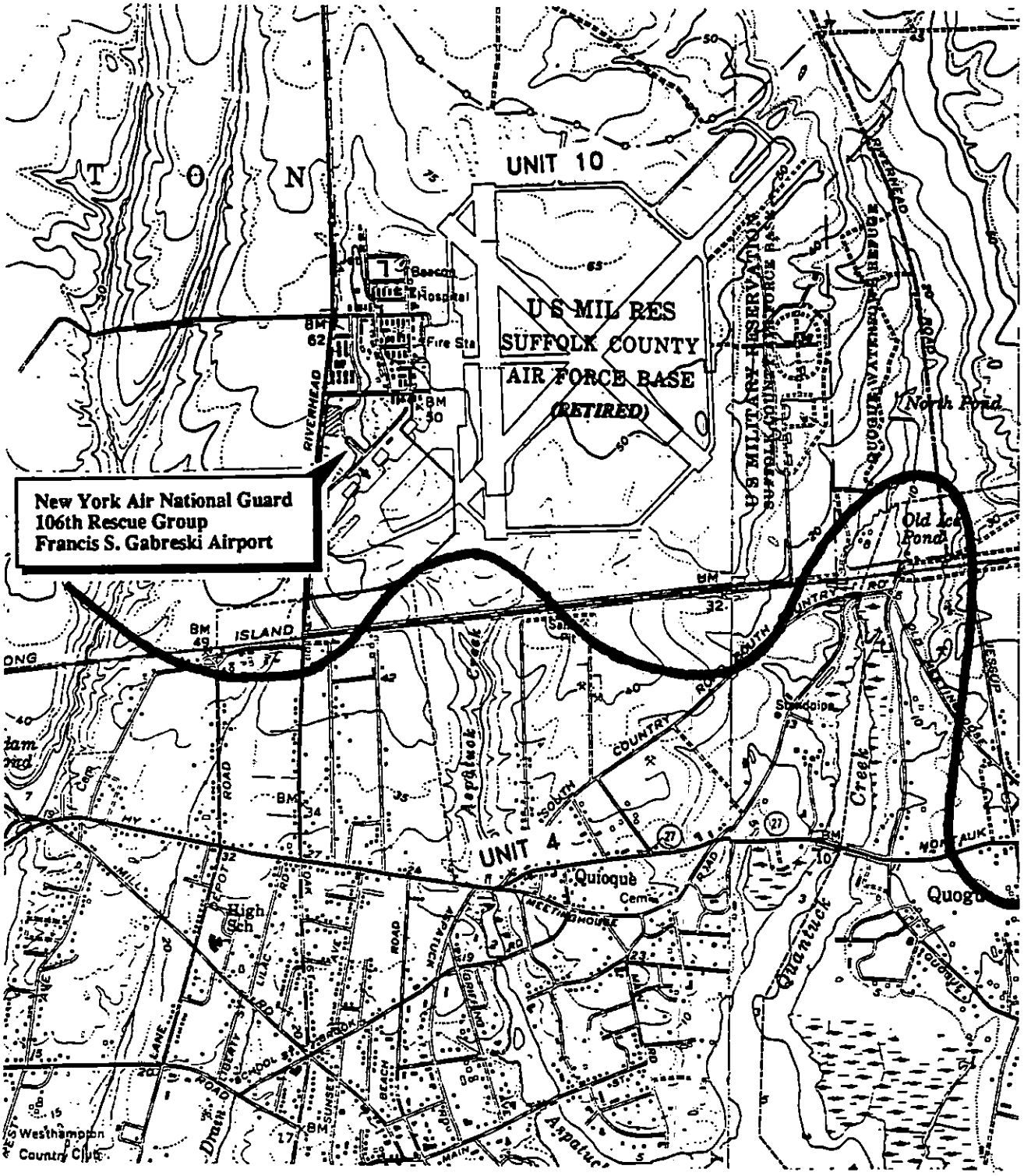
Source: USGS 7.5 minute series quadrangle maps for Eastport and Quogue, New York dated 1956



0 2,000 4,000
SCALE IN FEET

FIGURE 3–2
REGIONAL DRAINAGE MAP
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

ABB Environmental Services, Inc.



UNIT 4 Riverhead–Plymouth–Carver Soil
UNIT 10 Plymouth–Carver Soil

Sources: Dames & Moore, 1986
USGS 7.5 minute series quadrangle maps for Eastport and Quogue, New York dated 1956

N

0 2,000 4,000

SCALE IN FEET

FIGURE 3–3
SOIL ASSOCIATIONS
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

ABB Environmental Services, Inc.

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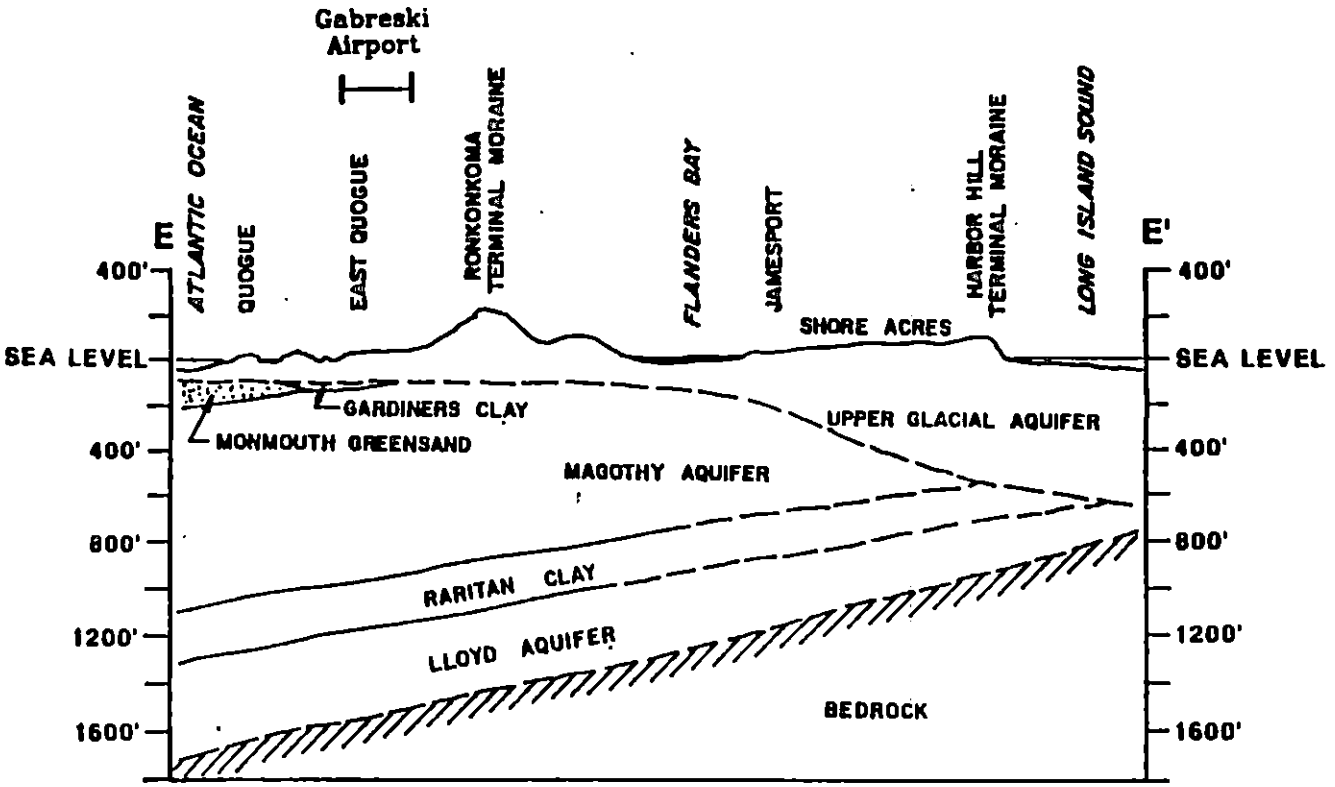


Figure 3–4
Regional Stratigraphy
106th Rescue Group, NYANG
Westhampton Beach, New York

SOURCE: ABB–ES, 1990

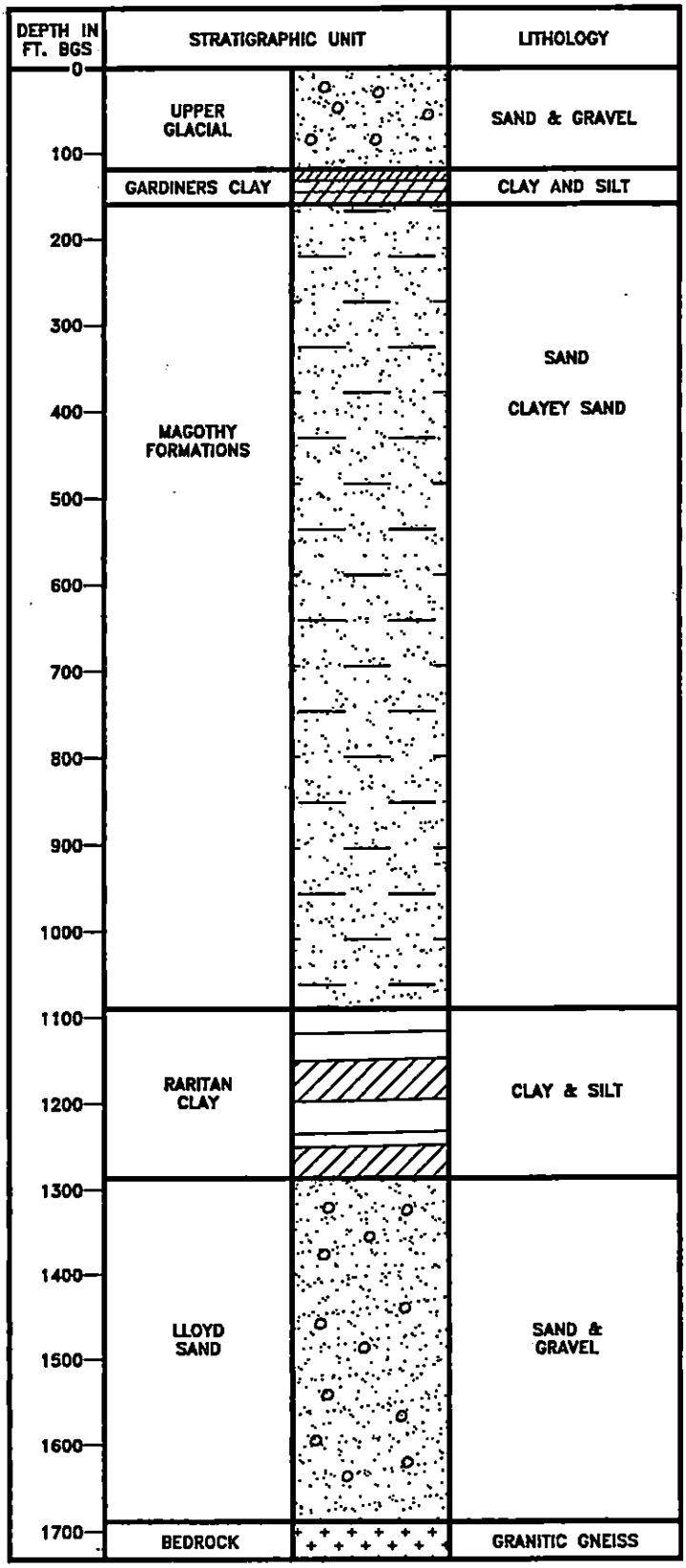


Figure 3–5
Generalized Stratigraphic Column
106th Rescue Group, NYANG
Westhampton Beach, New York

BGS – BELOW GROUND SURFACE

metamorphosed Precambrian or early Paleozoic Age sediments. Two deep borings penetrated bedrock at a depth of approximately 1,600 ft at locations 18 miles west of the airport. The bedrock was hard, banded, granite gneiss (Dames & Moore, 1986).

Mineralogy of the gneiss showed almost 50 percent plagioclase feldspar, almost 50 percent quartz, about 1 percent biotite, and a trace of garnet. The surface of the bedrock in the region around the airport dips almost directly southward with an average gradient of 1 percent (Dames & Moore, 1986).

Raritan Formation

The Raritan formation rests directly on highly to slightly weathered bedrock. The formation is probably entirely continental and was laid down as a coastal-plain deposit by streams flowing off the mainland. On Long Island the formation has two fairly distinct members: the Lloyd sand member below, and a clay member above. The formation probably occurs beneath all central Suffolk County. Northward the Lloyd sand thins and probably pinches out beneath Long Island Sound, and the clay member may do likewise. Southward the formation extends a considerable distance offshore, possibly as far as the continental shelf (about 100 miles) (Dames & Moore, 1986).

Lloyd Sand Member of the Raritan Formation

The Lloyd sand member is a fairly uniform and extensive unit consisting predominantly of sand and gravel with some clay. It is known only from well logs. At two deep test wells it is separated from the hard crystalline bedrock by 15 to 30 ft to tough, white, structureless clay containing scattered angular grains of quartz, which is considered to be weathered bedrock. The upper contact of the Lloyd sand member with the overlying clay member is fairly definitely marked by a change in the lithology of the sediments.

The Lloyd sand member is about 400 ft thick. It is largely composed of fine to coarse sand containing silt and clay in the interstices. It also includes beds of clay or sandy clay and coarser textured beds that contain gravel. Near the middle, the unit consists chiefly of sand and coarse gravel, which contains some

pebbles at least 2 inches in diameter. The voids between the pebbles are for the most part filled with sand and some clay. The porosity of the unit is appreciably less than that of a well-sorted sand or gravel.

The pebbles and the sand found in the Lloyd member are composed almost entirely of quartz. This composition suggests that the material was derived from a region in which the climate was warm and the rate of erosion slow, so that all but the most resistant material was entirely decomposed. The clay is entirely or dominantly kaolinite, a mineral indicative of complete weathering (Dames & Moore, 1986).

Clay Member of the Raritan Formation

The clay member, which overlies the Lloyd sand, makes up the balance of the Raritan formation. The top of the clay member is approximately 1,000 ft below MSL at the airport. Its thickness is about 200 ft. It is largely composed of tough dark-gray or black lignitic clay and some red and white clay and includes some sandy layers and thin lenses of gravel. It also contains some light-gray silty and sandy clay. It is not clearly bedded, as the textures and colors grade into one another. Zones containing well-marked, narrow bands of light silty clay alternate with darker clay.

The clay member shows little, if any, systematic variation in thickness on Long Island. In most of the carefully logged wells that penetrate it, the clay is about 200 ft thick, and at least some of the greater or lesser thicknesses reported may be due to difficulty in placing the contacts, for these depend only on differences in lithology.

Like the Lloyd member below and the Magothy formation above, the clay member has not yielded any fossils except plant remains and is probably nonmarine. The scattered pieces and grains of lignite, the widely distributed spores and pollen, the casts of twigs and leaves, and the possible varying suggest deposition on a coastal plain by generally sluggish, but sometimes flooded, rivers that drained a deeply weathered area of moderate relieve. The coarser grained materials found in seams probably are lenses of limited extent both horizontally and vertically and may act as relatively permeable but devious paths for the movement of water (Dames & Moore, 1986).

Magothy Formation

The Magothy formation is a thick body of continental deposits composed of lenses of sand, sandy clay, clay, and some gravel. It rests on the Raritan formation and is in turn unconformably overlain by upper Pliestocene deposits. The greatest thickness revealed by drilling is about 1,000 ft. The present upper surface of the Magothy on Long Island is an erosional surface, and the original total thickness is not known.

The Magothy formation underlies most of Long Island except for some western areas where it was removed by erosion. It may extend beneath Long Island Sound but is probably truncated by erosion and overlain by Pleistocene deposits. To the south, the Magothy formation, like the Raritan, extends out under the sea, where it also probably changes from a terrestrial to a marine deposit.

The Magothy is composed of beds of poorly sorted quartzose sand mixed with and interbedded with silt and clay, and locally it contains pebbles or small lenses of gravel. Sandy clay and clayey sand make up most of the fine beds, but there are also several thick beds of clay. The basal 100-150 ft of the Magothy contains a greater proportion of coarse-grained material. This consists partly of coarse sand and gravel that contains pebbles as much as 2 or 3 inches in diameter. Voids are largely filled with silt and soft clay. The coarse-grained beds are separated by beds of sandy clay. A zone immediately overlying the clay member of the Raritan contains relatively coarse-grained permeable material.

The Magothy formation typically contains several clay layers, some of them as much as 50 ft thick. Where the Magothy itself is thick, the aggregate thickness of the clay beds is nearly as great as that of the clay member of the Raritan. It is difficult or impossible to trace any of these clay beds from one well to the next, which suggests they are probably lenticular and individually of small extent. These clay beds probably do not constitute as effective a barrier to the movement of groundwater as the clay member of the Raritan formation (Dames & Moore, 1986).

Monmouth Greensand

Unconformably overlying the Magothy Formation is the Monmouth Greensand. This unit is not present beneath the airport or to the north but is present 3,000 ft to the south. This unit extends southward and forms a wedge-like layer which thickens towards the south. It is approximately 50 ft thick beneath the barrier beach. The Monmouth Greensand consists of interbedded marine deposits of dark-gray, olive-green, dark-greenish-gray, and greenish-black glauconitic and lignitic clay, silt, and clayey and silty sand. This layer has a low hydraulic conductivity and tends to confine the water of the underlying aquifer (Dames & Moore, 1986).

Gardiners Clay

An approximately 40-foot-thick clay bed lies above the Magothy Formation and below the glacial deposits below the airport. This clay is present at about 100 ft below MSL at the airport and extends southward where it overlaps the Monmouth Greensand. The Gardiners clay pinches out just north of the airport, but equivalent clay bodies can be found locally at various locations on Long Island. This unit is made up of green and gray clay, silt, and clayey and silty sand including some interbedded clayey and silty gravel. This layer as a whole has low hydraulic conductivity and tends to confine water in the underlying aquifer (Dames & Moore, 1986).

Glacial Deposits

These upper Pleistocene sediments are composed of glacial outwash deposits; lacustrine and marine deposits; and terminal, ground, and ablation-moraine till deposits. The sediments below 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. 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 two miles north of the airport. Lacustrine and marine deposits are usually thin and discontinuous and are found locally throughout Long Island.

The Pleistocene epoch is divided into four major glacial stages, the Nebraskan, Kansan, Illinoian, and Wisconsin. The youngest epoch, the Wisconsin, produced Long Island Sound and most of the topographic features of Suffolk County as it is known today.

During the earlier part of the Wisconsin stage, the ice sheet moved to about the middle of the county and stopped, leaving before it the central ridge or terminal moraine. This ice sheet was called the Ronkonkoma sheet, and the moraine, which runs the entire length of the county from the Nassau County line to Montauk Point, was given the same name. The glacier retreated from this point back to the north of Long Island and then readvanced. The last advance terminated along the north shore, and again, a hilly terminal moraine was formed. This last advance of the ice was called the Harbor Hill sheet, and the moraine was called the Harbor Hill Moraine.

After the two ice sheets reached their southern limits in the county, they began to melt. As they melted, meltwater streams flowed from the glaciers and carried a large volume of sand and gravel farther south. The sand and gravel were deposited in a more or less flat plain, developing what is known as an outwash plain. Two outwash plains are in the county, with the one between the Ronkonkoma moraine and the Atlantic Ocean being the one present below the airport (Dames & Moore, 1986).

3.6 HYDROLOGY

3.6.1 Groundwater Hydrology

Three aquifers and two aquitards are present in the region around the 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 at the airport and overlying the Magothy north of the airport is the upper glacial aquifer, a predominately sand and gravel unit deposited during the Wisconsin glaciation

(Dames & Moore, 1986). The general characteristics of each aquifer and aquitard including hydrologic properties are presented below. Table 3-3 presents the hydrologic properties of each unit.

Table 3-3
HYDROLOGIC PROPERTIES OF REGIONAL AQUIFERS
WESTHAMPTON BEACH, NEW YORK

106th Rescue Group, NYANG
Westhampton Beach, New York

Unit	Texture	Thickness (ft)	Hydraulic Conductivity gpd/ft^2 (cms)	Estimated Transmissivity gpd/ft (cm^2/s)
Upper Glacial	Sand and gravel	120	2,000 (9.4×10^{-2})	200 (3×10^{-1})
Gardiners Clay	Clay and silt	40	Aquitard	Aquitard
Magothy Formations	Sand, clayey sand	930	380 (1.8×10^{-2})	300 (4.5×10^{-1})
Raritan Clay	Clay and silt	200	Aquitard	Aquitard
Lloyd Sand	Sand and gravel	400	300 (1.4×10^{-2})	75 (1.1×10^{-1})
Bedrock	Granitic gneiss	--	Aquiclude	Aquiclude

gpd/ft gallons per day per foot
gpd/ft^2 gallons per day per square foot
cms centimeters per second

Reference:
Dames & Moore, 1986.

Bedrock

This metamorphic unit is mostly plagioclase and quartz gneiss with no primary porosity. Some secondary porosity due to joints and fractures is present, which allows its use as a water source on western Long Island where bedrock is near surface and the overlying aquifers are absent. This unit has low hydraulic conductivity and is considered an aquiclude due to its texture and the highly weathered surface zone which has become a greenish-white residual clay (Dames & Moore, 1986).

Lloyd Aquifer

The Lloyd sand is one of the most important aquifers on Long Island largely because it yields adequate supplies of good quality water in areas, generally beneath the margins of Long Island, where supplies from overlying formations are inadequate or are contaminated by or readily subject to contamination by seawater. The Lloyd can supply water under these circumstances because it is overlain by the relatively impermeable and virtually continuous blanket of the clay member.

The usefulness of the aquifer is seriously compromised by the probability of poor yield. In the western part of the island, many wells tapping the Lloyd sand member yield 10 to 20 gallons per minute (gpm) per foot (gpm/ft) of drawdown. A well at Brookhaven National Laboratory was finished with 25 ft of screen and had a yield of about 2 gpm/ft of drawdown.

The hydraulic conductivity of the Lloyd around the airport was estimated to be 300 gallons per day per square foot (gpd/ft^2) (1.4×10^{-2} cm/s), and transmissivity was estimated as 75 gallons per day per foot (gpd/ft) (1.1×10^{-1} cm^2/s).

The Lloyd aquifer as of 1974 was not used as a water source at or near the Suffolk County Airport. In 1982, 0.19 million gallons per day (mgd) was taken from the Lloyd in the east central area of Long Island (Dames & Moore, 1986).

Raritan Clay

The Raritan Clay member of the Raritan Formation is considered an aquitard separating the underlying Lloyd Aquifer from the overlying Magothy Aquifer. Thickness below the airport is approximately 200 ft. The hydraulic conductivity of a clay similar to the Raritan was determined to be 0.2 gpd/ft^2 (9.3×10^{-6} cm/s), which is several orders of magnitude less than either the Lloyd or Magothy aquifers indicating that mixing of waters is quite small (Dames & Moore, 1986).

Magothy Aquifer

Although it consists in part of beds of dense clay and layers of coarse sand and gravel, by far the greater part of the Magothy formation is made up of sandy clay and clayey sand. The formation as a whole, because of its thickness, can transmit and store large amounts of groundwater. There are no effective barriers to the movement of water through the formation except locally. Wells that are constructed and developed carefully generally yield large quantities of water from all but the most clayey parts of the formation. The Magothy is important as an alternate aquifer in the event that the water in the overlying upper Pleistocene deposits becomes contaminated.

The highly productive beds of the Magothy are not confined to the basal gravely zone, but there is no other zone in which a reliable supply can be predicted. A well at Brookhaven National Laboratory penetrated considerable material in the Magothy from which water might be obtained. This well had only 20 ft of screen, no gravel pack, and little development but still yielded water at a specific capacity of 15 gpm/ft of drawdown.

Hydraulic conductivity of the Magothy below the airport was estimated to be 380 gpd/ft^2 (1.8×10^{-2} cm/s), and transmissivity was at least 300 gpd/ft (4.3×10^{-1}) with a saturated thickness of approximately 930 ft. In 1982, 1.02 million gallons per day was removed from this aquifer in east Central Long Island. Below the airport, the top of the Magothy aquifer is about 150 ft below MSL. The potentiometric surface of this aquifer is approximately 15 ft above MSL. This confined, artesian nature of the Magothy would cause an upward flow of water through the overlying Gardiners clay (Dames & Moore, 1986).

Gardiners Clay

This clay is poorly permeable and constitutes a confining layer for the underlying aquifer. Occasionally, some sand layers within the Gardiner may yield small quantities of water. The effectiveness of the Gardiners clay as a barrier to groundwater movement is an important factor in determining whether contamination reaching the groundwater in the glacial sands would be carried down to the lower aquifer. The sandy zones in the clay, which as far as is known may occur anywhere, would offer relatively little

restriction to the movement of water, which could then pass downward wherever the hydraulic gradient is favorable. Water can pass through the Gardiners clay, although at a slow rate, in small amounts and probably at most places only by circuitous routes.

Below the airport, the beds of clay and sand within the Gardiners are probably an effective barrier to the movement of groundwater into lower aquifers. The combination of low permeability with the generally upward movement of Magothy aquifer water would tend to keep near-surface contamination from migrating into the lower aquifer (Dames & Moore, 1986).

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 aquifer present directly below the airport. Depth to groundwater is approximately 30 ft but may be less or more due to topographic highs or lows.

The clean, coarse sand and gravel is very porous and highly permeable. It makes a porous soil, so that a high proportion of the rainfall infiltrates where it falls. There is virtually no surface runoff. Because of their high porosity, the deposits store large quantities of water. Because of their high permeability, the deposits yield large quantities of water to wells and are 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.

Some of these minor variations in water-bearing characteristics might become significant in connection with possible movement of a contaminant. As the moraine deposits and outwash were deposited by water flowing in general from north to south, individual lenses of sand and gravel may themselves be elongated in this direction. Thus, there may be threads of material with relatively higher permeable material along which water might move a little more rapidly under proper hydraulic conditions. Hydraulic conductivity of the outwash was estimated to be about 2,000 gpd/ft^2 (9.4 x 10^{-2} cm/s), and transmissivity is approximately 200 gpd/ft (2.9 x 10^{-1} cm^2/s).

The upward movement of water from the Magothy Aquifer would cause the upper glacial aquifer water to flow horizontally toward surface water discharge points. Migration of contaminants downward into lower aquifers is very unlikely (Dames & Moore, 1986).

3.6.2 Surface Water Hydrology

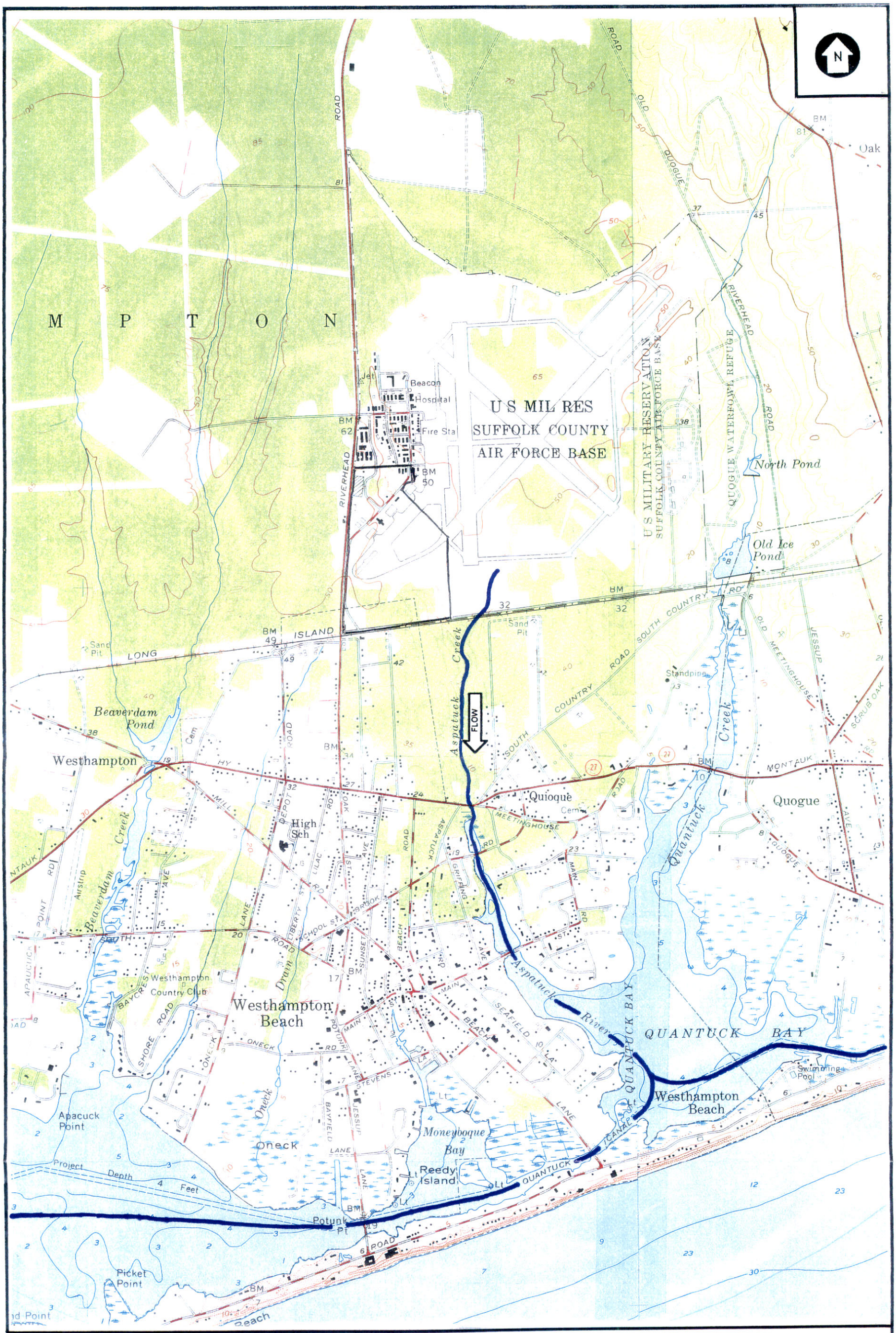
The topography of the Suffolk County Airport area is such that surface water runoff flows in a southerly and southeasterly direction. Runoff from the airport mainly percolates into the soil and moves in the subsurface aquifers although some may move as sheet flow. The airport drains to Aspatuck Creek located near the southeast corner of the base. this creek flows into Quantuck Bay, which is separated from the Atlantic Ocean by a narrow barrier island (Figure 3-1). The surface water segments leading away from the site, as defined in the HRS are listed in Table 3-4 and shown in Figure 3-6.

Table 3-4
SURFACE WATER SEGMENTS

106th Rescue Group, NYANG
Westhampton Beach, New York

PATHWAY 1: SEGMENTS	LENGTH (miles)	CLASSIFICATION
Aspatuck Creek	0 - 0.9	Coastal Tidal
Aspatuck River	0.9 - 2.0	Coastal Tidal
Quantuck Bay	2.0 - 2.75	Coastal Tidal
Quogue Canal	2.75 - 4.35	Coastal Tidal
Shinnecock Bay	4.35 - 9.35	Coastal Tidal
Atlantic Ocean	9.35 - 15.0	Moderate Depth Ocean
PATHWAY 2: SEGMENTS	LENGTH (miles)	CLASSIFICATION
Aspatuck Creek	0 - 0.9	Coastal Tidal
Aspatuck River	0.9 - 2.0	Coastal Tidal
Quantuck Bay	2.0 - 2.4	Coastal Tidal
Quantuck Canal	2.4 - 3.6	Coastal Tidal
Moriches Bay	3.6 - 10.6	Coastal Tidal
Atlantic Ocean	10.6 - 15.0	Moderate Depth Ocean

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



QUADRANGLE LOCATION

0 2,000 4,000

SCALE IN FEET

FIGURE 3-6
SURFACE WATER SEGMENTS
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

ABB Environmental Services, Inc.

3.7 GROUNDWATER USE

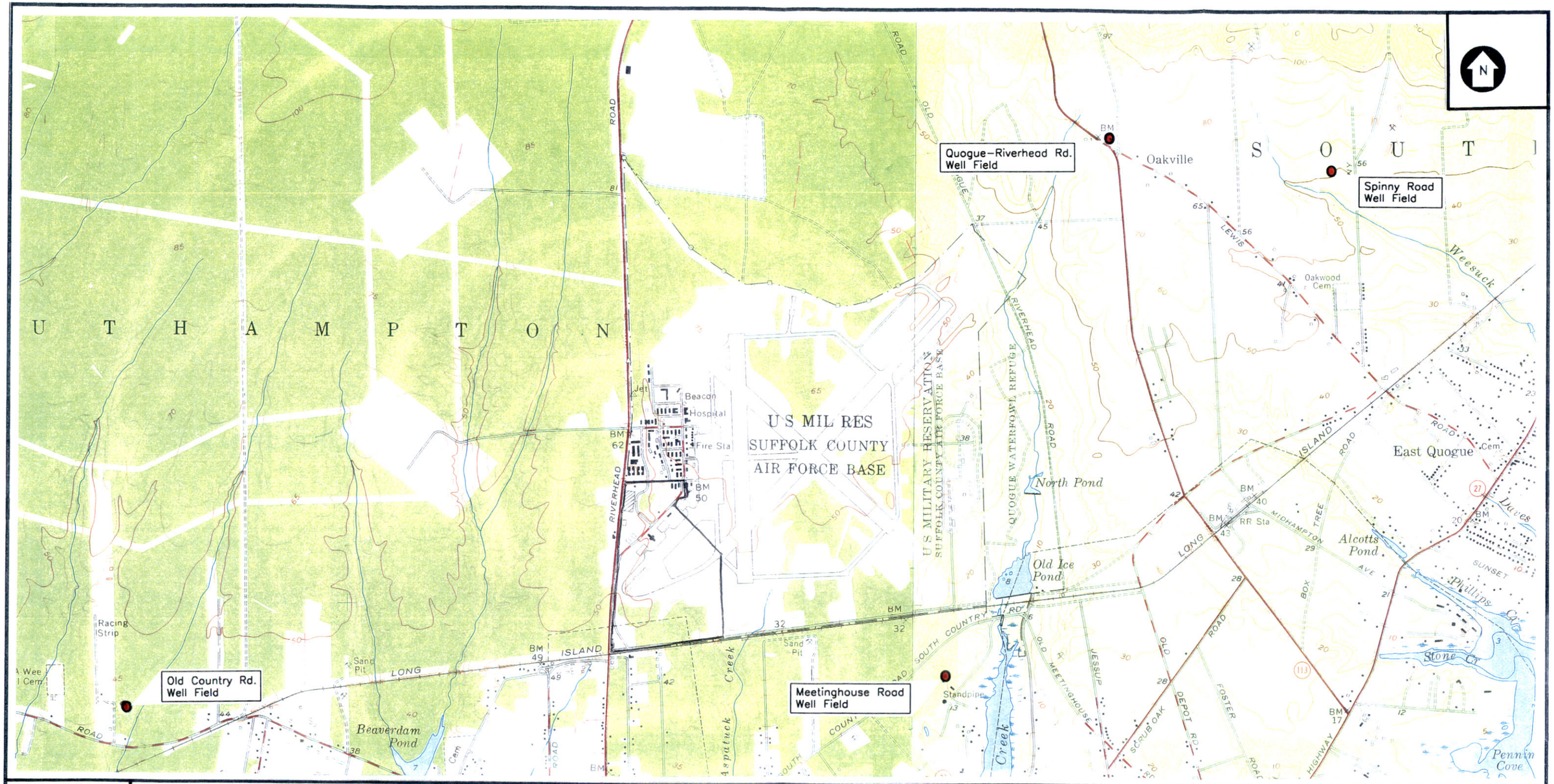
Groundwater is the only water supply source for Suffolk County. Most of the water in the Gabreski Airport area is obtained from the upper glacial aquifer; the rest is obtained from the Magothy and Lloyd aquifers. At present, Suffolk County Water Authority supplies the majority of the water in the area; the rest is supplied by several smaller companies. Suffolk County Water Authority operates 18 wells in four well fields within a four mile radius of the site. The nearest public supply well field is located 0.61 miles southeast of Gabreski Airport according to the Suffolk County Water Authority. Table 3-5 provides information pertaining to the public drinking water supply wells. Figure 3-7 shows the location of identified public drinking water supply wells. Some domestic wells are located within one mile, south of the airport.

Table 3-5
PUBLIC DRINKING WATER SUPPLY WELL INFORMATION

106th Rescue Group, NYANG
Westhampton Beach, New York

WELL FIELD ID	DISTANCE FROM SITE	AQUIFER TAPPED	SCREENED INTERVAL (ft)	TOTAL DEPTH (ft)	POPULATION SERVED
Meeting House Road	0.61 miles	Upper Glacial	Well #20 - 55-75 Well #22 - 74-104 Well #15A - 31-51	Well #20 - 78 Well #22 - 104 Well #15A - 53	~ 6538.29
Quogue-Riverhead Rd.	1.16 miles	Magothy	Well #1 - 386-447	Well #1 - 449	~1188.78
Spinny Road	1.7 miles	Upper Glacial	Well #1 - 85-115 Well #2 - 118-158	Well #1 - 118 Well #2 - 163	~ 188.78
Old Country Road	2.18 miles	Upper Glacial	Well #1 - 60-75 Well #2 - NA Well #3 - 128-157	Well #1 - 76 Well #2 - 70 Well #3 - 161	~ 1783.17

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



0 2,000 4,000
SCALE IN FEET

FIGURE 3–7
PUBLIC DRINKING WATER
SUPPLY WELL LOCATIONS
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

ABB Environmental Services, Inc.

4.0 FIELD PROGRAM

The following subsections provide details of the geophysical survey conducted at each sample location, the technologies and methods used to conduct subsurface explorations, and sample collection procedures. Field quality assurance measures, the disposal of investigation derived waste (IDW), and survey control are also included in this section.

4.1 GEOPHYSICAL SURVEY

Prior to the commencement of sample collection, a geophysical survey was completed at proposed boring and well locations to minimize the potential of drilling through underground utilities or other subsurface features. Boring and well locations were selected based on a contamination scenario developed for each site, likely release pathway(s), and potential affected media (ABB-ES, 1994). The survey was conducted with Ground Penetrating Radar (GPR), which uses a high-frequency electromagnetic signal to locate subsurface objects. Interpretation of GPR signals can also provide information on the depth and size of underground features. Proposed boring or well locations overlying detected underground utilities or other subsurface features were adjusted. As the survey at each proposed location was completed, a stake marking the location was flagged to indicate that the location had been cleared.

4.2 SUBSURFACE EXPLORATION

4.2.1 Borings

Seventy four borings were drilled at the facility using ABB-ES' Geoprobe™ mounted in a van. The borings were completed by hydraulically pushing or hammering a soil sampling sleeve or screen attached small diameter rods into the subsurface and retrieving soil or groundwater samples from a specified depth interval. Soil and groundwater sampling procedures are described in Section 4.3. The borings were abandoned by grouting to the surface with a cement/bentonite mixture. Boring logs are provided in Appendix A.

A sheet of 10 mil plastic was spread over the sample location area and beneath the van in the down wind direction. The exclusion zone encompassed the van and an area behind the Geoprobe™ large enough to perform sample collection activities. Sample collection personnel wore tyvek coveralls and booties, gloves, a hard hat, safety glasses, and steel-toed boots.

4.2.2 Small Diameter Well Installation

Twenty four small diameter wells (SDWs), designated SDW-001 through SDW-024, were installed across the facility by Subsurface Technology, Inc., of Orlando, Florida, using cone penetrometer technology (CPT). The CPT rig used hydraulic press to push a hollow, 2-inch (in) stainless steel rod with a sacrificial stainless steel drive point and an enclosed 1-in inside diameter schedule 40 polyvinyl chloride (PVC) well to a specified depth below ground surface. Once the desired depth was reached, the rods were removed from the borehole, leaving behind the well and drive point.

A 5- or 10-ft section of 0.010-in slotted, PVC screen was used for the wells. The screened intervals in the shallow wells were installed so as to intersect the water table. The top of the screened interval in the deep wells was placed approximately 25 ft below the water table. Because subsurface soils consisted of relatively clean sands, the native formation material was allowed to collapse around the well to form a natural filter pack. Bentonite and grout were not used during construction to facilitate well removal at a later date.

SDWs located in high traffic areas were completed with flush-mount protective casings, while the remainder were completed with above-ground, 4-in inside diameter, PVC protective casings. The protective casings were grouted in place. All wells or protective casings were completed with a water-tight, locking cap.

The SDWs were developed by manual pumping using Teflon™ tubing with a stainless steel check valve. Groundwater pH, conductivity, and temperature were measured initially and after the removal of each well volume. Development continued until the groundwater appeared sediment free and the pH, conductivity, and temperature readings had stabilized.

Table 4-1 summarizes construction details for the SDWs and existing monitor wells and piezometers. Well construction logs for the SDWs are provided in Appendix B. Location, set-up, and safety features were similar to those used at the Geoprobe™ borings and are described in Section 4.2.1.

4.2.3 Groundwater Level Measurements

Groundwater levels were measured in all of the wells and piezometers on December 2, 1994, to assess basewide hydraulic conditions in the upper glacial aquifer. Prior to measuring the groundwater levels, the wells and piezometers were uncapped and allowed to vent for at least five minutes to permit equalization of water levels. The depth to water was then measured with an electronic water level meter and recorded for each well or piezometer. The groundwater levels were subsequently converted to elevations in reference to mean sea level (msl) using the survey control data discussed later in Section 4.6. The groundwater elevation data were then used to evaluate hydraulic gradient and direction of groundwater flow.

4.2.4 Aquifer Testing

Rising head slug tests of the existing monitor wells and piezometers were conducted to define the hydraulic characteristics of the upper glacial aquifer underlying the facility.. A falling head test of MW-002 was also conducted because the screened interval is positioned well below the water table.

In a rising head test, a slug of known volume from the water column is removed, and the rate of recovery is evaluated by measuring the rise in water level in the well over a period of time. At the start of each test, the wells were uncapped and allowed to vent for approximately five minutes to permit equilibration of water levels. The depth to water was then measured using an electronic water level meter. A pressure transducer was connected to an electric data logger and then lowered into the well approximately 15 ft below the top of water. A PVC slug (approximately 1-in in diameter and 5.3 ft long) was then lowered into the well until completely submerged. Well parameters were entered into the data logger, and the water level was

Table 4-1
WELL CONSTRUCTION SUMMARY

106th Rescue Group, NYANG
Westhampton Beach, New York

Well ID	Site Location	Type	Total Depth (ft bgs)	Screened Interval (ft bgs)	Water Level (ft bgs)[1]
SDW-001	8 (cell 1)	shallow	44.6	34.6 - 44.6	38.8
SDW-002	8 (cell 1)	deep	70.3	65.1 - 70.1	39.0
SDW-003	8 (cell 1)	shallow	47.1	36.9 - 46.9	42.2
SDW-004	8 (cell 1)	shallow	41.3	31.1 - 41.1	35.8
SDW-005	8 (cell 2)	shallow	37.8	27.8 - 37.8	31.1
SDW-006	8 (cell 2)	shallow	36.9	26.7 - 36.7	30.0
SDW-007	8 (cell 3)	deep	60.2	55.0 - 60.0	30.8
SDW-008	8 (cell 3)	shallow	36.7	26.4 - 36.4	30.6
SDW-009	8 (cell 3)	shallow	35.6	25.5 - 35.5	28.6
SDW-010	8 (cell 3)	shallow	38.1	27.9 - 37.9	30.3
SDW-011	8 (cell 4)	shallow	47.4	37.4 - 47.4	41.0
SDW-012	8 (cell 4)	shallow	42.2	32.0 - 42.0	36.1
SDW-013	8 (cell 4)	shallow	45.7	35.5 - 45.5	38.7
SDW-014	8 (cell 5)	shallow	39.1	28.9 - 38.9	33.8
SDW-015	8 (cell 5)	deep	65.1	57.9 - 62.9	34.0
SDW-016	8 (cell 5)	shallow	39.7	29.7 - 39.7	33.8
SDW-017	8 (cell 5)	shallow	39.6	29.6 - 39.6	34.2
SDW-018	background	deep	76.0	71.0 - 76.0	44.1
SDW-019	background	shallow	39.1	29.1 - 39.1	34.6
SDW-020	background	deep	64.1	58.8 - 68.8	34.7
SDW-021	background	shallow	36.8	27.2 - 36.8	31.2
SDW-022	background	deep	63.1	58.1 - 63.1	31.5
SDW-023	4	shallow	31.1	21.1 - 31.1	26.8
SDW-024	4	shallow	30.8	20.8 - 30.8	25.7
MW-001[2]	background	shallow	52.0	40.0 - 50.0	44.7
MW-002[2]	background	deep	55.0	45.0 - 55.0	30.0
MW-003[2]	background	shallow	39.0	27.9 - 37.9	30.1
PZ-001[2]	site wide	shallow	50.0	45.0 - 50.0	43.1
PZ-002[2]	site wide	shallow	38.0	33.0 - 38.0	30.8
PZ-003[2]	site wide	shallow	47.2	42.2 - 47.2	39.8
PZ-004[2]	site wide	shallow	40.0	35.0 - 40.0	35.2
PZ-005[2]	site wide	shallow	40.0	33.0 - 38.0	30.3
PZ-006[2]	site wide	shallow	40.0	35.0 - 40.0	31.2

[1] Measured December 2, 1994
[2] Existing monitor well or piezometer
bgs below ground surface

remeasured. Once the water level had stabilized, the data logger was activated and the slug removed from the well. The test was run until the water level in the well had recovered to within at least 10% of static level. A falling head test is conducted in the same manner as a rising head test except that the slug is introduced into the water column at the start of the test rather than removed.

Data recorded by the data logger during the slug tests were reduced and analyzed by the Bouwer-Rice method for unconfined aquifers using Aqtesolv™, an analytical computer program for calculating hydraulic conductivity (Duffield and Rumbaugh, 1991; Bouwer and Rice, 1976). The results of Aqtesolv™ were verified by performing the hydraulic conductivity calculations by hand.

4.2.5 Borehole Abandonment Procedures

Following completion of each direct-push boring, a neat cement slurry with 5 percent bentonite was immediately emplaced into each borehole to ensure a proper seal of the boring. After an initial hydration period of several hours or more, the borings were checked and grouted to land surface to complete the seal of each boring. In paved areas, an asphalt patch was also installed over the top of the hydrated grout seal.

4.3 SAMPLE COLLECTION

4.3.1 Sample Containers

Surface water, sediment, surface/subsurface soils, and groundwater samples were collected during this SI. Constituents of concern included VOCs, SVOCs, and/or metals. Table 4-2 summarizes the containers used for sample collection by sample media and analytical fraction.

4.3.2 Surface Water Samples

Only one surface water sample was obtained during the SI due to a lack of water in the ditches at Sites 5 and 9. The sample was collected by standing on the downstream side of the sample collection location, lowering the sample container into the water, allowing the container to fill taking care not to disturb any

sediment. VOC vials were filled first. The vials were capped while underwater. Once capped, the vials were inverted and tapped lightly to check for air bubbles. The SVOC and metals sample containers were filled next. The metals sample was preserved with nitric acid to a pH of less than 2. All sample containers were then rinsed with deionized (DI) water, dried, labeled, put in plastic baggies, and placed in a cooler with ice. No surface water samples were collected for off-site confirmation analysis.

Table 4-2
SAMPLE CONTAINER/PRESERVATION SUMMARY

106th Rescue Group, NYANG
Westhampton Beach, New York

SURFACE WATER/GROUNDWATER		
Analysis	Container	Preservative
VOCs	40-milliliter (ml) amber glass vial	HCl
SVOCs	500-ml amber glass bottle	None
Metals	125-ml amber plastic bottle	HNO_3
Analysis	Container	Preservative
VOCs	2-ounce (oz) clear glass jar	None
SVOCs	2-oz clear glass jar	None
Metals	2-oz clear glass jar	None
SURFACE/SUBSURFACE SOILS		
Analysis	Container	Preservative
VOCs	6-inch section of Teflon™ sample liner with Teflon™ end caps	None
SVOCs	2-oz clear glass jar	None
Metals	2-oz clear glass jar	None

HCl - Hydrochloric Acid
HNO_3 - Nitric Acid

4.3.3 Sediment Samples

Sediment samples were collected using a sediment sampler. Any vegetation present at a sampling location was cleared, and the top two inches of sediment were removed to expose fresh material for collection. Sediment samples were obtained by placing the sample barrel of the sediment sampler on the surface and

driving it into the ground approximately 6 inches using a rod and hammer attachment. For collection of VOC samples, a stainless steel liner was placed in the sample barrel. After the barrel was pulled from the ground, the liner was removed and capped to minimize volatilization. SVOC and metals samples were collected using the sediment sampler without a stainless steel liner. The sediment was emptied from the appropriate sample barrel into a stainless steel or Pyrex™ bowl, composited, and placed in the sample containers using a stainless steel spoon. All sample containers were rinsed with DI water, dried, labeled, put in plastic baggies and placed in a cooler with ice. No sediment samples were collected for off-site confirmation analysis.

The sediment samples were screened in the field after collection of VOC samples using a flame ionization detector (FID). The sample was mounded in the compositing bowl, and a stainless steel knife or spoon was used to make a small depression in the mound. The tip of the FID was then lowered into the depression to obtain a reading.

4.3.4 Surface and Subsurface Soil Samples

Surface and subsurface soil samples were collected using ABB-ES' Geoprobe™. Each sample location was cleared of vegetation, if present, and any concrete or asphalt was penetrated using a concrete bit attached to the Geoprobe™ rods. The soil sampling probe, which contains a 2-ft long, 1-in inside diameter Teflon™ sleeve, was then pushed or hammered to the top of the specified sampling interval, and a pin was removed from the top of the sample barrel to open the bottom of the barrel for sample collection. The sample barrel was then pushed another two ft, filling the sleeve with soil. The sample barrel was pulled to the surface, and upon removal of the sleeve, the bottom 6-in section was extracted for VOC analysis using a stainless steel knife. This portion of the sleeve was immediately sealed with Teflon™ caps, and the top of the sleeve was identified. The sample was then labeled, put in a plastic baggie, and placed in a cooler with ice. The remaining soil was removed from the sleeve and placed in either a stainless steel or Pyrex™ bowl for compositing and FID analysis. These samples were placed in prelabelled jars for SVOC and metals analysis, and the jars were then put in plastic baggies and placed in a cooler with ice. No surface or subsurface samples were collected for off-site confirmation analysis.

4.3.5 Groundwater Samples

Groundwater samples were collected from the borings through a 2 ft, 0.010-in slotted, stainless steel screen attached to the bottom of the Geoprobe™ drive rods, which were then pushed and/or hammered through the subsurface to a specified sampling interval. At the desired sampling interval, disposable Teflon™ tubing fitted with a stainless steel check valve was lowered inside the drive rods and into the screened section. The tubing was then worked in an up-and-down motion to bring water inside the tubing to the surface. Groundwater was evacuated from the tubing in this manner until it appeared relatively sediment free; usually one to two gallons of water were removed. The sample bottles for SVOC and metals analysis, as well as a small container used to measure pH, conductivity, and temperature, were filled from the tubing during pumping. The tubing was then pulled from the rods and the check valve removed so that the VOC vials could be filled with groundwater contained in the bottom of the tubing. Once filled, the VOC vials were inverted and tapped lightly to check for air bubbles. All sample containers were then dried, labeled, put in plastic baggies, and placed in a cooler with ice. No groundwater samples were collected for off-site confirmation analysis.

Groundwater samples were also collected from the 24 SDWs. Prior to sampling, these wells were purged using disposable Teflon™ tubing fitted with a stainless steel check valve as described previously. Groundwater pH, conductivity, and temperature were measured initially and after the removal of each well volume. Purging continued until at least three well volumes of groundwater had been removed from the well. The groundwater samples were collected using the Teflon™ tubing in the same manner as from the Geoprobe™ rods. Two rounds of groundwater samples were collected from the SDWs during this SI.

The existing monitor wells were purged using Teflon™ bailers rather than tubing so that larger volumes of water could be removed in less time. Three well volumes were purged from each well prior to sample collection. Temperature, pH, and conductivity were measured and recorded initially and upon removal of each well volume. Groundwater samples were collected by pulling a bailer of water to the surface and then emptying the contents into sample containers. VOC vials were filled first to minimize volatilization and then checked for air bubbles. All containers were dried, labeled, put in plastic baggies, and placed in a cooler with ice. Two rounds of groundwater samples were collected from the monitor wells during this SI.

4.4 FIELD QUALITY ASSURANCE

4.4.1 Documentation

Several forms of documentation were used during sample collection. These included chain-of-custody (COC) forms, media-specific sample logs, boring logs, well construction diagrams, field quality control tracking forms, and a site-specific log book. COC forms and media-specific sample logs were completed during sampling. These forms document the date and time samples were collected, FID results, sample location information and descriptions, and the analyses to be performed. Upon completion of sampling activities, the COC was put in a plastic baggie and placed in the sample cooler with the samples for delivery to the field lab.

Boring logs and well diagrams were completed during drilling. Boring logs describe subsurface conditions, sample intervals, FID results, and depth to groundwater. Well diagrams document well construction. Field quality control tracking forms correlate QA samples with production samples, and provided a schedule for collection of specific field QA samples. Daily activities were also recorded in site-specific log books.

4.4.2 Quality Assurance Samples

QA samples were collected to evaluate the effectiveness of decontamination, the quality of decontamination water, and the accuracy and precision of analytical results. The following is a list of QA samples collected during the SI, their purpose, and the frequency of collection:

- Rinseate Blanks - Water samples collected by pouring DI water over decontaminated sampling equipment and into sample bottles. These samples provided data on the effectiveness of decontamination procedures. One rinseate sample (QARI) was collected for every ten production samples.

- Duplicate Samples - Samples collected by filling two sets of sample containers during production sampling. The second set or duplicate samples were collected to evaluate the reproducibility of analytical results. One duplicate sample (QADU) was collected for every ten production samples.

- Field Blanks - Samples of potable or DI water. These samples were collected to evaluate the quality of the potable or DI water used during decontamination procedures or chemical analyses. Potable (QAPW) and DI (QADI) water field blanks were collected at the beginning each field shift.

- Matrix Spike/Matrix Spike Duplicates - Samples which were split to evaluate the precision and accuracy of laboratory analyses. One matrix spike (QAMS)/matrix spike duplicate (QAMD) was collected for every twenty production samples collected.

- Trip Blanks - Samples of DI water prepared each day prior to sample collection and stored in the sample cooler for the duration of that day's sampling. These samples were collected to identify potential contaminants introduced into VOC samples during the time between sample collection and delivery to the field lab. One trip blank (QATB) was analyzed for each cooler used for VOC sample storage.

4.4.3 Decontamination

Equipment decontamination was performed in a designated area located in the staging area. The Geoprobe™ and CPT rig were decontaminated on a 10 ft by 20 ft pad constructed of 2x4-in lumber and covered with 20 mil plastic to contain fluids. Fluids in the decontamination pad were transferred to 55-gallon drums via a sump pump and section of hose. Occasionally some small pieces of sampling equipment were decontaminated in the field to expedite the completion of a particular boring. In these instances, a decontamination pad was constructed in the field from a sheet of plastic and stainless steel buckets were used to contain fluids.

The rear and undercarriage of the Geoprobe™ and CPT rig were sprayed with a laboratory-grade detergent and potable water wash from a high pressure sprayer and rinsed with potable water. The rigs were then removed from the decontamination pad and allowed to air dry. Down-hole equipment (i.e., drill rods, sampling tools, casing, screen, and centralizers) was sprayed with a laboratory-grade detergent and potable water wash from the high pressure sprayer, and, if necessary, scrubbed with a brush to remove debris. The items were rinsed with potable water and organic-free DI water. The equipment was then removed from the decontamination pad, placed on plastic-covered racks, and allowed to air dry. Once dry, the equipment was wrapped in plastic for transportation to the drill site.

Sampling equipment (i.e., sample barrels, Teflon™ liners and bailers, Pyrex™ bowls, stainless steel spoons, knives, and bowls) was washed with hand-held brushes using a laboratory-grade detergent and potable water wash and then rinsed successively with potable water, organic-free DI water, pesticide-grade isopropanol, and organic-free DI water. The equipment was then removed from the decontamination area, placed on a plastic-covered table, and allowed to air dry. Once dry, the equipment was wrapped in aluminum foil for transport to sample locations.

4.4.4 Field Variances

Seven field change request (FCR) forms were submitted to HAZWRAP by ABB-ES for approval of minor modifications to the SAP. These modifications were approved by the HAZWRAP Project Manager and implemented in the field. FCR forms are summarized as follows:

FCR 1: Change in Chemical Analysis Parameters at Site 4 - Total metals and lead were variably identified in the SAP as the potential inorganic contaminants of concern at Site 4. Since lead was anticipated to be the only metal of concern in aviation gasoline, inorganic analyses were amended to consist of lead (only). Later, two sample locations along the storm drainage line and the downgradient groundwater sample at DP-028 were modified to include the full metals suite. This modification was recommended to evaluate potential impacts to soil and/or groundwater due to discharges to the storm drainage line from facility and county hangars.

FCR 2: Modification of proposed SDW locations at Site 8, Cell 1 - This FCR proposed relocating SDW-001 and SDW-002 from the northeast corner of Building 250 to the east-central side of the building. This modification was recommended to evaluate potential impacts to groundwater from cesspools located on the north side of Building 250.

FCR 3: Elimination of DP-029 and DP-030 at Site 4 - Because VOCs, SVOCs, and lead were not detected above action levels in the unsaturated soil samples at DP-021 and DP-022, and saturated soils were difficult or impossible to recover (see FCR 5), these borings were eliminated. Instead, groundwater samples were collected at DP-031 and DP-032 to evaluate the potential for contamination in the saturated zone.

FCR 4: Decontamination of Teflon™ Sample Liners - HAZWRAP requested that ABB-ES initiate decontamination of Teflon™ sample liners to eliminate potential contamination of soil samples from liner materials.

FCR 5: Facility-wide elimination of saturated soil samples - This modification was recommended due to poor or no recovery of soil samples within the saturated zone. Repeated attempts to improve recovery proved futile because the sandy matrix lacked sufficient cohesion to remain in the sampler. Equipment modification, such as the use of a sand catcher, was not an option for the Geoprobe™ at this time. Instead, additional groundwater samples were collected from selected borings to evaluate the potential for soil contamination in the saturated zone.

FCR 6: Modification of VOC sample collection procedures during pumping - This method was proposed to eliminate volatilization of VOCs which can occur during pumping. This modification allowed collection of SVOC and metals samples during pumping as originally proposed, but VOC samples were obtained by pouring groundwater from the bottom of the tubing into sample vials.

FCR 7: Deletion of barium from the analyte list - High levels of naturally occurring barium were found to exceed the practical analytical range of the graphite furnace atomic absorption spectrophotometer (GFAA). Therefore, barium was not analyzed during this SI.

4.5 DISPOSAL OF INVESTIGATION DERIVED WASTE

IDW consisted of soils generated by the Geoprobe™ and CPT rig, decontamination water, development water, and assorted lab wastes. All IDW was stored in 55-gallon drums at the staging area. Drums used for IDW storage were numbered, dated and labeled, and this information was logged into the IDW log book.

In an effort to limit the number of drums on site and expedite disposal of IDW, waste materials were sampled and characterized during the field effort. This allowed ABB-ES, in cooperation with NYANG and Suffolk County environmental departments, to begin disposing of IDW during the field effort (Table 4-3). The most abundant IDW was decontamination water which was disposed of at the facility through permitted wash racks with the approval of Suffolk County. Purge water was similarly disposed of. Soils and lab waste, containerized in three 55-gallon drums, were disposed of at an off-site location soon after the field effort.

4.6 SURVEY CONTROL

OM P. Popli, P.E., L.S., P.C., of Rochester, New York, provided survey control for this SI. The purpose of this survey was to obtain horizontal and vertical control for all boring, SDW, monitor well, and piezometer locations. Elevations were obtained for ground surface at all locations, and the tops of protective casings and risers at all wells. Elevations were based on the National Geodetic Datum of 1929. A copy of the survey data can be found in Appendix C.

Table 4-3
INVESTIGATION DERIVED WASTE

106th Rescue Group, NYANG
Westhampton Beach, New York

Waste	Number of drums[1]	Approximate Volume	Disposal Method
Decon Water	22	1210 gallons	Disposed of on-site through permitted wash racks with the approval of Suffolk County.
Purge/Development Water	4	220 gallons	Disposed of on-site through permitted wash racks with the approval of Suffolk County.
Soil Cuttings	3	0.820 yd^3	Disposed of off-site after completion of field effort.
Liquid Lab Waste	1	55.0 gallons	Disposed of off-site after completion of field effort.
Glass Lab Waste	1	0.270 yd^3	Disposed of off-site after completion of field effort.
Gray Water	1	55.0 gallons	Disposed of off-site after completion of field effort.

[1] - 55 Gallon Drums
yd^3 - Cubic Yards
Gray Water - Soapy water from field lab

5.0 ANALYTICAL PROGRAM

Chemical analyses were performed on environmental and quality-control samples both on site in the field laboratory and off site by contract laboratories. The principal analytical data used for this SI were generated on site in two mobile field laboratories operated by ABB-ES. The field laboratories were set up in three sections to analyze for VOCs, SVOCs and metals. This section reviews and summarizes the chemical analytical program outlined in the SAP and implemented during SI activities.

5.1 SAMPLE TRACKING

Samples were tracked using bar-coded labels to identify sample containers and generate collection dates. Sample tracking included preparation of sample labels, COC and analytical request forms, field and laboratory records, and data management logs.

Soil and groundwater samples were identified using a seven character code. The first two characters in this code designated the site where the sample was collected. The third and fourth characters identified the sampled media: GW (groundwater), SS (surface soil), SB (subsurface soil), SD (sediment), and SW (surface water). The last three characters identified an individual sample.

5.2 SAMPLE CUSTODY AND HANDLING

Sample containers were labeled in the field. Each label contained a unique bar code and sample identification (ID) number. Sample ID number, collection date and time, preservation, and analytical requirements were recorded on the sample container and COC forms. Individual sample containers were sealed in plastic bags and stored in a cooler packed with ice.

Custody of the sample cooler was transferred from the field crew to the sample custodian at the field trailer. Transfer and receipt of the cooler was acknowledged by each party on the COC form. The sample

custodian verified the sample count against the COC form and checked preserved samples for appropriate pH. The samples were then placed in a designated refrigerator in the field trailer.

5.3 FIELD LABORATORY ANALYSES

The field laboratory program is outlined in the SAP and finalized in Task Instructions developed by ABB-ES and HAZWRAP. The Task Instructions provided a record of laboratory procedures used during this SI and guidance for laboratory personnel executing analyses and other laboratory functions. Sections 5.3.1 through 5.3.3 summarize the Task Instructions for the various analyses. A summary of the methods is provided in Table 5-1.

Table 5-1
LABORATORY ANALYTICAL METHODS

106th Rescue Group, NYANG
Westhampton Beach, New York

Matrix	Analytes	Instruments	References
Soil/Sediment	Target Volatile Organics	Purge and Trap/GC	Task Instructions
	Target Semi-volatile Organics	GC/MS	Task Instructions
	Target Inorganics	GFAAS	Task Instructions
	Total Organic Carbon		SW846-9060 [1]
Aqueous	Target Volatile Organics	Purge and Trap/GC	Task Instructions
	Target Semi-volatile Organics	GC/MS	Task Instructions
	Target Inorganics	GFAAS	Task Instructions

GC Gas Chromatograph
MS Mass Spectrometer
GFAAS Graphite Furnace Atomic Absorption Spectrophotometer
[1] SW846 refers to Test Methods for Evaluating Solid Waste, USEPA Office of Solid Waste and Emergency Response November 1986, Third Edition.

A method detection limit study was performed by each laboratory section prior to accepting samples for analysis. The results of the study were used to evaluate method precision and accuracy, and to determine matrix- and analyte-specific practical quantitation limits (PQLs). The target analytes in this SI and their respective PQLs are listed in Tables 5-2 and 5-3. PQLs were within ranges predicted in the SAP (except 1,1-DCE and naphthalene).

Table 5-2
ORGANIC TARGET COMPOUND LISTS AND PRACTICAL QUANTITATION LIMITS

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Water PQL (µg/L)	Soil PQL (mg/kg)
Volatile Organic Compounds		
1,1-Dichloroethene	10	0.010
1,1-Dichloroethane	5	0.005
cis-1,2-Dichloroethene	5	0.005
trans-1,2-Dichloroethene	5	0.005
Chloroform	5	0.005
1,1,1-Trichloroethane	5	0.005
Trichloroethene	5	0.005
Benzene	5	0.005
Tetrachloroethene	5	0.005
Toluene	5	0.005
Chlorobenzene	5	0.005
Ethylbenzene	5	0.005
1,2-Dichlorobenzene	5	0.005
1,3-Dichlorobenzene	5	0.005
1,4-Dichlorobenzene	5	0.005
Naphthalene	10	0.010
o-Xylene	5	0.005
m/p-Xylenes	10	0.010
Semi-volatile Organic Compounds		
Phenol	50	1.0
2-Chlorophenol	20	1.0
2-Methylphenol	20	1.0
2,2'-oxybis(1-Chloropropane)	20	1.0
4-Methylphenol	20	1.0
Hexachloroethane	20	1.0
Nitrobenzene	20	1.0
Isophorone	20	1.0
2-Nitrophenol	20	1.0

Table 5-2 (cont'd)
ORGANIC TARGET COMPOUND LISTS AND PRACTICAL QUANTITATION LIMITS

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Water PQL (µg/L)	Soil PQL (mg/kg)
Semi-volatile Organic Compounds (cont'd)		
2,4-Dimethylphenol	20	1.0
2,4-Dichlorophenol	20	1.0
1,2,4-Trichlorobenzene	20	1.0
Hexachlorobutadiene	20	1.0
4-Chloro-3-Methylphenol	20	1.0
2-Methylnaphthalene	20	1.0
Hexachlorocyclopentadiene	20	1.0
2,4,6-Trichlorophenol	20	1.0
2,4,5-Trichlorophenol	20	1.0
2-Chloronaphthalene	20	1.0
Dimethylphthalate	20	1.0
Acenaphthylene	20	1.0
2,6-Dinitrotoluene	20	1.0
Acenaphthene	20	1.0
2,4-Dinitrophenol	20	1.0
4-Nitrophenol	50	1.0
Dibenzofuran	20	1.0
2,4-Dinitrotoluene	20	1.0
Diethylphthalate	20	1.0
Fluorene	20	1.0
4,6-Dinitro-2-methylphenol	20	1.0
Hexachlorobenzene	20	1.0
Pentachlorophenol	20	1.0
Phenanthrene	20	1.0
Anthracene	20	1.0
Di-n-butylphthalate	20	1.0
Fluoranthene	20	1.0
Pyrene	20	1.0
Butylbenzylphthalate	20	1.0

Table 5-2 (cont'd)
ORGANIC TARGET COMPOUND LISTS AND PRACTICAL QUANTITATION LIMITS

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Water PQL (µg/L)	Soil PQL (mg/kg)
Semi-volatile Organic Compounds (cont'd)		
Benzo(a)Anthracene	20	1.0
Chrysene	20	1.0
bis(2-ethylhexyl)phthalate	20	1.0
Di-n-octylphthalate	20	1.0
Benzo(b)Fluoranthene	20	1.0
Benzo(k)Fluoranthene	20	1.0
Benzo(a)Pyrene	20	1.0
Indeno(1,2,3-c,d)Pyrene	20	1.0
Dibenz(a,h)Anthracene	20	1.0
Benzo(g,h,i)perylene	20	1.0

PQL Practical Quantitation Limit
µg/L micrograms per liter
mg/kg milligrams per kilogram

Table 5-3
INORGANIC ANALYTE LIST AND PRACTICAL QUANTITATION LIMITS

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Water PQL (µg/L)	Soil PQL (mg/kg)
Arsenic	10	0.20
Cadmium	10	0.20
Chromium	10	0.20
Lead	10	0.20
Selenium	10	0.20
Silver	10	0.20

PQL Practical Quantitation Limit
µg/L micrograms per liter
mg/kg milligrams per kilogram

Data from analyses of environmental samples are presented in Appendix D. Individual sample quantitation limits (SQLs) have been adjusted for dilutions or sample amounts where necessary. Applicable data qualifying flags (Section 5.5.2) accompany individual results.

5.3.1 Volatile Organic Compound Analyses

The ABB-ES field laboratory utilized the following chromatographic method to identify and determine the concentration of selected halogenated and aromatic VOCs. This method can be used for most organic compounds that have boiling points below 22°C and are insoluble or slightly soluble in water. Compounds specific to this project are listed with retention times in Table 5-4.

Instrumentation

Soil and groundwater samples were analyzed for VOCs using two purge and trap gas chromatograph systems. One system included a Tekmar™ 3000 interfaced with a Hewlett-Packard™ gas chromatograph equipped with a J & W, DB-VRX, 30-meter capillary column with an inside diameter of 0.45 millimeters and a film thickness of 2.5 micrometers. The second gas chromatograph was interfaced with a Tekmar™ 2016 multi-port purge and trap auto-sampling system. The purge and trap/gas chromatograph system and detector operating conditions are listed in Table 5-5. Both systems included a photoionization detector (PID) and an electrolytic conductivity detector (ELCD) installed in series. Aromatic compounds (i.e., benzene, toluene, xylenes) were detected by the PID; the ELCD detected the halogenated compounds (i.e., 1,1,1-trichloroethane, trichloroethene, tetrachloroethene, etc.).

Standards

This method required three types of standards: a stock standard, working standards, and an independent check standard. Stock standards were purchased as certified solutions from Supelco, Inc. and were stored in a freezer at -10°C to -20°C. The analyst prepared working standards from stock standards as needed.

Table 5-4
VOLATILE ORGANIC COMPOUNDS
ANALYTICAL LIST

106th Rescue Group, NYANG
Westhampton Beach, New York

Detector: ELCD	Retention Time (min)
1,1-Dichloroethene	3.420
trans-1,2-Dichloroethene	4.067
1,1-Dichloroethane	4.338
cis-1,2-Dichloroethene	5.018
Chloroform	5.284
1,1,1-Trichloroethane	6.230
Trichloroethene	7.714
Tetrachloroethene	11.041
1,3-Dichlorobenzene	16.228
1,4-Dichlorobenzene	16.355
1,2-Dichlorobenzene	16.927
Detector: PID	**Retention Time (min)**
Benzene	6.757
Toluene	9.918
Chlorobenzene	12.095
Ethylbenzene	12.499
m/p-Xylenes	12.848
o-Xylene	13.472
Naphthalene	20.398

ELCD electrolytic conductivity detector
PID photoionization detector

Table 5-5
LABORATORY OPERATING CONDITIONS

106th Rescue Group, NYANG
Westhampton Beach, New York

Purge-and-Trap	Conditions
Purge pressure	30 psi
Purge flow	30 mL/minute
Purge time	6.0 minutes
Trap temperature	40°C
Desorb time and temperature	3.0 min. at 225°C
Bake time and temperature	5.0 min. at 230°C
Transfer line and valve temperature	180°C
Bake gas delay	2.0 minutes
Gas Chromatograph	**Conditions**
Injection temperature	225°C
Initial temperature	40°C, hold for 4.0 minutes
Ramp rate	8°C/minute
Final temperature	180°C
Carrier gas flow rate	10 mL/minute (Helium 99.999% pure)
Photoionization Detector	
Make-up gas flow rate	35 mL/minute (Helium 99.999% pure)
Detector temperature	275oC
Lamp power source	Intensity of 5
Electrolytic Conductivity Detector	
Combustion gas flow	100 mL/minute (Hydrogen 99.999% pure)
Reactor temperature	900°C
Solvent flow	35% ± 5% (n-Propanol)

An independent check standard was created from standards purchased from Ultra Scientific, Inc.. The analyst labeled all the standards with an identification code and recorded relevant information in the appropriate log book.

Calibration

Three types of calibrations were used to monitor the system and quantitate analytes detected. Calibrations included initial, continuing, and closing calibrations.

A three point initial calibration curve was developed at the beginning of the project. The initial calibration for aromatics consisted of concentrations of 5, 25, and 50 µg/L. The halogenated compounds were initially calibrated at concentrations of 5, 10, and 20 µg/L. The Hewlett-Packard™ ChemStation™ software plotted the response (area) versus concentration thus creating a calibration curve for each analyte. The software generated a correlation coefficient (r) for each compound by means of linear regression. A correlation coefficient of 0.995 or greater was required for each target compound for the calibration to be considered acceptable.

A single independent check standard was analyzed during the project. The standard was compared to the initial calibration and all compounds met the percent difference (%D) criteria of ≤30 percent. The %D was calculated as follows:

$$\% \ Difference = \left[\frac{(C_i - C_c)}{C_c}\right] x \ 100$$

Where:

C_C = calculated concentration of the analyte in the independent check standard

C_D = determined concentration of the analyte in the independent check standard quantitated with the initial calibration

Following a successful initial calibration, a mid-level continuing calibration standard (CCS) was analyzed after every ten analyses and after the last analysis of the day. The determined concentrations of analytes in the CCS, quantitated with the initial calibration curve, were compared to the calculated concentrations of the analytes in the CCS. The %D between the calculated and determined concentrations of each analyte was calculated as shown for the independent check standard mentioned above. A criteria of $\leq$20%D was required for the preceding calibration period to be valid and for analysis to continue. If any analyte failed the $\leq$20%D, the CCS could be reanalyzed. If successful on the second attempt, analysis could proceed. Otherwise, a new three-point initial calibration curve was generated and results for failed compounds obtained during the non-compliant calibration period were considered estimated. A CCS was analyzed at the beginning of each day. If the %D criteria was met for all analytes, analysis could proceed. Otherwise, a new three-point initial calibration curve was generated.

Sample Preparation

Sample preparation for groundwater included drawing a 5 mL aliquot of groundwater into a syringe and adding surrogate. The sample was then injected into the purge vessel and sealed. Helium (He), was then bubbled through the sample solution at ambient temperature, and the volatile components were transferred from the aqueous phase to the vapor phase. The vapor was swept into a sorbent trap where the volatile components were adsorbed. After purging was complete, the sorbent trap was heated and backflushed with He to desorb the components onto the column.

Sample preparation for soils consisted of weighing out five ±0.5 grams of soil and placing it into the purge vessel. The analyst inserted the vessel into the appropriate port and added 5.0 mL of reagent water spiked with surrogate. The soil sample underwent the same purging step as above.

Surrogates are chemicals added to all samples and blanks prior to analysis. Surrogate recovery provides a means to measure accuracy of results of each analysis. Surrogate recovery is expressed as percent recovery (%R) as follows:

$$\% \ Difference = \left[\frac{(C_i - C_c)}{C_c} \right] x \ 100$$

Where:

Cr = concentration of surrogate recovered

Cs = concentration of surrogate spiked

For VOC analyses, 4-Bromofluorobenzene was used as the surrogate. Surrogate recovery control limits are listed in Table 5-6.

Table 5-6
VOLATILE ORGANIC COMPOUNDS
SURROGATE RECOVERY CONTROL LIMITS

106th Rescue Group, NYANG
Westhampton Beach, New York

Surrogate	Control Limits	
	Soil	Groundwater
4-Bromofluorobenzene	30 - 200	50 - 150

Matrix Spike/Matrix Spike Duplicate Preparation

Certain soil and groundwater samples were designated by the field crew for matrix spike and matrix spike duplicate (MS/MSD) analyses. Two equal amounts of these samples were spiked with mid-level concentrations of all analytes. The %R, adjusted for concentrations of spiked analytes detected in the parent sample, was calculated for each analyte to identify matrix interferences. As a measure of analytical precision, the relative percent difference (RPD) between the %Rs of analytes in MS/MSD sample pairs was calculated as follows:

$$\% \ Difference = \left[\frac{(C_i - C_e)}{C_e} \right] x \ 100$$

Where:

$\%R_{MS}$ = percent recovery of analyte from matrix spike sample

$\%R_{MSD}$ = percent recovery of analyte from matrix spike duplicate sample

X = arithmetic mean of $\%R_{MS}$ and $\% R_{MSD}$

MS/MSD compounds and their respective %R and RPD limits are listed in Table 5-7.

Target Compound Identification

Compounds behave differently within the chromatographic column and are moved along by the carrier gas at different rates. Mixtures of compounds are separated and each compound has a characteristic retention time on the column. The retention time of a compound is measured in minutes from the time a mixture of compounds is placed on the column until the individual compound elutes at the detector. Unknown compounds were identified by matching their retention times with retention times of target compounds in the working standard mix used for

the calibration period (refer to Table 5-4). A ±3 percent variation of the retention time of the unknown compound from the retention time of the known compound in the standard mix was allowed.

Table 5-7
VOLATILE ORGANIC COMPOUND
MATRIX SPIKE RECOVERY CONTROL LIMITS
(soil and groundwater)

106th Rescue Group, NYANG
Westhampton Beach, New York

Parameter	% Recovery	RPD limit	
		Water	Soil
1,1-Dichloroethene	(28 - 167)	30%	50%
trans-1,2-Dichloroethene	(38 - 155)	30%	50%
1,1-Dichloroethane	(47 - 132)	30%	50%
cis-1,2-Dichloroethene	(38 - 155)	30%	50%
Chloroform	(49 - 133)	30%	50%
1,1,1-Trichloroethane	(41 - 138)	30%	50%
Trichloroethene	(35 - 146)	30%	50%
Tetrachloroethene	(26 - 162)	30%	50%
1,4-Dichlorobenzene	(42 - 143)	30%	50%
1,3-Dichlorobenzene	(50 - 141)	30%	50%
1,2-Dichlorobenzene	(37 - 154)	30%	50%
Benzene	(39 - 150)	30%	50%
Toluene	(46 - 148)	30%	50%
Chlorobenzene	(55 - 135)	30%	50%
Ethylbenzene	(32 - 160)	30%	50%
m/p-Xylenes	(30 - 200)	30%	50%
o-Xylene	(30 - 200)	30%	50%
Naphthalene	(30 - 200)	30%	50%

Quantitation

The Hewlett-Packard™ ChemStation™ software plotted the response (area) of the analyte in the sample on the calibration curve and reported a raw concentration. The final concentration was calculated manually as follows:

$$final\ concentration = \frac{(raw\ concentration)\ (dilution\ factor)}{decimal\ percent\ solid}$$

Reporting

The Hewlett-Packard™ ChemStation™ software provided a report with the raw analytical results. The analyst would evaluate retention times, chromatogram results, and edit the hard copy report. After this evaluation, the analyst converted the report file into a text file and imported the data into Data Manager 2000™ (DM2000), an analytical database. The DM2000™ calculated the final results taking into account the dilution factor and the percent solid. The analyst compared the results generated by the DM2000™ to the results manually calculated on the hard copy to verify the results. The analyst then exported the data to the Real-Time Interpretation System (R-TIS) database via modem.

Quality Assurance/Quality Control (QA/QC)

Quality control samples included field blanks, trip blanks, rinseates, field duplicates, matrix spikes and matrix spike duplicates. Field blanks were collected at the beginning of each shift from the potable water source and the deionized water source. The field crew collected the rinseates from field equipment used to sample soil and groundwater. One rinseate sample was collected per every ten production samples. MS/MSD samples were analyzed per every twenty production samples. One field duplicate sample was collected per every 10 production samples.

5.3.2 Semi-volatile Organic Compound Analyses

The ABB-ES field laboratory used this chromatographic method to identify and quantitate concentrations of SVOCs in extracts prepared from soil and groundwater samples. Primary base/neutral and acidic organic compounds soluble in methylene chloride can be eluted from a gas chromatographic fused-silica capillary column internally coated with a slightly polar silicone and quantified with reasonable detection limits. This method was employed to analyze SVOCs. Compounds specific to this project are listed in Table 5-8.

Table 5-8
CHARACTERISTIC IONS FOR SEMI-VOLATILE TARGET COMPOUNDS, INTERNAL STANDARDS, AND SURROGATES

106th Rescue Group, NYANG
Westhampton Beach, New York

Compound	Retention Time (RT)	Primary Ion	Secondary Ion(s)
Phenol	8.73	94	65, 66
2,2'-Oxybis(1-chloropropane)	8.88	45	77, 121
2-Chlorophenol	9.09	128	64,130
2-Methylphenol	9.74	108	107
4-Methylphenol	10.01	108	107
Hexachloroethane	10.06	117	201, 199
Nitrobenzene	10.26	77	123, 65
Isophorone	10.71	82	95, 138
2-Nitrophenol	10.86	139	65, 109
2,4-Dimethylphenol	10.99	107	121, 122
2,4-Dichlorophenol	11.35	162	164, 98
1,2,4-Trichlorobenzene	11.51	180	182, 145
Hexachlorobutadiene	12.03	225	223, 227
4-Chloro-3-methylphenol	12.95	107	144, 142
2-Methylnaphthalene	13.24	142	141
Hexachlorocyclopentadiene	13.85	237	235, 272
2,4,6-Trichlorophenol	14.09	196	198, 200
2,4,5-Trichlorophenol	14.19	196	198, 200
2-Chloronaphthalene	14.57	162	164, 127
Dimethylphthalate	15.74	163	194, 164
Acenaphthylene	15.83	152	164, 127
Acenaphthene	16.45	153	152, 154
2,4-Dinitrophenol	16.68	184	63, 154
4-Nitrophenol	16.99	109	139, 65
Dibenzofuran	16.99	168	139
2,4-Dinitrotoluene	17.22	165	63, 182
2,6-Dinitrotoluene	15.93	165	89, 121
Diethylphthalate	18.21	149	177, 150
Fluorene	18.20	166	165, 167
4,6-Dinitro-2-Methylphenol	18.67	198	182, 77
Hexachlorobenzene	20.54	284	142, 249
Pentachlorophenol	21.28	266	264, 268

Table 5-8 (cont'd)
CHARACTERISTIC IONS FOR SEMI-VOLATILE TARGET COMPOUNDS, INTERNAL STANDARDS, AND SURROGATES

106th Rescue Group, NYANG
Westhampton Beach, New York

Compound	Retention Time (RT)	Primary Ion	Secondary Ion(s)
Phenanthrene	21.78	178	179, 176
Anthracene	21.95	178	179, 176
Di-n-butylphthalate	24.62	149	150, 104
Fluoranthene	26.57	202	101, 100
Pyrene	27.44	202	101, 100
Butylbenzylphthalate	30.74	149	91, 206
Benzo(a)anthracene	32.47	228	229, 226
Bis(2-ethylhexyl)phthalate	33.37	149	167, 279
Chrysene	32.65	228	226, 229
Di-n-Octylphthalate	35.78	149	167, 43
Benzo(b)fluoranthene	36.71	252	253, 125
Benzo(k)fluoranthene	36.80	252	253, 125
Benzo(a)pyrene	37.82	252	253, 125
Indeno(1,2,3-cd)pyrene	41.51	276	138, 227
Dibenz(a,h)anthracene	41.59	278	139, 279
Benzo(g,h,i)perylene	42.33	276	138, 277
Phenol-D_5 (S)	8.71	99	42, 71
2-Fluorophenol (S)	6.90	112	64
2,4,6-Tribromophenol (S)	19.15	330	332, 141
Nitrobenzene-D_5 (S)	10.23	82	128, 54
2-Fluorobiphenyl (S)	14.32	172	171
Terphenyl-$D_{1,4}$ (S)	28.37	244	122, 212
1,4-Dichlorobenzene-D_4 (I)	9.17	152	115
Naphthalene-D_8 (I)	11.59	136	68
Acenaphthene-D_{10} (I)	16.34	164	162, 160
Phenanthrene-D_{10} (I)	21.68	188	94, 80
Chrysene-D_{12} (I)	32.54	240	120, 236
Perylene-D_{12} (I)	38.00	264	260, 265

(S) Surrogates
(I) Internal Standards
m/z atomic mass unit of characteristic ion per unit charge

Instrumentation

Soil and groundwater samples were analyzed for SVOCs using a Hewlett-Packard™ 5890 series II temperature programmable GC equipped with a splitless injection system and a capillary column. A Hewlett-Packard™ 30 meter capillary column with an inside diameter of 0.25 mm and a film thickness of one µm was utilized. The GC system was interfaced with a Hewlett-Packard™ 5972 mass spectrometer (MS). The MS was in the electron impact ionization mode producing a mass spectrum that meets the criteria in Table 5-9 when 50 nanograms (ng) of decafluorotriphenyl-phosphine (DFTPP) was injected onto the analytical column. GC and MS operating conditions are listed in Table 5-10.

Table 5-9
DFTPP KEY IONS AND ION ABUNDANCE CRITERIA
FOR QUADRAPOLE MASS SPECTROMETERS

106th Rescue Group, NYANG
Westhampton Beach, New York

Mass	Ion Abundance Criteria
51	30.0 - 80.0 percent of mass 198
68	Less than 2.0 percent of mass 69
69	Present
70	Less than 2.0 percent of mass 69
127	25.0 - 75.0 percent of mass 198
197	Less than 1.0 percent of mass 198
198	Base peak, 100 percent relative abundance (see note)
199	5.0 - 9.0 percent of mass 198
275	10.0 - 30.0 percent of mass 198
365	Greater than 0.75 percent of mass 198
441	Present but less than mass 443
442	40.0 - 110.0 percent of mass 198
443	15.0 - 24.0 percent of mass 442

Note: All ion abundances must be normalized to m/z 198, the nominal base peak, even though the ion abundances of m/z 442 may be up to 110 percent that of m/z 198

Table 5-10
GC/MS OPERATING CONDITIONS

106th Rescue Group, NYANG
Westhampton Beach, New York

Gas Chromatograph	Conditions
Initial Column Temperature Hold	50°C for 5 minutes
Column Temperature Program	50-130°C at 20°/min., hold for 12 min., then ramp to 320°C
Column Temperature Final Hold	320°C for 10 minutes
Injector Temperature	275°C
Transfer Line Temperature	280°C
Source Temperature	175°C.
Injector	Grob-type, splitless
Sample Volume	2 µL
Carrier Gas	Helium at 20 mL/min
Electron Energy	70 volts (nominal)
Mass Range	35 to 550 amu
Scan Rate	3 A/D

Standards

This method required three types of standards; stock, working, and an independent check standard. The stock standard solutions were purchased as certified solutions from Supelco, Inc. and stored in a freezer at -10°C to -20°C, protected from light. The analyst transferred the standards to clean vials sealed with Teflon™ lined screw caps, as needed. The analyst made working standards by doing serial dilutions on the stock standards. These working standards were stored at 4°C, ±2°. Independent check standards were purchased from Supelco's second source supply stock. All standards were labeled with an identification code and logged in the instrument logbook.

Instrument Performance

Before analyzing any calibration standards, blanks, or samples, an instrument performance check was performed. A performance check was run every 24 hours. This performance check involved the analysis of a 50 ng injection of DFTPP. The mass spectral ion abundance criteria for DFTPP was met to verify instrument mass calibration and resolution capabilities. See Table 5-9 for mass criteria.

Calibration

Prior to analyzing samples, the analyst generated an initial calibration curve consisting of 20, 80, and 160 ng per 2µL injection. The Hewlett-Packard™ MS ChemStation™ software created a relative response factor (RRF) for each compound. The equation used to calculate RRF is provided below:

$$RRF = \frac{A_x \ C_{is}}{A_{is} \ C_{is}}$$

Where:

A_x = Area of the characteristic ion for the compound being measured

A_{is} = Area of the characteristic ion for the specific internal standard

C_x = Concentration of the compound being measured (ng/µL)

C_{is} = Concentration of the specific internal standard (ng/µL)

The percent relative standard deviation (%RSD) of the RRFs from the initial calibration curve for each target compound should have been ≤ 30 percent not to exceed 50 percent. The analyst considered the calibration curve acceptable when 90 percent of the target compounds met the acceptance limit. The equation used to calculate the % RSD is provided below:

$$RRF = \frac{A_x \ C_{is}}{A_{is} \ C_{is}}$$

Where:

SD = Standard deviation of the RRFs from the initial calibration mean

X_{RRF} = Average RRF from the initial calibration

A single independent check standard was analyzed prior to analyzing samples. The standard was compared to the initial calibration and all compounds met the percent difference criteria of ≤30 percent. Calculation of the percent difference was as follows:

$$\% \ Difference = \left[\frac{(C_C - C_D)}{C_C}\right] x \ 100$$

Where:

C_C = Calculated concentration of the analyte in the independent check standard.

C_D = Determined concentration of the analyte in the independent check standard quantitated with the initial calibration.

The continuing calibration period started at initial DFTPP injection and lasted for 24 hours or until a subsequent DFTPP injection was made. When the calibration expired, the analyst checked the system performance by injecting DFTPP and evaluating the mass spectra. If the DFTPP met the criteria, a continuing calibration would follow. If the criteria was not met, the detector parameters were adjusted. Prior to sample analysis, a continuing calibration check standard was analyzed at the 80 ng (mid-level). The target compounds had to meet %D criteria of less than 30 percent when compared to the initial

calibration. The analyst analyzed samples if no more than 10 percent of the target compounds exceeded the %D criteria. Results for the target analytes out of specification were qualified. If greater than 10 percent of the compounds did not meet this criteria another continuing calibration was performed. If the continuing calibration failed the criteria a second time, an initial calibration was performed.

$$\% \ Difference = \left[\frac{(RF_i - RF_c)}{RFc} \right] x \ 100$$

Where:

RF_i = Average response factor from the initial calibration.

RF_c= Response factor from continuing calibration.

Sample Preparation

Soil and groundwater samples were prepared using micro-extraction techniques developed by ABB-ES and HAZWRAP. Soil samples were prepared by the extractionist by weighing approximately 5 grams of soil in a drying tin and adding sodium sulfate to dry the sample. After the sample dried, it was transferred to a test tube and spiked with the surrogate mix. Five 5.0 mL of methylene chloride was added to the test tube and the sample was vortexed for one minute. After vortexing the sample, the sample was centrifuged to enhance phase separation. A 2.0 mL aliquot of the sample extract was transferred to a graduated test tube and blown down to a 1.0 mL volume using nitrogen. The extract was then transferred to a clean, labeled 2.0 mL vial, sealed with a Teflon™-lined screw cap, and stored in a refrigerator at 4°C, ± 2°.

Groundwater samples were prepared by measuring a 100 mL aliquot of the sample into a graduated cylinder. The sample aliquot was transferred to a clean 250-mL separatory funnel and then acidified to a pH of ≤2 with sulfuric acid. Fifteen mL of methylene chloride was added and the sample was shaken for 5 minutes. The sample was then set aside to allow phase separation. The organic layer was poured through

a small glass column that contained sodium sulfate which dried and filtered the extract. The extract was collected in a graduated test tube and concentrated down to a final volume of 1.0 mL using nitrogen. A list of surrogates with their respective %R control limits is provided in Table 5-11.

Table 5-11
SEMI-VOLATILE ORGANIC COMPOUNDS
SURROGATE RECOVERY CONTROL LIMITS
(soil and groundwater)

106th Rescue Group, NYANG
Westhampton Beach, New York

Surrogate	% R Control Limits	
	soil	groundwater
Nitrobenzene-d_5	(23 - 120)	(35 -114)
2-Fluorobiphenyl	(30 - 115)	(43 - 116)
Terphenyl- d_{14}	(18 - 137)	(33 - 141)
Phenol-d_5	(24 - 113)	(10 - 94)
2-Fluorophenol	(25 - 121)	(21 - 100)
2,4,6-Tribromophenol	(19 - 122)	(10 - 123)

Matrix Spike/Matrix Spike Duplicate Preparation

Matrix spike samples were analyzed and aided in the evaluation of laboratory precision and accuracy. Soil and groundwater samples designated for MS/MSD analysis were collected by the field crew and submitted to the field laboratory. The samples were spiked at a mid-level concentration with compounds that represent the compound families found on the target compound list. A list of matrix spike compounds with their control limits and their relative percent difference limits is provided in Table 5-12.

Target Compound Identification

The relative retention times (RRTs) for target compounds were identified within ±0.6 units of the standard. The data collection system calculated the RRT for each compound and compared it to its associated internal standard. If coelution of interfering components prohibited accurate assignment of the sample RRT from the total ion

chromatogram, the RRT was assigned by comparing extracted ion current profiles for ions unique to the component of interest.

Table 5-12
SEMI-VOLATILE ORGANIC COMPOUND
MATRIX SPIKE RECOVERY CONTROL LIMITS
(soil and groundwater)

106th Rescue Group, NYANG
Westhampton Beach, New York

Compound	Control Limits		RPD Limit	
	soil	groundwater	soil	groundwater
Phenol	(26 - 90)	(12 - 89)	50%	30%
2-Chlorophenol	(25 - 102)	(27 - 123)	50%	30%
1,4-Dichlorobenzene	(28 - 104)	(36 - 97)	50%	30%
1,2,4-Trichlorobenzene	(38 - 107)	(39 - 98)	50%	30%
4-Chloro-3-methylphenol	(26 - 103)	(23 - 97)	50%	30%
Acenaphthene	(31 - 137)	(46 - 118)	50%	30%
4-Nitrophenol	(11 - 114)	(10 - 80)	50%	30%
2,4-Dinitrotoluene	(28 - 89)	(24 - 96)	50%	30%
Pentachlorophenol	(17 - 109)	(9 - 103)	50%	30%
Pyrene	(35 - 142)	(26 - 127)	50%	30%

Qualitative positive verification of a compound required that all ions present in the standard mass spectrum at a relative intensity greater than 10 percent (most abundant ion in the spectrum equals 100 percent) were also present in the sample mass spectrum. Relative intensities of the ions had to agree within ±20 percent between the standard and sample spectra. (Example: For an ion with an abundance of 50 percent in the standard spectrum, the corresponding sample ion abundance was between 30 and 70 percent.).

Quantitation

When the analyst identified a compound, the quantitation of that compound was based on the integrated abundance from the extracted ion current profile (EICP) of the primary characteristic ion found in Table 5-8. Target compounds were quantitated by the internal standard method. The internal standard used was

selected as having the retention time nearest to the analyte. SVOC internal standards and surrogates and their corresponding target compounds are listed in Table 5-13.

Calculation of the concentrations of target compounds detected in groundwater is as follows:

$$Concentration\ ug/L = \frac{(A_x)\ (I_s)\ (V_t)\ (DF)}{(A_{is})\ (RRF)\ (V_o)\ (V_i)}$$

Where:

A_x = Area of the characteristic ion for the compound to be measured

A_{is} = Area of the characteristic ion for the internal standard

I_s = Amount of internal standard injected in ng

V_o = Volume of water extracted in mL

V_i = Volume of extract injected in microliters (µL)

V_t = Volume of the concentrated extract in mL

DF = Dilution factor

Calculation of the concentration of the target compounds found in soil samples are as follows:

$$Concentration\ ug/kg = \frac{(A_x)\ (I_s)\ (V_t)\ (DF)}{(A_{is})\ (RRF)\ (V_i)\ (W_s)(D)}$$

Table 5-13
SEMI-VOLATILE INTERNAL STANDARDS WITH CORRESPONDING TARGET COMPOUNDS
AND SURROGATES ASSIGNED FOR QUANTITATION

106th Rescue Group, NYANG

Westhampton Beach, New York

1,4-Dichlorobenzene-D_4	Naphthalene-D_8	Acenaphthene-D_{10}	Phenanthrene-D_{10}	Chrybene-D_{12}	Perylene-D_{12}
Phenol	Nitrobenzene	Hexachlorocyclopentadiene	4,6-Dinitro-2-Methylphenol	Pyrene	Di-n-octylphthalate
2,2'-oxybis(1-Chloropropane)	Isophorone	2,4,6-Trichlorophenol	Fluoranthene	Butylbenzylphthalate	Benzo(b)fluoranthene
2-Chlorophenol	2-Nitrophenol	2,4,5-Trichlorophenol	Hexachlorobenzene	Benzo(a)anthracene	Benzo(k)fluoranthene
1,3-Dichlorobenzene	2,4-Dimethyl-phenol	2-Chloronaphthalene	Pentachlorophenol	Bis(2-ethylhexyl)phthalate	Benzo(a)pyrene
1,4-Dichlorobenzene	2,4-Dichlorophenol	Dimethylphthalate	Phenanthrene		Indeno(1,2,3-CD)-pyrene
1,2-Dichlorobenzene	1,2,4-Trichlorobenzene	Acenaphthylene	Anthracene	Terphenyl-D_{14}	Dibenz(a,h)-anthracene
2-Methylphenol	Naphthalene	Acenaphthene	Di-n-Butyl-phthalate	(surrogate)	Benzo(g,h,i)-perylene
4-Methylphenol	Hexachlorobutadiene	2,4-Dinitrophenol			
Hexachloroethane	4-chloro-3-methylphenol	4-Nitrophenol			
2-Fluorophenol (surrogate)	2-Methylnaphthalene	Dibenzofuran			
Phenol-D_5 (surrogate)	Nitrobenzene-D_5 (surrogate)	2,4-Dinitrotoluene			
		2,6-Dinitrotoluene			
		Diethylphthalate			
		Fluorene			
		2,4,6-Tribromophenol (surrogate)			
		Fluorene			
		2-Fluorobiphenyl (surrogate)			

Where:

A_x = Area of the characteristic ion for the compound to be measured

A_{is} = Area of the characteristic ion for the internal standard

I_s = Amount of internal standard injected in ng

V_t = Volume of the concentrated extract in mL

V_i = Volume of extract injected in µL

D = Decimal % solid

W_s = Weight of sample extracted in grams

DF = Dilution factor

Reporting

The Hewlett-Packard™ MS ChemStation™ software provided a report with the raw concentrations that were detected in the sample. The analyst evaluated the results, the chromatogram, and the mass spectra of the detected compounds. The hard copy report was edited after the evaluation. The analyst then converted the report file into a reduced results file and imported the data into DM2000™, an analytical database. The DM2000™ calculated the final results taking into account the dilution factor and the percent solid. The analyst compared the results generated by the DM2000™ to the results manually calculated on the hard copy to verify results. Then the analyst exported the data to R-TIS via modem.

QA/QC

Quality control samples included field blanks, rinseates, field duplicates, matrix spikes and matrix spike duplicates and field duplicates. Field blanks were collected at the beginning of each shift from the potable water

source and the de-ionized water source. The field crew collected the rinseates from field equipment used to sample soil and groundwater. Rinseates were collected for every ten production samples. Field duplicates were collected per every ten production samples.

MS/MSD samples were analyzed for every twenty production samples. These samples were taken into the laboratory and spiked with ten of the target compounds. These ten matrix spike compounds are representative of the compound families found on the target compound list:

- Phenol
- 2-Chlorophenol
- 1,4-Dichlorobenzene
- 1,2,4-Trichlorobenzene
- 4-Chloro-3-methylphenol
- Acenaphthene
- 4-Nitrophenol
- 2,4-Dinitrotoluene
- Pentachlorophenol
- Pyrene

The percent recoveries were used to evaluate possible matrix interferences and laboratory accuracy.

5.3.3 Inorganic Analyses

The ABB-ES field laboratory used the following atomic absorption method to determine the concentrations of inorganic analytes in soil and groundwater samples. Analytes specific to this project are listed in Table 5-14.

Instrumentation

Soil and groundwater samples were analyzed using a Perkin Elmer™ Graphite Furnace Atomic Absorption Spectrophotometer (GFAAS) with a programmable four lamp turret to analyze for the six inorganic target

analytes. The analyst used hollow cathode lamps to analyze for cadmium (Cd), chromium (Cr), lead (Pb), and silver (Ag). Arsenic (As) and Selenium (Se) required the use of an electrodeless discharge lamp (EDL). A multi-position programmable auto-sampler device was used to deposit samples in the furnace. The auto-sampler device in conjunction with the programmable lamp turret allowed overnight analyses. A Perkin Elmer™ data collection system was interfaced with the GFAAS enabling analyses to be programmed and monitored. The operating conditions for the GFAAS included a carrier gas (argon) flow rate of 3 liters per minute and cooling water flow rate of 1.5 liters per minute at 10 to 25 °C.

Table 5-14
INORGANIC TARGET ANALYTES AND ABSORBANCE WAVELENGTH

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	nanometers (nm)
Arsenic	193.7
Chromium	357.9
Selenium	196.0
Lead	283.3
Cadmium	228.8
Silver	328.1

Standards

This method incorporated two types of standards, stock, and working. The laboratory purchased certified stock chemical standards from VWR Scientific, Inc. at concentrations of 1000 parts per million (ppm). Working calibration standards were prepared from single element stock solutions daily. The analyst cleaned standard preparation glassware with a 20 percent nitric acid (HNO_3) solution followed by three rinses with de-ionized water. All standards were labeled, coded, and stored in appropriate containers. Standard codes and summaries of standards preparation were entered into the project logbook prior to analysis.

Calibration

An initial calibration curve was generated daily, consisting of a blank and three standards at concentrations of 10, 20, and 30 µg/L. The data collection system created a calibration curve by plotting concentration vs. absorbance. A correlation coefficient was generated for each analyte by means of linear regression. The calibration curve for each analyte met a correlation coefficient criteria of 0.995 or greater for each target analyte. If the correlation coefficient was less than 0.995, a new calibration curve was generated.

A calibration check standard at the mid-level concentration was analyzed prior to sample analysis, after every 10 samples, and at the end of the day. The %R control limits were 80 to 120 %R when compared to the initial calibration. If the %R criteria was not met, a second standard was analyzed. If the second standard was unacceptable, a new calibration curve was created for that analyte.

Sample Preparation

Soil and groundwater samples were prepared using micro-digestion techniques developed by ABB-ES and HAZWRAP. Soil and groundwater samples required preparation in order to dissolve inorganic salts, minimize organic interferences, and convert samples into suitable solutions for analysis. All samples were digested prior to analysis. All aqueous samples were preserved with nitric acid to a pH of <2 and were centrifuged to remove suspended sediment.

Groundwater samples were prepared by transferring a 9.0 mL aliquot of the sample to a test tube, adding 0.5 mL of concentrated nitric acid and 0.5 mL of hydrogen peroxide (30 percent), and shaking carefully. The samples were then placed in a water bath and heated to 90°C. After digesting at 90°C for 45 minutes, the samples were removed from the water bath and allowed to cool. Deionized water was added to the samples to obtain a final volume of 10 mL. A dilution factor of 1.11 was taken into account when the final results were calculated.

Soil samples were prepared by weighing 0.50 grams of sample into a test tube and adding 9.0 mL of deionized water, 0.5 mL of concentrated nitric acid, and 0.5 mL of hydrogen peroxide solution (30 percent). The samples

were mixed gently, placed in the water bath and heated to 90°C. After digesting at 90°C for 45 minutes, the samples were removed from the water bath and allowed to cool. Deionized water was added to the samples to obtain a final volume of 10 mL.

Matrix Spike/Matrix Spike Duplicate Preparation

Soil and groundwater samples designated for MS/MSD analysis were collected by the field crew and submitted to the field laboratory. MS/MSD samples were spiked with all inorganic analytes at a mid-level concentration. A list of analytes with their %R and RPD control limits is provided in Table 5-15.

Table 5-15
INORGANIC MATRIX SPIKE RECOVERY CONTROL LIMITS
(soil and groundwater)

106th Rescue Group, NYANG
Westhampton Beach, New York

Element	%R Control Limits		RPD Limit	
	soil	groundwater	soil	groundwater
Arsenic	(75 - 125)	(75 - 125)	50%	30%
Cadmium	(75 - 125)	(75 - 125)	50%	30%
Chromium	(75 - 125)	(75 - 125)	50%	30%
Lead	(75 - 125)	(75 - 125)	50%	30%
Selenium	(75 - 125)	(75 - 125)	50%	30%
Silver	(75 - 125)	(75 - 125)	50%	30%

Target Analyte Identification

The digested sample is introduced into an electrically heated graphite tube and atomized. A light beam from a hollow cathode or electrodeless discharge lamp is directed through the tube and onto a detector that measures the amount of absorbed light. Because the wavelength of the light beam is characteristic of only the metal being determined, the light energy absorbed is a measure of the concentration of that metal in the sample. Refer to Table 5-14 for analyte specific wavelengths.

Quantitation

The data collection system quantified the inorganic analyte by measuring the absorbance and plotting it on the calibration curve of the analyte of interest. The analyst manually calculated results for soil and groundwater using the equations below. Sample concentrations exceeding the linear range of the calibration curve were diluted to fall within range and re-analyzed.

$$ug/Kg = \left(\frac{A \ x \ V}{W \ x \ S} \right)$$

Where:

A = µg/L of metal in processed sample from calibration curve

V = final volume of the processed sample, in mL

W = weight of sample, grams

S = decimal percent solid

$$\mu g/L = A\ (V/C)$$

Where:

A = µg/L of metal in processed sample from calibration curve

V = Final volume of sample digestate, in mL

C = Initial sample aliquot, in mL

Reporting

The Perkin Elmer™ software provided a report with the raw results detected in the sample. The analyst calculated the final results in the logbook. After evaluating the final results, the analyst converted the report file into a text file and imported the data into DM2000™, an analytical database. The DM2000™ calculated the final results taking into account the dilution factor and the percent solids. The analyst compared the results generated by the DM2000™ to the tabulated results to ensure that no transcription errors were made. The data was then exported to R-TIS via modem.

QA/QC

Quality control samples included field blanks, rinseates, field duplicates, matrix spikes and matrix spike duplicates. Field blanks were collected at the beginning of each shift from the potable water source and the de-ionized water source. The field crew collected the rinseates from field equipment used to sample soil and groundwater. Rinseates were collected per every 10 production samples. One MS/MSD sample was analyzed per every 20 production samples. Field duplicates were collected per every 10 production samples. The MS and MSD recoveries were used to evaluate possible matrix interferences and laboratory accuracy.

5.4 TOTAL ORGANIC CARBON ANALYSES

Six samples were collected for total organic carbon (TOC) analysis as outlined in Section 3.3.5 in the SAP. Table 5-16 below summarizes the samples collected.

The samples were sent to a contract laboratory, Specialized Assays Environmental in Nashville, Tennessee, for the analysis. They were analyzed using modified Method 9060. The TOC results for all six samples were <30.0 mg/kg. Copies of the analytical reports are included in Appendix E.

Table 5-16
TOC SAMPLE SUMMARY

106th Rescue Group, NYANG
Westhampton Beach, New York

Site	Sample ID	Description
Site 1	01SS003	Surface Soil
Site 5	05SD001	Sediment
	05SD008	Sediment
	05SD009	Sediment
Background	DP-086	Subsurface Soil Composite
	DP-089	Subsurface Soil Composite

5.5 DATA EVALUATION

All analytical data generated from the field laboratories were evaluated prior to end use. Evaluations were performed internally by ABB-ES during and after the field effort to satisfy project-specific Data Quality Objectives (DQOs), which depend in part on the type of site being investigated, the degree of certainty required in precision and accuracy of measurements, and the intended use of the data.

5.5.1 Data Quality Objectives

HAZWRAP (1990) has defined five levels of Quality Control (QC) corresponding to five levels of EPA DQOs (USEPA, 1987). These QC and DQO levels and their relationships are presented in Table 5-17.

The data generated during this SI is characterized by two of the five HAZWRAP QC levels as follows:

- Level A: Field analysis and monitoring for qualitative information used for exploration locations and sample selection, and health and safety monitoring (e.g., FID screening).

Table 5-17
DATA QUALITY OBJECTIVES AND HAZWRAP QUALITY CONTROL LEVELS

106th Rescue Group, NYANG
Westhampton Beach, New York

Examples of Data Uses	DQO Level	HAZWRAP QC Level	Examples of Use for SI
Site characterization Monitoring during implementation Field Screening	I	A	Qualitative or semiquantitative analysis Indicator parameters Immediate response in the field
Site characterization Evaluation of alternatives Engineering design Monitoring during implementation Field screening	II	B	Semiquantitative or quantitative analysis Compound specific Rapid turnaround in the field
Risk assessment Site characterization Evaluation of alternatives Engineering design Monitoring during implementation	III	C	Quantitative analysis Technically defensible data Sites near populated area Major sites
Risk assessment Site characterization Evaluation of alternatives Engineering design	IV	D	Quantitative analysis Legally defensible data National Priorities List sites
Risk assessment Evaluation of alternatives Engineering design	V	E	Qualitative to quantitative analysis Method specific Unique matrices (i.e., pure waste, biota, explosives, etc)

DQO Data Quality Objectives
HAZWRAP Hazardous Waste Remedial Actions Program
QC Quality Control

- Level B: Field analysis data based on quantitative methods performed on-site (e.g., purge and trap GC analysis). These methods do not provide the same degree of QC as quantitative chemical-specific methods conducted in a contract controlled laboratory. However, a Level B analytical program can include QC samples and measures which provide information necessary for data evaluation.

A summary of QC levels, analyses, data uses, and evaluation is presented in Table 5-18.

Table 5-18
SUMMARY OF DATA QUALITY LEVELS, ANALYSES, DATA USES AND EVALUATION

106th Rescue Group, NYANG
Westhampton Beach, New York

HAZWRAP QC Level	Analysis	Method/Equipment	Data Uses in SI	Evaluation
A	VOCs pH Conductivity Temperature	FID Portable Field Instruments	Health and safety monitoring Site characterization Well development and groundwater sampling	ABB-ES [1]
B	Target VOCs, SVOCs, Metals	GC, GC/MS, GFAAS	Site characterization	ABB-ES [1]

FID Flame Ionization Detector
GC Gas Chromatograph
MS Mass spectrometer
GFAAS Graphite Furnace Atom Absorption Spectrophotometer
VOCs Volatile Organic Compounds
SVOCs Semi-volatile Organic Compounds
[1] Evaluated by ABB-ES before use.

5.5.2 Data Qualification

Analytical results were evaluated and flagged when quality control criteria were not met. Data were evaluated and qualified according to the requirements outlined in the Task Instructions. The following flags were used to denote qualified data:

(U) Indicates the compound was analyzed for but not detected at the SQL. The number adjacent to the "U" qualifier indicates the SQL for that compound (usually equivalent to the PQL). The

(E) If a compound or element was detected at a concentration exceeding the calibration range, the result was qualified as estimated and flagged with an "E". Calibration ranges are described in Sections 5.3.1 through 5.3.3.

(B) If a target compound or element was detected in a method blank, concentrations of the analyte detected in associated production samples, less than five times the concentration detected in the blank, were qualified as estimated and flagged with a "B".

VOC Data Qualifications - Groundwater

- Twenty percent of positive results reported for VOCs in groundwater required no qualification.

- Eighty percent of positive results were qualified as estimated and flagged "J": 68% because concentrations were detected below the SQL; 10% because of compliance times; and 2% because of failed calibrations.

- Ninety-two percent of all volatile organic data generated for groundwater were reported as undetected at the SQL. Of that 92% , 8% was reported undetected at estimated SQLs, primarily because of failed calibration criteria.

- No groundwater data for VOCs were qualified due to failed surrogate recoveries.

- Three percent of positive results were qualified due to failed MS/MSD criteria.

- Eleven percent of positive results were qualified because results were detected and reported at concentrations greater than the instrument calibration range.

- No groundwater data for VOCs were flagged due to method blank contamination.

SQL may vary for samples due to dilution factors and adjustments for sample amount (% solids).

(J) The "J" qualifier was used to flag data qualified as estimated for a variety of reasons. It indicates that the analyte is present, but that the reported value may not be accurate. Although data may be qualified as estimated and flagged "J", the data are considered useable for the purpose of is SI. When combined with the "U" qualifier, the "J" flag indicates the SQL is estimated. Data were qualified as estimated under the following conditions:

If any analyte failed calibration criteria, then all results for those analytes in all samples analyzed during the affected calibration period were qualified as estimated and flagged with a "J". Criteria for calibrations are listed in Sections 5.3.1 through 5.3.3.

Reportable organic results detected below the SQL were qualified as estimated and flagged with a "J".

Analyses noncompliant in other aspects, (e.g., holding times before analysis or extraction; improper handling, storage or preservation, etc.) were qualified as estimated and flagged with a "J".

(S) If any analysis failed criteria for surrogate recovery, then all results for those analytes associated with the failed surrogate were qualified as estimated and flagged with an "S". Criteria for surrogate recoveries are listed in Sections 5.3.1 and 5.3.2.

(M) If spiked analytes in samples analyzed as a MS/MSD pair failed criteria for recovery or duplicate precision, then all results for appropriate analytes in samples associated with the MS/MSD were qualified as estimated and flagged with an "M". Criteria for MS/MSD recovery and are listed in Sections 5.3.1 through 5.3.3.

SVOC Data Qualifications - Groundwater

- Eighty percent of positive results reported for SVOCs in groundwater required no qualification.

- Twenty percent of positive results were qualified as estimated because samples were extracted out of compliance.

- Ninety-nine percent of all semi-volatile organic data generated for groundwater were reported as undetected at the SQL. Of that 99%, 52% was reported undetected at estimated SQLs, primarily because samples were extracted out of compliance.

- Less than 1% of the data were qualified due to failed surrogate recoveries.

- Three percent of positive results were qualified due to failed MS/MSD criteria.

- All positive results were detected and reported at concentrations within the instrument calibration range.

- No semi-volatile groundwater data were flagged due to method blank contamination.

Inorganic Data Qualifications - Groundwater

- Thirty percent of positive results reported for inorganic analytes in groundwater required no qualification.

- Seventy-four percent of all inorganic data generated for groundwater were reported as undetected at the SQL. Of that 74% , less than 1% was reported undetected at estimated SQLs (failed calibration criteria)

- Seventy percent of positive results were qualified due to failed MS/MSD criteria.

- All positive results were detected and reported at concentrations within the instrument calibration range.

- No inorganic groundwater data were flagged due to method blank contamination.

VOC Data Qualifications - Soils

- Thirty-four percent of positive results reported for VOCs in soils required no qualification.

- Fifty-two percent of positive results were qualified as estimated because concentrations were detected below the SQL.

- Ninety-six percent of all volatile organic data for soils were reported as undetected at the SQL. Of that 96%, 8% was reported undetected at estimated SQLs, primarily because of failed calibration criteria.

- Less than 1% of positive results were qualified due to failed surrogate recoveries.

- Less than 2% of undetected results were qualified due to failed surrogate recoveries.

- Eleven percent of positive results were qualified due to failed MS/MSD criteria.

- Four percent of undetected results were qualified due to failed MS/MSD criteria.

- Seven percent of positive results were qualified because results were detected and reported at concentrations greater than the instrument calibration range.

- Less than 1% of volatile data for soils (20 records for toluene and 1 for tetrachloroethene) were qualified due to method blank contamination; all qualified concentrations were less than the SQL.

SVOC Data Qualifications - Soils

- No positive results reported for SVOCs in soils required qualification.

- Ninety-eight percent of all semi-volatile organic data for soils were reported as undetected at the SQL. Of that 98%, less than 1% was reported undetected at estimated SQLs.

- Less than 1% of undetected results were qualified due to failed surrogated recoveries.

- No results were qualified due to failed MS/MSD criteria.

- All positive results were detected and reported at concentrations within the instrument calibration range.

- No results were flagged due to method blank contamination.

Inorganic Data Qualifications - Soils

- Ten percent of positive results reported for inorganic analytes in soil required no qualification.

- Sixty-two percent of all inorganic data for soils were reported as undetected at the SQL. Of that 62% , 4% was reported undetected at estimated SQLs (failed calibration criteria).

- Eighty-nine percent of positive results were qualified due to failed MS/MSD criteria.

- Twenty-six percent of undetected results were qualified due to failed MS/MSD criteria.

- All positive results were detected and reported at concentrations within the instrument calibration range.

- No inorganic groundwater data were flagged due to blank contamination.

5.5.3 Data Quality Assessment

An additional assessment of overall data quality is achieved by grouping particular data evaluation findings and reviewing them in terms of precision, accuracy, representativeness, completeness, and comparability (PARCC) criteria. Data generated during this SI were evaluated for PARCC criteria during operation of the field laboratories and after completion of all analyses. A summary of evaluations for PARCC criteria is presented in Appendix F.

5.6 TENTATIVELY IDENTIFIED COMPOUNDS

A library search was executed for non-target sample components for tentative identification on this project. For this purpose, the most recent release of the NIST/USEPA/MSDC mass spectral library, containing 50,000 spectra, was utilized. Potentially 20 non-surrogate organic compounds of greatest apparent concentrations could have been identified tentatively by means of a forward search of the NIST/USEPA/MSDC mass spectral library. Substances that responded less than 10 percent of the nearest internal standard were not searched. Only after visual comparison of sample spectra with the nearest library searches would the analyst assign a tentative identification. Relative intensities of major ions in the reference spectrum (ions greater than 10 percent of the

most abundant ion) were present in the sample spectrum. Relative intensities of the major ions should have agreed within ±20 percent.

Molecular ions present in the reference spectrum were presented in the sample spectrum. Ions present in the sample spectrum but not in the reference spectrum were reviewed for possible background contamination or presence of coeluting compounds. Ions present in the reference spectrum but not in the sample spectrum were reviewed for possible subtraction from the sample spectrum because of background contamination or coeluting compounds.

If the analyst could not make a valid tentative identification, the compound was reported as an unknown. However, the analyst gave additional classification of the unknown compound, if possible (i.e., unknown phthalate, unknown hydrocarbon, unknown acid type, or unknown chlorinated compound).

All chromatograms and ion chromatograms were evaluated for all samples with reported TICs. The TICs detected in soil and groundwater are tabulated and summarized in Appendix G. The concentrations reported in the summary tables are not based on calibration standards and should be considered estimated.

5.7 CHARACTERIZATION OF FIELD LABORATORY WASTE

Waste generated by the field laboratory during the site investigation was managed as stated in the IDW Task instructions. Volatile liquid wastes were allowed to evaporate under the fume hood. Solid and non-volatile liquid wastes were stored in 55 gallon drums. Laboratory and SI IDW was characterized by analysis of composite samples collected from the drums. Samples were analyzed in the field laboratories by the same procedures used during the SI. Analytical results for all IDW composite samples are presented in Appendix H.

6.0 DATA MANAGEMENT

Analytical data generated by the on-site laboratory were electronically transferred to a general purpose, data handling program for evaluation and file formatting. The data were then electronically imported to ABB-ES' Real-Time Interpretation System (R-TIS) for production of analytical reports, data queries, and graphics. Physical data (sample depth and interval, water levels, and survey data) were entered into R-TIS manually.

Following completion of the field effort, the data were downloaded from R-TIS to GIS\Key (an environmental data management software system) for production of cross sections, flow nets, isoconcentration contour plans, and graphs. Some physical data (soil units and well construction information) were entered into GIS\Key manually. Boring logs and well diagrams were prepared in Geotechnical Graphics System software. Data evaluation and hits tables were generated from GIS\Key or downloaded to Microsoft Excel.

The R-TIS database was accessible only to the technical lead for this project. Data stored in GIS\Key were protected from unauthorized access by password security. Both databases were backed up daily, and one copy of each was stored off site.

7.0 ACTION LEVELS

7.1 GROUNDWATER

New York State (NYS) Class GA[1] standards or guidance values were used as action levels for groundwater. The levels were selected by determining the applicability of the principle organic contaminant (POC) groundwater standard. This procedure consists of five steps which are outlined in the Division of Water Technical and Operational Guidance Series or TOGS (1.1.1) (Zambrano, J., 1991).

The first step for determining an action level requires finding the constituent of concern in one of three tables presented in the TOGS. These tables are summarized below. If the constituent of concern is not listed in Table 1, then Table 2 is used, then Table 3. If the constituent of concern is not included in any of the three tables, then definitions included on page 9 of the TOGS are followed (also listed below). If the constituent of concern is not found in these four steps, NYSDEC assistance is required (Step 5).

- NYS Ambient Water Quality Standards and Guidance Values (Table 1)
- Partial List of Substances Regulated by the Principle Organic Contaminant Groundwater Standard of 5 µg/L (Table 2)
- Partial List of Substances Not Regulated by the Principle Organic Contaminant Groundwater Standard (Table 3)
- Definitions of POC Classes 1 (halogenated alkanes) and 2 (halogenated ether) (page 9)

[1] NYS water is classified by primary or best usage. Guidance and standards are developed to provide protection of the primary usage(s) assigned to each water class. Usages are described in Part 701 of the NYS Administrative Code.

Table 7-1 presents action levels for groundwater relative to NYS guidance and federal maximum contaminant levels (MCLs). If standards or guidance values were less than laboratory reporting limits (RLs), the RLs were used as action levels.

7.2 SOIL

7.2.1 Organic Compounds

Action levels for volatile and semi-volatile organic compounds were developed from NYSDEC guidance for determination of soil cleanup objectives (O'Toole, 1994). These levels reflect the most stringent value obtained from the following alternative criteria:

(a) Human health-based levels that correspond to excess lifetime cancer risks of one in a million for Class A and B carcinogens, or one in 100,000 for Class C carcinogens. These levels are calculated by NYSDEC using USEPA cancer slope factors and exposure scenarios which ensure acceptable risk. Class A carcinogens are proven human carcinogens; Class B are probable human carcinogens; and Class C are possible human carcinogens.

(b) Human health-based levels for systemic toxicants, calculated from Reference Doses (RfDs). RfDs represent an estimate of daily exposure an individual can experience without appreciable risk of health effects during a lifetime.

(c) Environmental concentrations protective of groundwater/drinking water quality. These concentrations are based on the Water-Soil Equilibrium Partition Theory which assumes that organic matter present in soils will adsorb organic compounds and attenuate continued migration. The concentrations are dependent on the amount of carbon present in the soil and whether or not the soil is in contact with groundwater. This approach predicts a maximum, estimated soil concentration which does not generate a leachate likely to impact groundwater quality above applicable standards.

Table 7-1
ACTION LEVELS FOR GROUNDWATER

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	USEPA MCL (µg/L)	NYS Class GA Groundwater (µg/L)	Reporting Limit (µg/L)
Volatile Organic Compounds			
Benzene	5	0.7	5
Chlorobenzene	-	5	5
Chloroform	100	7	5
1,1-Dichloroethane	-	5	5
1,1-Dichloroethene	7	5	10
cis-1,2-Dichloroethene	70	5 [1]	5
trans-1,2-Dichloroethene	100	5	5
Ethlybenzene	700	5	5
Tetrachloroethene	5	5	5
Toluene	1,000	5	5
1,1,1-Trichloroethane	200	5	5
Trichloroethene	5	5	5
o-Xylene [2]	10,000	5	5
m/p-Xylenes [2]	10,000	5	10
Semi-volatile Organic Compounds			
Acenaphthene	-	20 G	20
Acenaphthylene	-	50 [3]	20
Anthracene	-	50 G	20
Benzo(a)anthracene	0.1 P	0.002 G	20
Benzo(a)pyrene	0.2	ND	20
Benzo(b)fluoranthene	0.2 P	0.002 G	20
Benzo(g,h,i)perylene	-	50 [3]	20
Benzo(k)fluoranthene	0.2 P	0.002 G	20
bis(2-ethylhexyl)phthalate [4]	6	50	20
Butylbenzylphthalate	100 P	50 G	20
4-Chloro-3-methlyphenol	-	1 [5]	20
2-Chloronaphthalene	-	10 G	20
2-Chlorophenol	-	1 [5]	20
Chrysene	0.2 P	0.002 G	20
Dibenzofuran	-	50 [3]	20
Dibenz(a,h)anthracene	0.3 P	50 [3]	20
1,2-Dichlorobenzene	600	4.7	5
1,3-Dichlorobenzene	600	5	5
1,4-Dichlorobenzene	75	4.7	5
2,4-Dichlorophenol	-	1 [5]	20
Diethylphthalate	-	50 G	20
Dimethylphthalate	-	50 G	20

Table 7-1 (cont'd)
ACTION LEVELS FOR GROUNDWATER

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	USEPA MCL (µg/L)	NYS Class GA Groundwater (µg/L)	Reporting Limit (µg/L)
2,4-Dimethylphenol	-	1 [5]	20
Di-n-butylphthalate	-	50 [3]	20
Di-n-octylphthalate	-	50 G	20
2,4-Dinitrophenol	-	1 [5]	20
2,4-Dinitrotoluene	-	5 [1]	20
2,6-Dinitrotoluene	-	5	20
4,6-Dinitro-2-methylphenol	-	1 [5]	20
Fluoranthene	-	50 G	20
Fluorene	-	50 G	20
Hexachlorobenzene	1	0.35	20
Hexachlorobutadiene	-	5	20
Hexachlorocyclopentadiene	50	5	20
Hexachloroethane	-	5 [1]	20
Indeno(1,2,3-cd)pyrene	0.4 P	0.002 G	20
Isophorone	-	50 G	20
2-Methlynaphthalene	-	50 [3]	20
2-Methylphenol	-	1 [5]	20
4-Methylphenol	-	1 [5]	20
Naphthalene	-	10 G	10
Nitrobenzene	-	5	20
2-Nitrophenol	-	1 [5]	20
4-Nitrophenol	-	1 [5]	50
2,2'-oxybis(1-chloropropane)	-	50 [3]	20
Pentachlorophenol	1	1 [5]	20
Phenanthrene	-	50 G	20
Phenol	-	1 [5]	50
Pyrene	-	50 G	20
1,2,4-Trichlorobenzene	70	5 [1]	20
2,4,5-Trichlorophenol	-	1 [5]	20
2,4,6-Trichlorophenol	-	1 [5]	20
Inorganic Constituents			
Arsenic	50 [6]	25	10
Cadmium	5	10	10
Chromium	100	50	10
Lead	TT 15 [7]	25	10
Selenium	50	10	10
Silver	100 S	50	10

Table 7-1 (cont'd)
ACTION LEVELS FOR GROUNDWATER

106th Rescue Group, NYANG
Westhampton Beach, New York

Action levels are shaded [8]

-	No promulgated standard or guidance value available
G	Guidance values taken from Zambrano, J., 1991
MCL	Maximum Contaminant Level
ND	Non-detectable concentration
NYS	New York State
P	standard is proposed
S	Secondary Federal Maximum Contaminant Level
TT	Treatment Technique Action Level
µg/L	micrograms per liter
USEPA	United States Environmental Protection Agency
[1]	Compound is a Principal Organic Contaminant (POC). Under NYDOH Drinking Water Standards (10 NYCRR Subpart 5-1), a general standard of 5 µg/L applies to all POCs unless a more stringent, compound-specific standard has been set (ABB-ES, 1994).
[2]	Total xylene standard is applied to each isomer, equally, based upon toxicity profile data.
[3]	Compound is an Unspecified Organic Contaminant (UOC). Under NYDOH Drinking Water Standards (10 NYCRR Subpart 5-1) a general standard of 50 µg/L applies (ABB-ES, 1994).
[4]	Bis(2-ethylhexyl)phthalate is listed as diethylhexylphthalate under 6 NYCRR 700-705 (ABB-ES, 1994), and USEPA Drinking Water Regulations and Health Advisories, November, 1994.
[5]	NYS groundwater phenol standard of 1.0 µg/L is for total phenolic compounds.
[6]	Federal MCL for arsenic is under review.
[7]	Federal MCL and MCLG for lead is concentration in water collected from the tap.
[8]	Action level selection criteria are presented in Section 8.0.

Reference:

USEPA, 1992, Drinking Water Regulations and Health Advisories: USEPA Office of Water, Washington, D.C.

Zambrano, J., 1991, "Ambient Water Quality Standards and Guidance Values", Memorandum by the Division of Water Technical and Operational Guidance Series (1.1.1).

State of New York, 1993, New York Public Water Supply Regulations, Title 10, Code of Rules and Regulations, Subpart 5-1.

Human health-based criteria were compiled from USEPA Health Effects Assessment Summary data (O'Toole, 1994). Environmental concentrations protective of groundwater/drinking water quality are based on NYSDEC calculations which assume 1% total organic carbon and a correction factor of 100 for saturated soils. Soils located within 5 ft of the water table were considered saturated.

Action levels are summarized relative to NYS guidance and RLs in Table 7-2. RLs which exceed NYS guidance were used as action levels. Site background data are included in this table for comparison because background concentrations which exceed health-based levels can be used as action levels. Soils with a discernible odor of a particular chemical or substance were considered indicative of a release regardless of contaminant concentration(s).

7.2.2 Inorganic Compounds

Action levels for inorganic constituents were developed from NYSDEC guidance for determination of soil cleanup objectives (O'Toole, 1994). The levels are based on the upper limit value (ULV) of site background concentrations, excluding outliers, as recommended by NYSDEC (Harrington, 1994). The ULV was calculated from the mean of background constituent concentrations plus three standard deviations. The Coefficient of Variation Test, presented below, was used to evaluate data distribution. Background data are discussed in Section 9.0.

$$X_b = \frac{X^1 + X^2 + \ldots . X_n,}{n}$$

$$S_b^2 = \frac{(X_1 - \overline{X_b})^2 + (X_2 - \overline{X_b})^2 , \ldots . (X_n - \overline{X_b})^2,}{n-1}$$

$$S_b = \sqrt{S_b^2}, \quad \textit{and}$$

$$CV = S_b / X_b \quad \textit{where,}$$

X_b = background mean

X = concentration of individual concentrations

Table 7-2
ACTION LEVELS FOR ORGANIC COMPOUNDS IN SOIL AND SEDIMENT

106th Rescue Group, NYANG
Westhampton Beach, New York

	USEPA Health -Based Levels		Range of Background	Environmental Concentrations Protective of Groundwater Quality		
	Carcinogens (mg/kg)	Systemic Toxicants (mg/kg)	Concentrations (mg/kg)	Saturated [1] Soil (mg/kg)	Unsaturated [2] Soil (mg/kg)	Reporting Limit (mg/kg)
Volatile Organic Compounds [3]						
Benzene	24	NA	ND - 0.8	0.0006	0.06	0.005
Chlorobenzene	NA	2,000	ND	0.017	1.7	0.005
Chloroform	114	800	ND	0.003	0.3	0.005
1,1-Dichloroethane	NA	NA	ND	0.002	0.2	0.005
1,1-Dichloroethene	12	700	ND	0.004	0.4	0.010
cis-1,2-Dichloroethene	NA	NA	ND	NA	NA	0.005
trans-1,2-Dichloroethene	NA	2,000	ND	0.003	0.3	0.005
Ethylbenzene	NA	8,000	ND - 0.032	0.055	5.5	0.005
Tetrachloroethene	14	800	ND	0.014	1.4	0.005
Toluene	NA	20,000	ND	0.015	1.5	0.005
1,1,1-Trichloroethane	NA	7,000	ND - 0.16	0.0076	0.76	0.005
Trichloroethene	64	NA	ND	0.007	0.7	0.005
o-Xylene [4]	NA	200,000	ND	0.012	1.2	0.005
m/p-Xylenes [4]	NA	200,000	ND	0.012	1.2	0.010
Semi-volatile Organic Compounds [5]						
Acenaphthene	NA	5,000	ND	0.9	50.0 [6]	1.0
Acenaphthylene	NA	NA	ND	0.41	41.0	1.0
Anthracene	NA	20,000	ND	7	50.0 [6]	1.0
Benzo(a)anthracene	0.224	NA	ND	0.03	0.224 or RL [7]	1.0
Benzo(a)pyrene	0.0609	NA	ND	0.0609 or RL [7]	0.0609 or RL [7]	1.0
Benzo(b)fluoranthene	NA	NA	ND	0.011	1.1	1.0
Benzo(g,h,i)perylene	NA	NA	ND	8	50.0 [6]	1.0
Benzo(k)fluoranthene	NA	NA	ND	0.011	1.1	1.0
bis(2-ethylhexyl)phthalate	50	2,000	ND	4.35	50.0 [6]	1.0
Butylbenzylphthalate	NA	20,000	ND	1.215	50.0 [6]	1.0
4-Chloro-3-methlyphenol	NA	NA	ND	0.0024	0.24 or RL	1.0
2-Chloronaphthalene	NA	NA	ND	NA	NA	1.0
2-Chlorophenol	NA	400	ND	0.008	0.8	1.0
Chrysene	NA	NA	ND	0.004	0.4	1.0
Dibenzofuran	NA	NA	ND	0.062	6.2	1.0

Table 7-2 (cont'd)
ACTION LEVELS FOR ORGANIC COMPOUNDS IN SOIL AND SEDIMENT

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	USEPA Health -Based Levels		Range of Background Concentrations (mg/kg)	Environmental Concentrations Protective of Groundwater Quality		Reporting Limit (mg/kg)
	Carcinogens (mg/kg)	Systemic Toxicants (mg/kg)		Saturated [1] Soil (mg/kg)	Unsaturated [2] Soil (mg/kg)	
Dibenzo(a,h)anthracene	0.0143	NA	ND	0.014 or RL [7]	0.014 or RL [7]	1.0
1,2-Dichlorobenzene	NA	NA	ND	0.079	7.9	0.005
1,3-Dichlorobenzene	NA	NA	ND	0.0155	1.55	0.005
1,4-Dichlorobenzene	NA	NA	ND	0.085	8.5	0.005
2,4-Dichlorophenol	NA	200	ND	0.004	0.4	1.0
Diethylphthalate	NA	60,000	ND	0.071	7.1	1.0
Dimethylphthalate	NA	80,000	ND	0.02	2	1.0
2,4-Dimethylphenol	NA	NA	ND	NA	NA	1.0
Di-n-butylphthalate	NA	8,000	ND	0.081	8.1	1.0
Di-n-octylphthalate	NA	2,000	ND	1.2	50.0 [6]	1.0
2,4-Dinitrophenol	NA	200	ND	0.002	0.2 or RL	1.0
2,4-Dinitrotoluene	NA	NA	ND	NA	NA	1.0
2,6-Dinitrotoluene	1.03	NA	ND	0.01	1	1.0
4,6-Dinitro-2-methylphenol	NA	NA	ND	NA	NA	1.0
Fluoranthene	NA	3,000	ND	19	50.0 [6]	1.0
Fluorene	NA	3,000	ND	3.5	50.0 [6]	1.0
Hexachlorobenzene	0.41	60	ND	0.014	0.41 [7]	1.0
Hexachlorobutadiene	NA	NA	ND	NA	NA	1.0
Hexachlorocyclopentadiene	NA	NA	ND	NA	NA	1.0
Hexachloroethane	NA	NA	ND	NA	NA	1.0
Indeno(1,2,3-cd)pyrene	NA	NA	ND	0.032	3.2	1.0
Isophorone	1,707	20,000	ND	NA	NA	1.0
2-Methlynaphthalene	NA	NA	ND	0.364	36.4	1.0
2-Methylphenol	NA	NA	ND	0.001	0.1 or RL	1.0
4-Methylphenol	NA	4,000	ND	0.009	0.9	1.0
Naphthalene	NA	300	ND - 4.6	0.13	13	0.010
Nitrobenzene	NA	40	ND	0.002	0.2 or RL	1.0
2-Nitrophenol	NA	NA	ND	0.0033	0.33 or RL	1.0
4-Nitrophenol	NA	NA	ND	0.001	0.1 or RL	1.0
2,2'-oxybis(1-chloropropane)	NA	NA	ND	NA	NA	1.0
Pentachlorophenol	NA	2,000	ND	0.01	1 or RL	1.0
Phenanthrene	NA	NA	ND	2.2	50.0 [6]	1.0
Phenol	NA	50,000	ND	0.0003	0.03 or RL	1.0
Pyrene	NA	2,000	ND	6.65	50.0 [6]	1.0
1,2,4-Trichlorobenzene	NA	NA	ND	NA	NA	1.0
2,4,5-Trichlorophenol	NA	8,000	ND	0.001	0.1	1.0
2,4,6-Trichlorophenol	NA	NA	ND	NA	NA	1.0

Table 7-2 (cont'd)
ACTION LEVELS FOR ORGANIC COMPOUNDS IN SOIL AND SEDIMENT

106th Rescue Group, NYANG
Westhampton Beach, New York

Action levels are shaded [8]

mg/kg	milligrams per kilogram
NA	Not available
ND	Non-detectable concentration
RL	Reporting Limit
SVOCs	Semi-volatile organic compounds
USEPA	United States Environmental Protection Agency
VOCs	Volatile organic compounds
[1]	Soil in direct contact with groundwater.
[2]	Greater than five feet above the water table.
[3]	Maximum allowable total VOCs $\leq$ 10 mg/kg based on soil cleanup objectives.
[4]	Total xylene standard is applied to each isomer, equally, based upon toxicity profile data.
[5]	Maximum allowable total SVOCs $\leq$ 500 mg/kg based on soil cleanup objectives.
[6]	Per the Technical and Administrative Guidance Memorandum (O'Toole, 1994), the action level of an individual semi-volatile organic compound is 50 mg/kg.
[7]	Recommendation from USEPA Health Board.
[8]	Action level selection criteria are presented in Section 8.0.

Reference:

O'Toole, M.J., Jr., 1994, Division Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels: NYSDEC Division of Hazardous Waste Remediation, 10 p.

n = total number of background readings

S_b^2 = background variance

$n-1$ = degrees of freedom

S_b = background standard deviation

CV = coefficient of variance

Background data for which CV was greater than 0.50 were re-evaluated without outliers and the maximum allowable concentration or ULV for individual constituents was calculated again by adding the new background (X_b) mean to 3 times the standard deviation (S_b). Outliers which do not exceed this upper limit are not considered indicative of a release. Calculations are included in Appendix K.

Action levels for inorganic compounds in surface soils, sediment, and subsurface soils are summarized in Tables 7-3 and 7-4. Eastern USA or NYS background concentrations are provided for comparison. Because background sediments were not available to sample, and sediment and surface soils appear to be texturally similar, surface soil action levels were used to evaluate sediment data. Action levels for chromium and lead in subsurface soils are different because background concentrations were lower in these soils than in the surface samples.

Table 7-3
ACTION LEVELS FOR INORGANIC COMPOUNDS IN SURFACE SOIL AND SEDIMENT

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Eastern USA or NYS Background Concentrations (mg/kg)	Range of Site Background Concentrations (mg/kg)	NYS Soil Cleanup Objectives (mg/kg)	Upper Limit of Background Concentrations (mg/kg)[1]	Reporting Limit (mg/kg)
Inorganic Constituents					
Arsenic	3 - 12	ND	7.5 or SB	0.10	0.20
Cadmium	0.1 - 1	ND	1 or SB	0.10	0.20
Chromium	1.5 - 40	0.53 - 3.8	10 or SB	6.1	0.20
Lead	4 - 500[2]	0.46 - 2.4	SB	4.4	0.20
Selenium	0.1 - 3.9	ND	2 or SB	0.10	0.20
Silver	NA	ND	SB	0.10	0.20

Action levels are shaded [3]

mg/kg	milligrams per kilogram
NA	Not available
ND	Non-detectable concentration
NYS	New York State
SB	Site background
USA	United States of America
1	Upper limit of background concentrations are based on the mean concentration of site background constituents plus 3 times the standard deviation, excluding outliers.
2	Average concentrations in rural or undeveloped areas may range from 4 to 61 mg/kg. Average background concentrations in metropolitan or suburban areas or near highways are much higher and typically range from 200 to 500 mg/kg.
3	Action level selection criteria are provided in Section 8.0.

Reference:

O'Toole, M.J., Jr., 1994, Division Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels: NYSDEC Division of Hazardous Waste Remediation, 10 p.

Table 7-4
ACTION LEVELS FOR INORGANIC COMPOUNDS IN SUBSURFACE SOIL

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Eastern USA or NYS Background Concentrations (mg/kg)	Range of Site Background Concentrations (mg/kg)	NYS Soil Cleanup Objectives (mg/kg)	Upper Limit of Background Concentrations (mg/kg)[1]	Reporting Limit (mg/kg)
Inorganic Constituents					
Arsenic	3 - 12	ND 0.22	7.5 or SB	0.10	0.20
Cadmium	0.1 - 1	ND	1 or SB	0.10	0.20
Chromium	1.5 - 40	ND	10 or SB	0.84	0.20
Lead	4 - 500[2]	ND - 0.6	SB	0.65	0.20
Selenium	0.1 - 3.9	ND	2 or SB	0.10	0.20
Silver	NA	ND	SB	0.10	0.20

Action levels are shaded [3]

mg/kg	milligrams per kilogram
NA	Not available
ND	Non-detectable concentration
NYS	New York State
SB	Site background
USA	United States of America
1	Upper limit of background concentrations are based on the mean concentration of site background constituents plus 3 times the standard deviation, excluding outliers.
2	Average concentrations in rural or undeveloped areas may range from 4 to 61 mg/kg. Average background concentrations in metropolitan or suburban areas or near highways are much higher and typically range from 200 to 500 mg/kg.
3	Action level selection criteria are provided in Section 8.0.

Reference:

OToole, M.J., Jr., 1994, Division Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels: NYSDEC Division of Hazardous Waste Remediation, 10 p.

8.0 INVESTIGATION FINDINGS

Section 8.0 summarizes the basewide geology and hydrogeology and presents site-specific investigation findings for each of the nine sites of concern and background. Sampling strategies, sample location information, and analytical results by media for each site (including background) are presented. Sampling logic diagrams are included to illustrate the sampling and analytical protocol developed for the SI. Sampling information, such as location, compounds analyzed, and hits above action levels, are summarized in tables presented in this section. Analytical results are provided in Appendix D.

Conceptual models were used to develop sampling strategies. The models delineated potential release pathways and affected media based on an assumed contamination scenario. Each model included a three-dimensional drawing of the release scenario, a sampling logic diagram, and a plan view of initial and proposed secondary sample locations. These figures are included in the SAP. A brief summary of the conceptual model developed for each site is included in this section.

Not all samples were analyzed for all chemical fractions; secondary samples were generally tested for the fractions or individual analytes of concern identified at each site in initial samples. Secondary samples are not otherwise distinguished from initial samples in this report.

8.1 BASEWIDE GEOLOGY AND HYDROGEOLOGY

8.1.1 Geology

Subsurface soils at the facility consist primarily of fine to medium-grained sand with trace silt and/or trace to some gravel in localized areas. Sieve analyses for two subsurface samples are summarized in Table 8-1. Surface soils generally contained a higher percentage of silt. These soils are similar to the glacial outwash deposits previously described for the facility (E.C. Jordan Co., 1989) and constitute that portion of the upper glacial aquifer which underlies the airport.

Table 8-1
SIEVE ANALYSIS RESULTS [1]

106th Rescue Group, NYANG
Westhampton Beach, New York

Boring	Sand	Silt/Clay	Gravel	Total
DP-086	86.1%	2.2%	11.7%	100%
DP-089	94.9%	1.0%	4.1%	100%

[1] Grain size test results are provided in Appendix I.

8.1.2 Hydrogeology

8.1.2.1 Movement of Groundwater

ABB-ES personnel measured water levels in the nine existing monitor wells and piezometers on September 16, 1994. A second round of water level measurements were collected on December 2, 1994 from the existing monitor wells and piezometers and the SDWs installed during this SI. Water level measurements and groundwater elevations are shown in Table 8-2. The data show a slight decrease in water table elevations in December. Direction of groundwater movement is toward the south-southeast (Figure 8-1) which is consistent with flow directions evaluated previously for this facility (ABB-ES, 1991).

8.1.2.2 Aquifer Test Results

Table 8-3 presents slug test results for monitor wells and piezometers installed in the upper glacial aquifer at the base. The average hydraulic conductivity of this aquifer, as evaluated from the slug tests, is 3.8 x 10^{-2} to 5.2 x 10^{-2} centimeters per second (cm/sec), which is consistent with a hydraulic conductivity value (2.1 x 10^{-2} cm/sec) evaluated during previous work at this facility. Slug test data are provided in Appendix J. The average rate of groundwater movement, or average linear velocity of groundwater flow, is estimated to be 0.60 ft/day or 219 ft/year assuming the average hydraulic conductivity of 3.8 x 10^{-2} cm/sec (7.4 x 10^{2} ft/min), an effective porosity of 25% (ABB-ES, 1994), and a hydraulic gradient of 0.0014 ft/ft. This rate was estimated from the following equation:

Table 8-2
GROUNDWATER ELEVATIONS

106th Rescue Group, NYANG
Westhamtpon Beach, New York

Well / Piezometer	Top of Casing Elevation (ft NGVD)	DTW (ft) 9/16/94	Groundwater Elevation (ft NGVD)	DTW (ft) 12/2/94	Groundwater Elevation (ft NGVD)
MW-001	62.58	46.35	16.23	46.95	15.63
MW-002	47.42	31.51	15.91	32.02	15.40
MW-003	47.13	31.21	15.92	31.75	15.38
PZ-001	57.71	42.45	15.26	43.10	14.61
PZ-002	45.44	30.16	15.28	30.84	14.60
PZ-003	53.77	39.48	14.29	39.85	13.92
PZ-004	49.81	34.52	15.29	35.19	14.62
PZ-005	43.97	29.62	14.35	30.33	13.64
PZ-006	43.69	30.63	13.06	31.18	12.51
SDW-001	56.01	NM	-	40.78	15.23
SDW-002	56.13	NM	-	40.91	15.22
SDW-003	56.61	NM	-	41.80	14.81
SDW-004	53.23	NM	-	38.47	14.76
SDW-005	45.68	NM	-	30.44	15.24
SDW-006	44.21	NM	-	29.34	14.87
SDW-007	47.32	NM	-	32.78	14.54
SDW-008	47.22	NM	-	32.65	14.57
SDW-009	44.86	NM	-	30.54	14.32
SDW-010	44.07	NM	-	29.82	14.25
SDW-011	56.26	NM	-	41.60	14.66
SDW-012	51.52	NM	-	37.78	13.74
SDW-013	54.86	NM	-	40.88	13.98
SDW-014	49.06	NM	-	35.56	13.50
SDW-015	49.43	NM	-	36.09	13.34
SDW-016	48.49	NM	-	35.38	13.11
SDW-017	49.06	NM	-	36.10	12.96
SDW-018	59.14	NM	-	43.58	15.56
SDW-019	51.73	NM	-	36.52	15.21
SDW-020	51.96	NM	-	36.81	15.15
SDW-021	46.89	NM	-	33.21	13.68
SDW-022	46.84	NM	-	33.20	13.64
SDW-023	41.53	NM	-	28.52	13.01
SDW-024	40.85	NM	-	27.31	13.54

DTW Depth to water below top of casing
NGVD National Geodetic Vertical Datum, 1929
NM Not measured

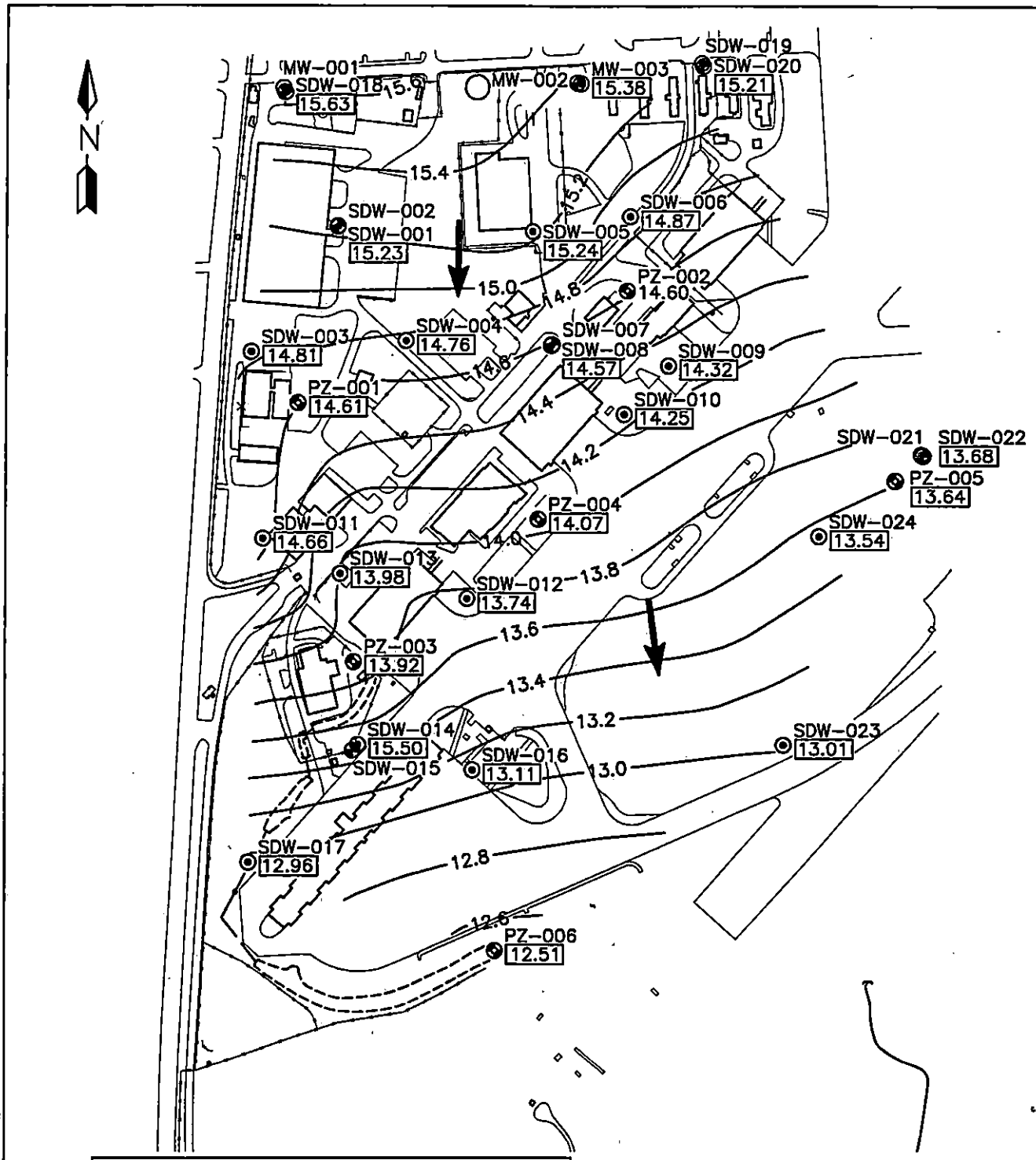


FIGURE 8-1
POTENTIOMETRIC SURFACE MAP
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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Table 8-3
AQUIFER TEST RESULTS

106th Rescue Group, NYANG
Westhampton Beach, New York

Well / Piezometer	Hydraulic Conductivity (cm/sec)	t/min	ft/day
MW-001	4.8 E-02	9.4 E-02	135.4
MW-002	3.5 E-02	6.9 E-02	99.4
PZ-003	5.2 E-02	1.0 E-01	144.0
PZ-004	4.0 E-02	7.8 E-02	112.3
PZ-005	2.4 E-02	4.7 E-02	67.7
PZ-006	3.1 E-02	6.1 E-02	87.8
Average	3.8E-02	7.4E-02	106.6

cm/sec - centimeters per second

$$V = \frac{Ki}{ne}$$

where,

K = hydraulic conductivity

i = hydraulic gradient

ne = effective porosity of the aquifer

Assuming a saturated thickness of 120 feet for the upper glacial aquifer beneath the base, a transmissivity of 95,684 gpd/ft is estimated from:

$$T = K \bullet h$$

where,

T = transmissivity

K = hydraulic conductivity

h = saturated thickness of the aquifer

8.2 SITE-SPECIFIC INVESTIGATION FINDINGS

Subsection 8.2 summarizes site-specific investigation findings for each of the nine sites and background sampling strategies, sample location information, and analytical results by media for each site are presented. The site-specific geological and hydrogeologic conditions encountered at each of the nine sites and background are also represented. Sampling logic diagrams are included to illustrate the sampling and analytical protocol developed for the SI. Sampling information, such as location, compounds analyzed, and hits above action levels, are summarized in tables presented for each site. Analytical results are provided in Appendix D.

8.2.1 Background Site

A background sampling and analysis program was developed for the purpose of comparing background soil and groundwater quality with the soil and groundwater quality at each site. This program was conducted at four locations, designated BG-1 through BG-4 (Figure 8-2).

8.2.1.1 Geology and Hydrology

Subsurface soil samples obtained from soil borings at the background locations consisted of fine- to medium-grained sand with trace to some gravel and/or silt. These soils typify the glacial outwash deposits of the area that comprise the upper glacial aquifer beneath Long Island. The upper glacial aquifer is the principal aquifer of concern for this SI.

Since the subsurface soil profiles observed at the background locations were consistent with those observed at all of the investigation sites, two background subsurface soil samples were collected for sieve analysis to characterize grain size distribution. The analyses of these samples yielded an average grain size distribution of 90.5% sand, 7.9% gravel and 1.6% for the combined silt and clay fractions. Individual sieve analyses for these samples were provided earlier in Table 8-1.

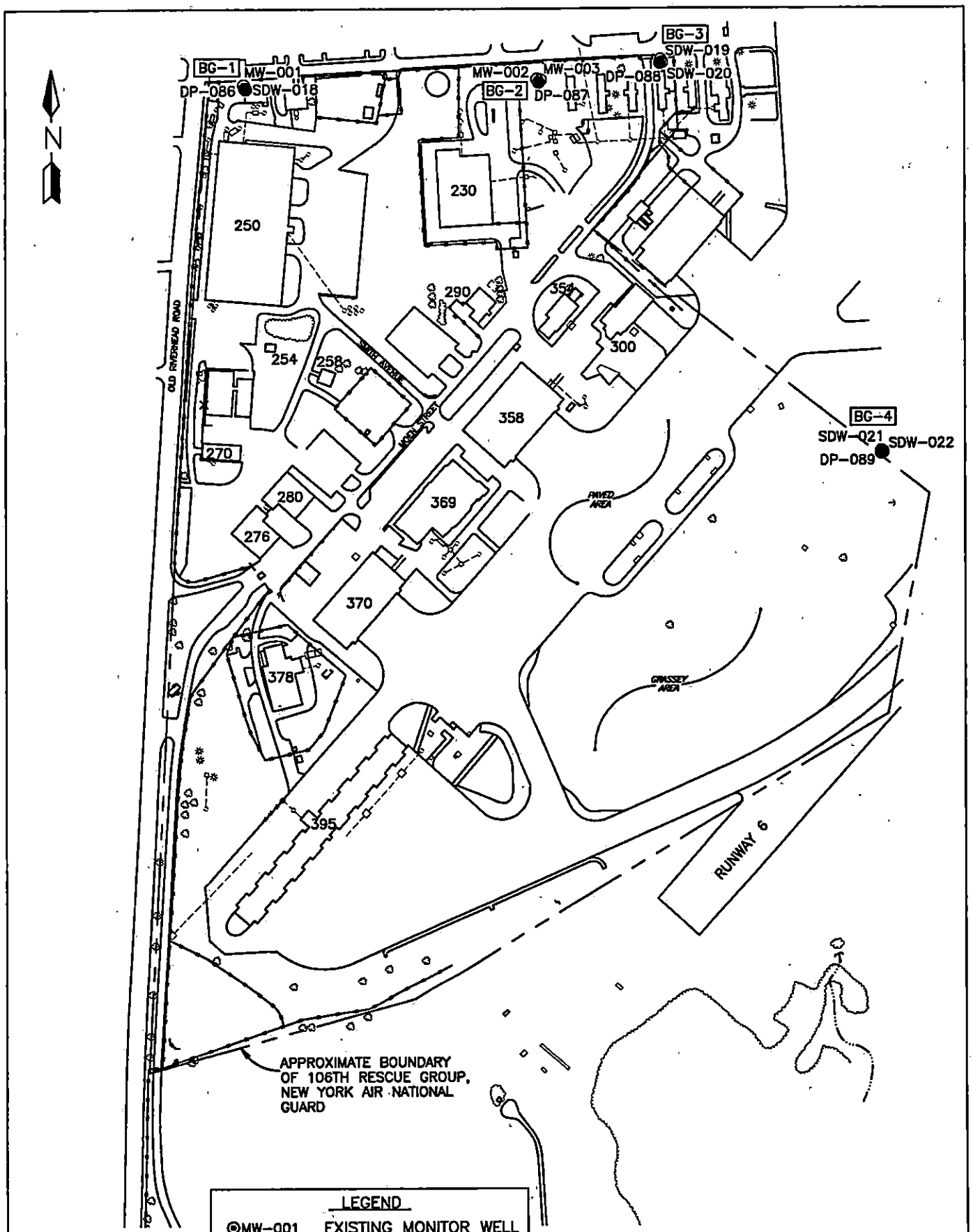


FIGURE 8-2
BACKGROUND LOCATIONS
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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The background locations are hydraulically upgradient of the investigation sites for this SI. At these locations, groundwater was encountered in the wells and borings at depths ranging from 30 to 44 feet bgs. From basewide groundwater levels measured in all of the wells and piezometers during December 1994, groundwater movement is directed to the south-southeast with an average hydraulic gradient of 0.0014 ft/ft. Hydraulic gradient and groundwater flow are relatively uniform basewide, but may be locally influenced by topography and the infiltration of surface water runoff from man-made surface features.

8.2.1.2 Sampling Strategy

Potential constituents of concern at the NYANG facility included solvents, fuels, and oil. Therefore, background surface and subsurface soils and groundwater were collected for analysis of VOCs, SVOCs, and six of the Resource and Conservation Recovery Act metals (mercury and barium were excluded). Figure 8-3 presents the sampling logic diagram developed for the background sampling program.

8.2.1.3 Sample Location And Description

Four borings, designated DP-086 through DP-089, and five small diameter wells, designated SDW-018 through SDW-022, were completed at the background locations between September 27 and October 29, 1994 (Figure 8-2). The borings and wells were placed somewhat equidistantly across the facility along the northern (upgradient) boundary between NYANG-leased property and the County airport. These locations are hydraulically upgradient of the nine sites investigated in this SI. One surface soil sample and five subsurface soil samples were collected from the borings, and groundwater samples were obtained from the small diameter and existing monitor wells during two sampling rounds. Sample location information and compounds analyzed are summarized in Table 8-4. Well depth, screened interval, and static water levels are tabulated in Table 4-1.

A fuel odor was noted in the saturated soils at DP-087. Organic vapors were detected in the saturated soils at DP-087 (25 ppm) and DP-089 (5 ppm) using an FID. Organic vapors in the wells ranged from background to 18 ppm.

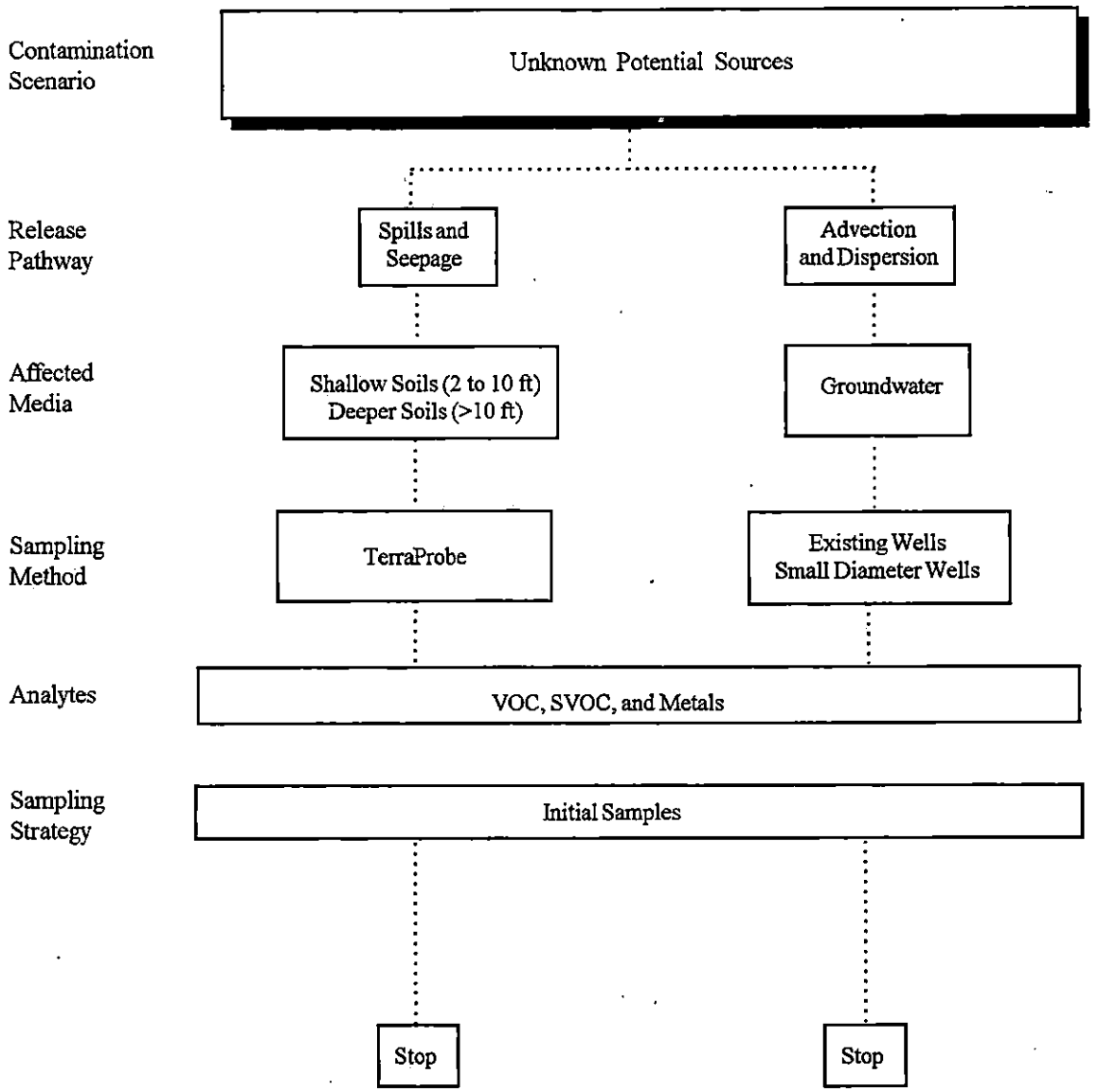


FIGURE 8-3
SAMPLING LOGIC DIAGRAM
BACKGROUND
106 RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

Table 8-4
SAMPLE SUMMARY[1]
Background

106th Rescue Group, NYANG
Westhampton Beach, New York

Sample Location	Background Location	Depth to Water (ft bgs)	Sample Designation	Sample Type	Depth/Interval (ft bgs)
DP-086	BG-1	44	BGSS001	Surface soil	0-2
			BGSB001	Subsurface soil	5-7
			BGSB002	Subsurface soil	10-12
			BGSB003	Subsurface soil	20-22
			BGSB004	Subsurface soil	30-32
			BGSB005	Subsurface soil	44-46
DP-087	BG-2	30	BGSS002	Surface soil	0-2
			BGSB007	Subsurface soil	5-7
			BGSB008	Subsurface soil	10-12
			BGSB009	Subsurface soil	20-22
			BGSB010	Subsurface soil	28-30
			BGSB011	Subsurface soil	38-40
DP-088	BG-3	34	BGSS003	Surface soil	0-2
			BGSB013	Subsurface soil	5-7
			BGSB014	Subsurface soil	10-12
			BGSB015	Subsurface soil	20-22
			BGSB016	Subsurface soil	30-32
			BGSB017	Subsurface soil	40-42
DP-089	BG-4	31	BGSS004	Surface soil	0-2
			BGSB019	Subsurface soil	5-7
			BGSB020	Subsurface soil	10-12
			BGSB021	Subsurface soil	20-22
			BGSB022	Subsurface soil	28-30
			BGSB023	Subsurface soil	38-40
MW-001	BG-1	44.7[2]	BGGW001	Groundwater	40-50
			BGGW002	Groundwater	40-50
MW-002	BG-2	30.0[2]	BGGW003	Groundwater	45-55
			BGGW004	Groundwater	45-55
MW-003	BG-2	30.1[2]	BGGW005	Groundwater	27.9-37.9
			BGGW006	Groundwater	27.9-37.9
SDW-018	BG-1	44.1[2]	BGGW007	Groundwater	71.0-76.0
			BGGW008	Groundwater	71.0-76.0
SDW-019	BG-3	34.6[2]	BGGW009	Groundwater	29.1-39.1
			BGGW010	Groundwater	29.1-39.1
SDW-020	BG-3	34.7[2]	BGGW011	Groundwater	58.8-68.8
			BGGW012	Groundwater	58.8-68.8
SDW-021	BG-4	31.2[2]	BGGW013	Groundwater	27.2-36.8
			BGGW014	Groundwater	27.2-36.8
SDW-022	BG-4	31.5[2]	BGGW015	Groundwater	58.1-63.1
			BGGW016	Groundwater	58.1-63.1

1 All samples were analyzed for VOCs, SVOCs, and metals
2 Measured December 2, 1994
bgs below ground surface

8.2.1.4 Analytical Results

Surface Soils

Chromium and lead were detected in all surface soil samples. Ethylbenzene was detected in the surface sample collected from BG-1. None of these constituents exceeds action levels. No other constituents were detected above reporting limits.

Subsurface Soils

Fuel-related compounds were detected in the unsaturated soils at BG-1 and the saturated soils at BG-2 and BG-4. Chromium and lead were detected in subsurface soils collected from all background locations. Arsenic was found only at BG-2. Hits above action levels are presented in Table 8-5.

Table 8-5
SUBSURFACE SOIL HITS ABOVE ACTION LEVELS
Background Samples

106th Rescue Group, NYANG
Westhampton Beach, New York

Compound	Sample ID	Background Location	Sample Location	Concentration (mg/kg)	Action Level (mg/kg)
Benzene	BGSB010	BG-2	DP-087	0.80	0.06
Toluene	BGSB010	BG-2	DP-087	0.16	0.15
Naphthalene	BGSB010	BG-2	DP-087	4.6	0.13
Arsenic	BGSB010	BG-2	DP-087	0.22	0.20
Chromium	BGSB009	BG-2	DP-087	1.0	0.84
Fuel odor[1]	BGSB010	BG-2	DP-087	25[2]	Discernible odor
Chlorobenzene	BGSB023	BG-4	DP-089	0.017	0.017
m/p-Xylenes	BGSB023	BG-4	DP-089	0.027	0.012
o-Xylene	BGSB023	BG-4	DP-089	0.012	0.012

[1] Reporting based upon NYSDEC Guidance regarding discernible odor
[2] Detected with the FID
mg/kg milligrams per kilogram

Groundwater

Fuel-related compounds were detected in the groundwater samples collected from BG-2 and BG-4. Two solvents (cis-1,2-dichloroethene and trichloroethene) were also detected at BG-2, and chromium was found at BG-3 and BG-4. Hits above action levels are summarized in Table 8-6.

Table 8-6
GROUNDWATER HITS ABOVE ACTION LEVELS
Background Samples

106th Rescue Group, NYANG
Westhampton Beach, New York

Compound	MW-003		
	BGGW005 (µg/L)	BGGW006 (µg/L)	Action Level (µg/L)
Benzene	1.9 *	18	5.0
Chlorobenzene	1200	ND	5.0
Ethylbenzene	590	320	5.0
m/p-Xylenes	5.2 *	1400	10
o-Xylene	3.0*	600	5.0
Toluene	5.1	1200	5.0
2-Methylnaphthalene	ND	65	50
Naphthalene	5.4 *	240	10

* Below action levels in this round
ND Non-detectable concentration
µg/L micrograms per liter

8.2.2 Site 1 — Aviation Baseline Spill Site

8.2.2.1 Site Geology and Hydrogeology

Subsurface soil samples obtained from soil borings at Site 1 generally consisted of fine- to medium-grained sands. Surface soils were also found to contain some silt and/or gravel. These soils typify the glacial outwash deposits of the area that comprise the upper glacial aquifer beneath Long Island. The upper glacial aquifer is the principal aquifer of concern at Site 1.

Groundwater was encountered in the site borings at depths ranging from 32 to 33 feet bgs. From basewide groundwater levels measured in all of the wells and piezometers in December 1994, groundwater movement is

directed to the south-southeast with an average hydraulic gradient of 0.0014 ft/ft. Hydraulic gradient and groundwater flow are relatively uniform basewide, but may be locally influenced by topography and the infiltration of surface water runoff from man-made surface features. Much of the area in the vicinity of Site 1 is covered with asphalt and/or concrete pavement with narrow grassy strips located adjacent to the pavement margins.

Site 1 is hydraulically downgradient of Site 11 and Cells 1 and 2 of Site 8, but is hydraulically upgradient of Sites 4, 5, 9 and 10, and Cells 3, 4, and 5 of Site 8.

8.2.2.2 Sampling Strategy

The conceptual model developed for Site 1 assumed that aviation gasoline released from the tanker, as described in Section 2, would have accumulated in the drainage swale, infiltrated the subsurface, and migrated downward to the water table. Constituents of concern included lead and aromatic hydrocarbons.

Figure 8-4 presents the sampling logic diagram developed for this site. Metals analyses were amended in the field to include chromium at DP-011 (a secondary location) and the full SI suite of metals at DP-006 and DP-007.

8.2.2.3 Sample Location and Description

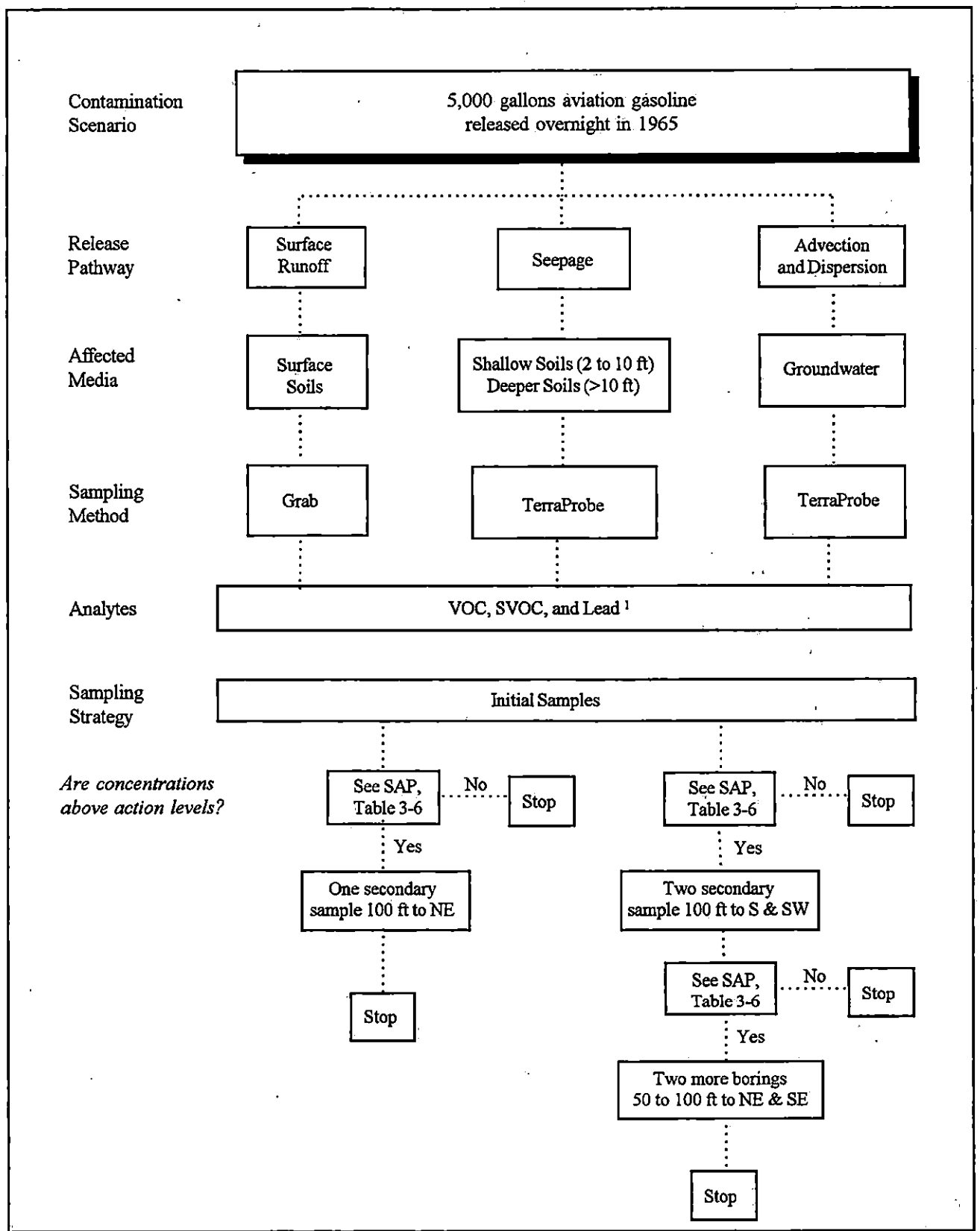
Eight borings, designated DP-001 through DP-007 and DP-011, were drilled at this site between October 12 and 30, 1994. DP-011 was drilled 2 ft bgs; DP-001 through DP-007 were terminated between 31 and 37 ft bgs. One surface soil and three subsurface soil samples were collected from DP-001 through DP-003, and one surface soil sample was obtained from DP-011. Organic vapors were not detected with the FID in any of these samples. Groundwater samples were collected from DP-002 and DP-004 through DP-007. Sample location information and compounds analyzed are summarized in Table 8-7. Boring locations are shown on Figure 8-5.

Table 8-7
SAMPLE SUMMARY
Site 1 - Aviation Gasoline Spill Site

106th Rescue Group, NYANG
Westhampton Beach, New York

Sample Location	Depth to Water (ft bgs)	Sample Designation	Sample Type	Depth/Interval (ft bgs)	Analysis
DP-001	32	01SS001	Surface soil	0-2	VOCs, SVOCs, Lead
		01SB001	Subsurface soil	8-10	VOCs, SVOCs, Lead
		01SB002	Subsurface soil	20-22	VOCs, SVOCs, Lead
		01SB003	Subsurface soil	30-32	VOCs, SVOCs, Lead
DP-002	32	01SS002	Surface soil	0-2	VOCs, SVOCs, Lead
		01SB005	Subsurface soil	8-10	VOCs, SVOCs, Lead
		01SB006	Subsurface soil	20-22	VOCs, SVOCs, Lead
		01SB007	Subsurface soil	29-31	VOCs, SVOCs, Lead
		01GW001	Groundwater	33-35	VOCs, SVOCs, Lead
DP-003	NE	01SS003	Surface soil	0-2	VOCs, SVOCs, Lead
		01SB009	Subsurface soil	8-10	VOCs, SVOCs, Lead
		01SB010	Subsurface soil	20-22	VOCs, SVOCs, Lead
		01SB011	Subsurface soil	29-31	VOCs, SVOCs, Lead
DP-004	32.5	01GW002	Groundwater	35-37	VOCs, SVOCs, Lead
DP-005	33	01GW003	Groundwater	35-37	VOCs, SVOCs, Lead
DP-006	33	01GW004	Groundwater	35-37	VOCs, SVOCs, Metals
DP-007	33	01GW005	Groundwater	35-37	VOCs, SVOCs, Metals
DP-011	NE	01SS004	Surface soil	0-2	Chromium, Lead

bgs below ground surface
NE Not encountered



[1] Lead analyses were supplemented with other metals at some locations. See Section 8.2.2.2 of this report for sampling strategies.

FIGURE 8-4
SAMPLING LOGIC DIAGRAM
SITE 1 - AVIATION GASOLINE SPILL SITE
106 RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

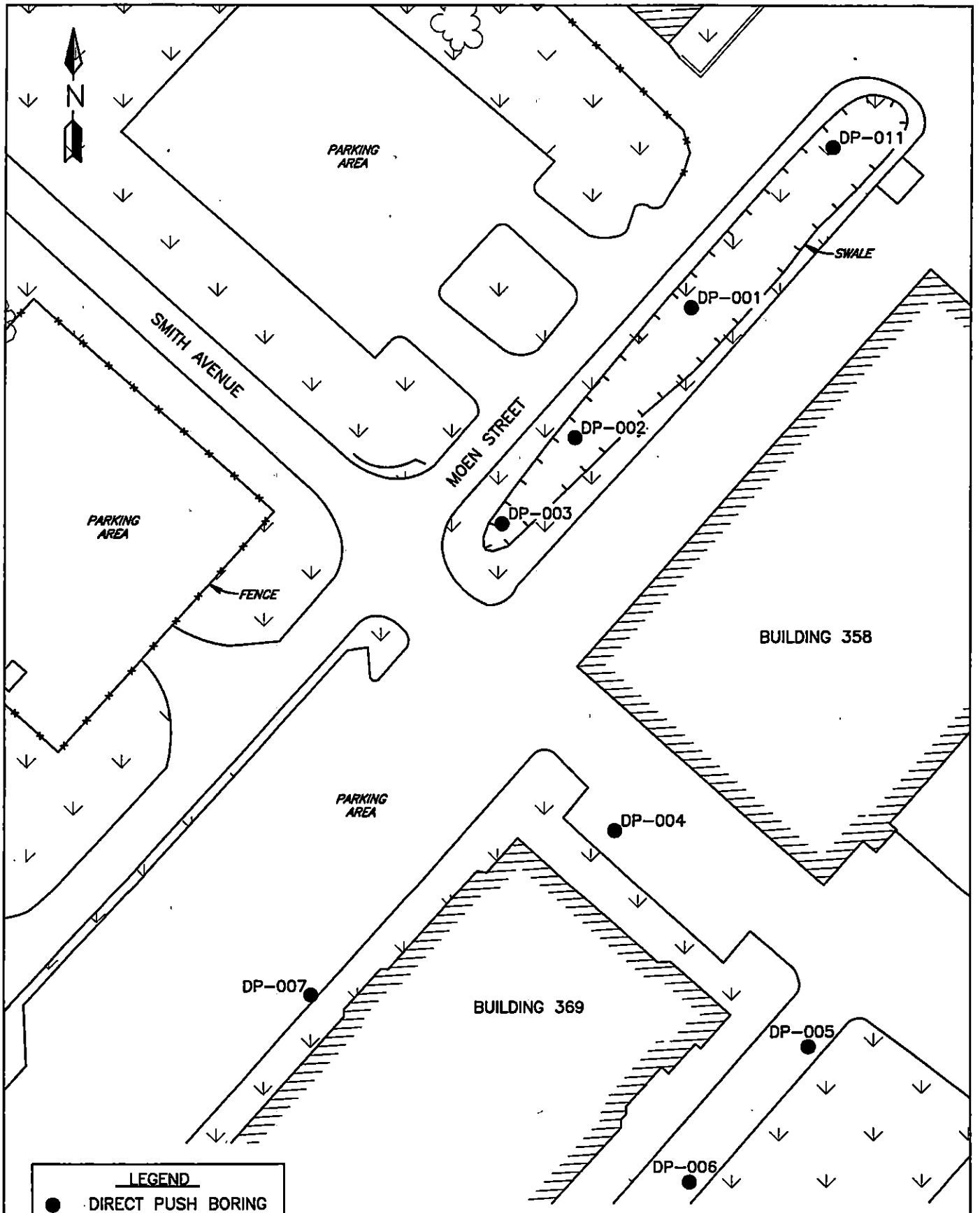


FIGURE 8-5
SITE 1 – AVIATION GASOLINE SPILL SITE
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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8.2.2.4 Analytical Results For Surface Soil, Subsurface Soil, and Groundwater

Surface Soils Lead and chromium were the only constituents detected above reporting limits in the surface soils obtained from this site (Figures 8-6 and 8-7). Hits above action levels are summarized in Table 8-8.

Table 8-8
SURFACE SOIL HITS ABOVE ACTION LEVELS
Site 1 - Aviation Gasoline Spill Site

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (mg/kg)	Action Level (mg/kg)
Lead	01SS001	DP-001	14	4.4
	01SS002	DP-002	10	4.4
	01SS003	DP-003	7.1	4.4

mg/kg milligrams per kilogram

Subsurface Soils Lead was detected above reporting limits in eight of nine subsurface soil samples collected at this site (Figures 8-6 and 8-7). The concentration of lead does not exceed action levels in any subsurface soil sample. No other analytes were detected in these samples.

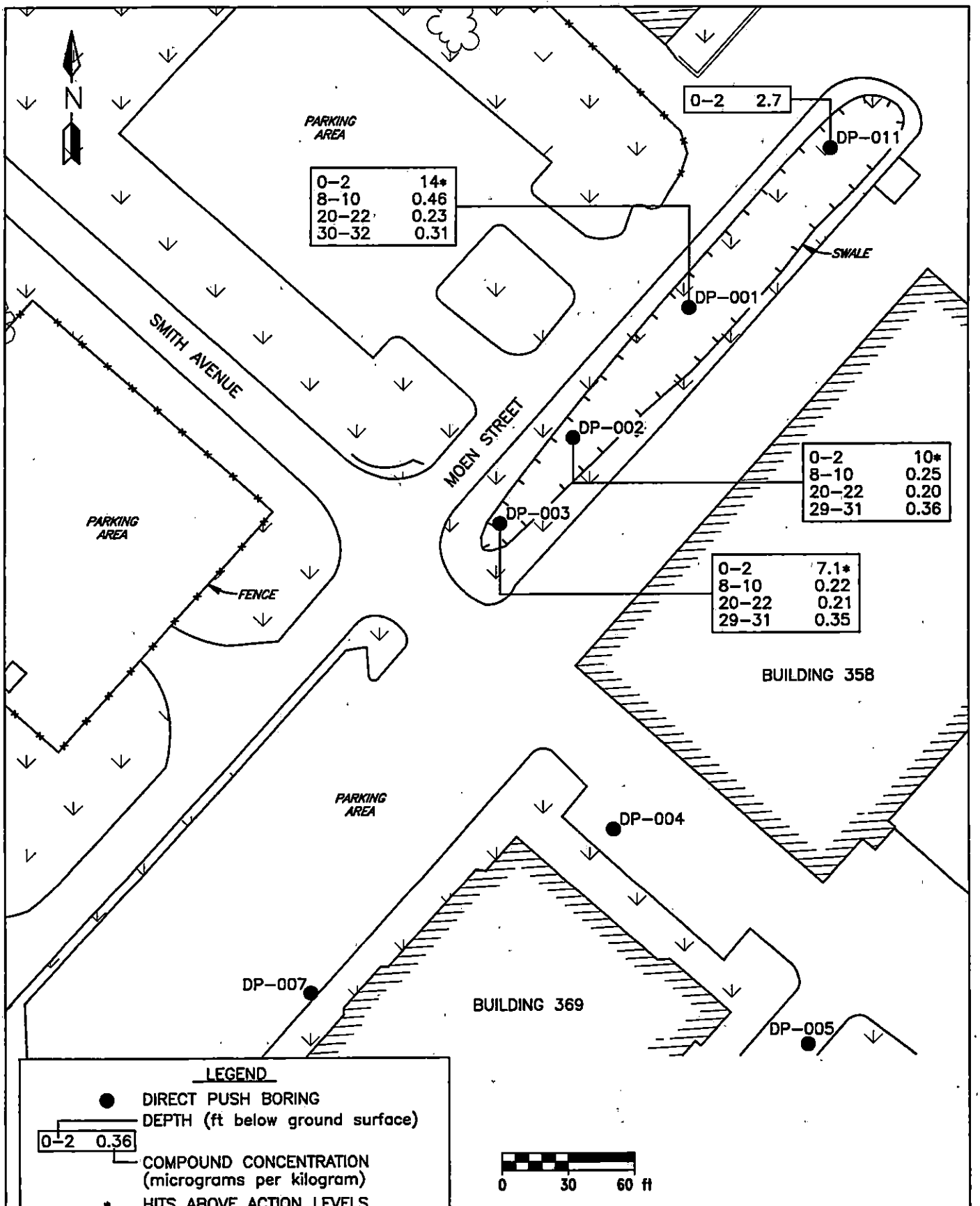
Groundwater Chromium was detected in both groundwater samples analyzed for this constituent. No other analytes were detected above reporting limits. Hits above action levels are summarized in Table 8-9.

Table 8-9
GROUNDWATER HITS ABOVE ACTION LEVELS
Site 1 - Aviation Gasoline Spill Site

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (µg/L)	Action Level (µg/L)
Chromium	01GW004	DP-006	70	50
	01GW005	DP-007	89	50

µg/L micrograms per liter

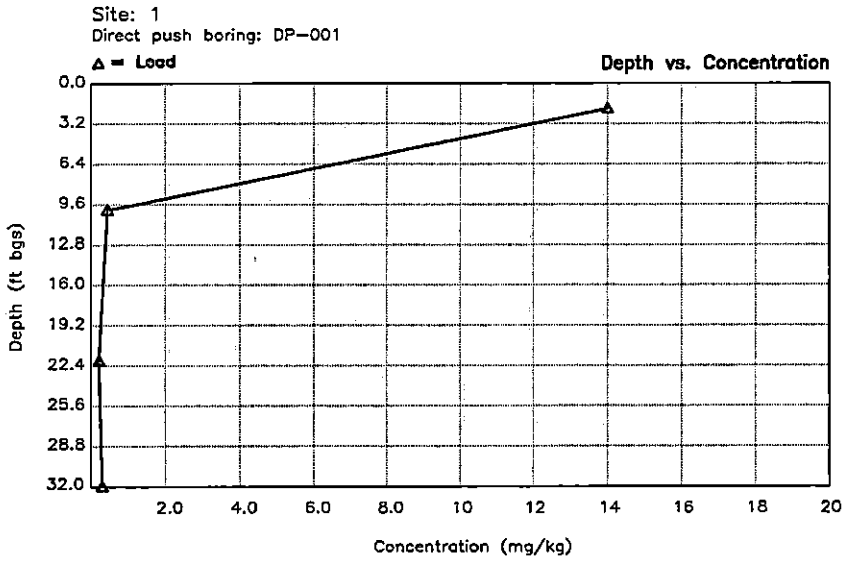


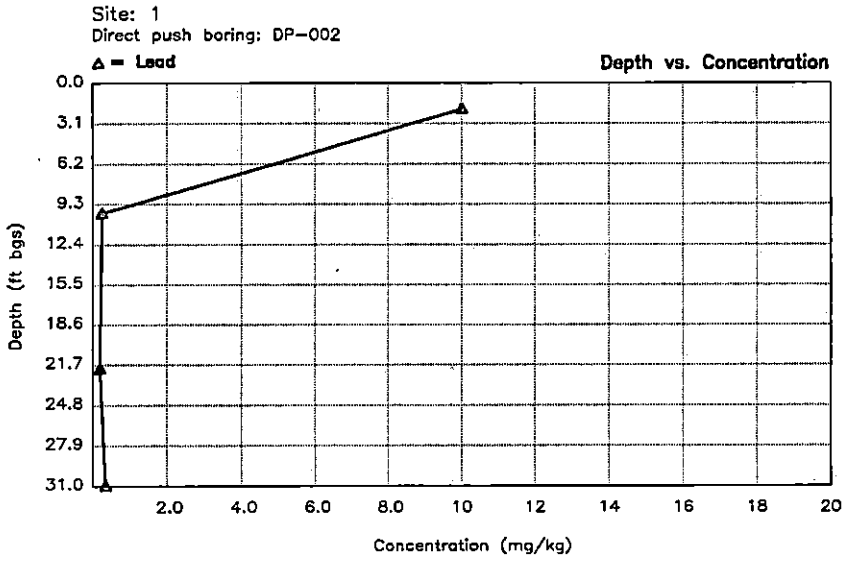
NOTES:

1. GROUNDWATER SAMPLES WERE COLLECTED IN OCTOBER 1994.
2. ACTION LEVELS ARE DESCRIBED IN SECTION 8.0 OF THIS REPORT.

FIGURE 8–6
LEAD CONCENTRATIONS IN SOIL
SITE 1 – AVIATION GASOLINE SPILL SITE
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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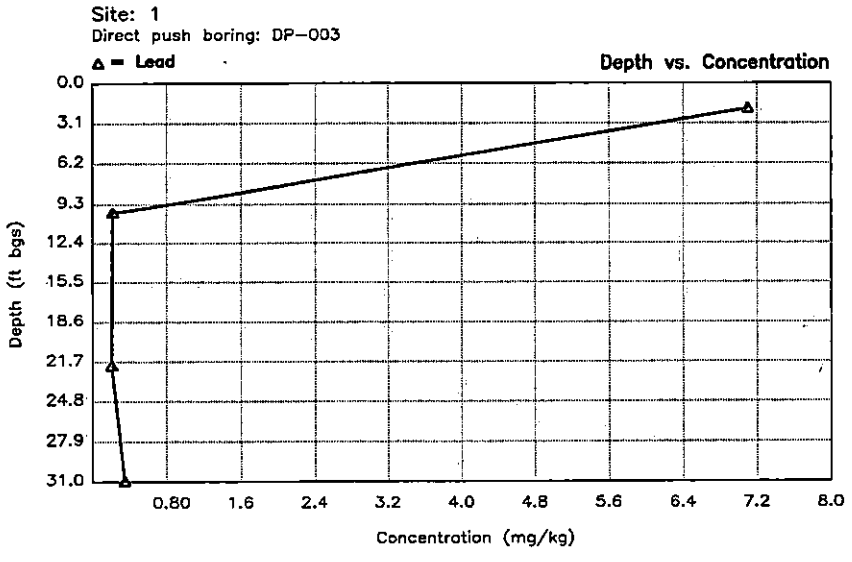


FIGURE 8-7
DEPTH VS. LEAD CONCENTRATIONS
SITE 1 – AVIATION GASOLINE SPILL SITE
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

NOTES:
Soil samples were collected in October 1994
bgs below ground surface
mg/kg milligrams per kilogram

8.2.2.5 Site 1 Summary

The release of aviation gasoline at this site does not appear to have adversely impacted groundwater quality above applicable guidance. None of the typical components of aviation gasoline were found with the exception of lead in soil. Although lead concentrations exceed action levels developed for this SI, none exceed the average range of concentrations in eastern US background soils, nor has lead been detected in groundwater.

8.2.3 Site 2 - Former Hazardous Waste Storage Area

8.2.3.1 Site Geology and Hydrogeology

Subsurface soil samples obtained from soil borings at Site 2 generally consisted of fine- to medium-grained sand with some silt and/or gravel. These soils typify the glacial outwash deposits of the area that comprise the upper glacial aquifer beneath Long Island. The upper glacial aquifer is the principal aquifer of concern at Site 2.

Groundwater was encountered in a single boring (DP-012) at Site 2 at a depth of 32 feet bgs. The remainder of the site borings did not penetrate this deeply. From basewide groundwater levels measured in all of the wells and piezometers in December 1994, groundwater movement is directed to the south-southeast with an average hydraulic gradient of 0.0014 ft/ft. Hydraulic gradient and groundwater flow are relatively uniform basewide, but may be locally influenced by topography and the infiltration of surface water runoff from man-made surface features. Site 2 is a small, ungrassed area surrounded by pavement. Site 2 is hydraulically downgradient of Site 11 and Cell 2 of Site 8, but is hydraulically upgradient of Sites 4 and 9.

8.2.3.2 Sampling Strategy

The conceptual model developed for Site 2 assumed that solvents, fuels, and oils, if released from drums at this site, would have infiltrated surface soils and migrated downward through the subsurface. Groundwater was not expected to have been impacted. Constituents of concern included halogenated and aromatic hydrocarbons and metals. Figure 8-8 presents the sampling logic diagram developed for this site.

8.2.3.3 Sample Location and Description

Four borings, designated DP-012 through DP-015, were drilled at this site from October 18 through 30, 1994. The borings were terminated between 2 and 34 ft bgs. One surface soil sample was collected from each boring and subsurface soils were collected at DP-012 and DP-013. Organic vapors were not detected with the FID in any sample. One groundwater sample was obtained from DP-012. Sample location information and compounds analyzed are summarized in Table 8-10. Boring locations are shown on Figure 8-9.

Table 8-10
SAMPLE SUMMARY
Site 2 - Former Hazardous Waste Storage Area

106th Rescue Group, NYANG
Westhampton Beach, New York

Sample Location	Depth to Water (ft bgs)	Sample Designations	Sample Type	Depth/Interval (ft bgs)	Analysis
DP-012	31.7	02SS001	Surface soil	0-2	VOCs, SVOCs, Metals
		02SB001	Subsurface soil	5-7	VOCs, SVOCs, Metals
		02GW001	Groundwater	32-34	VOCs, SVOCs, Metals
DP-013	NE	02SS002	Surface soil	0-2	VOCs, SVOCs, Metals
		02SB002	Subsurface soil	5-7	VOCs, SVOCs, Metals
DP-014	NE	02SS003	Surface soil	0-2	Metals
DP-015	NE	02SS004	Surface soil	0-2	Metals

bgs below ground surface
NE Not encountered

8.2.3.4 Analytical Results For Surface Soils, Subsurface Soils, and Groundwater

Surface Soils Chromium and lead were detected in every surface soil sample collected at this site. Arsenic was identified in the sample obtained northwest of the loading dock. No other analytes were found above reporting limits. Hits above action levels are summarized in Table 8-11.

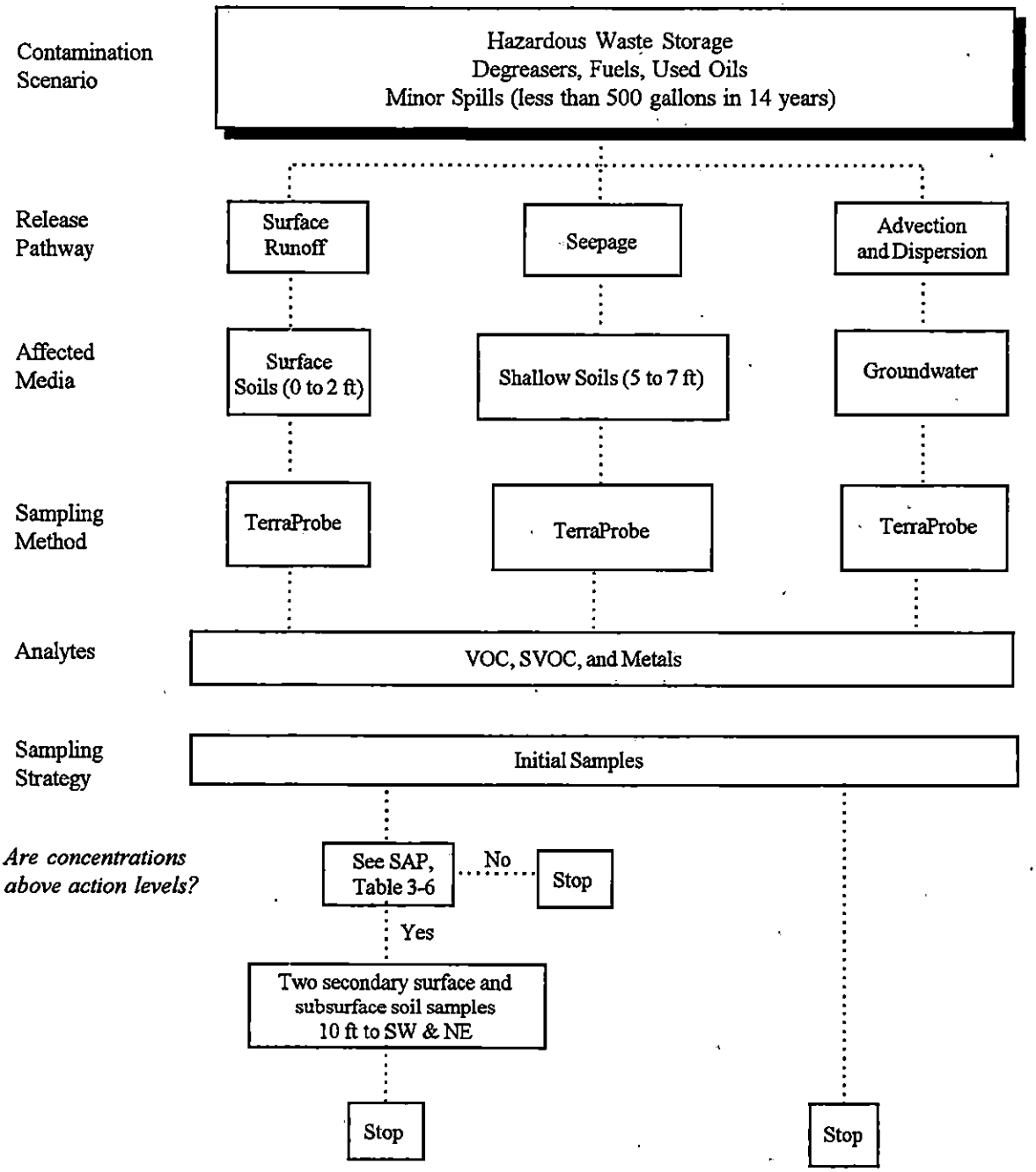


FIGURE 8-8
SAMPLING LOGIC DIAGRAM
SITE 2 - FORMER HAZARDOUS WASTE STORAGE AREA
106 RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

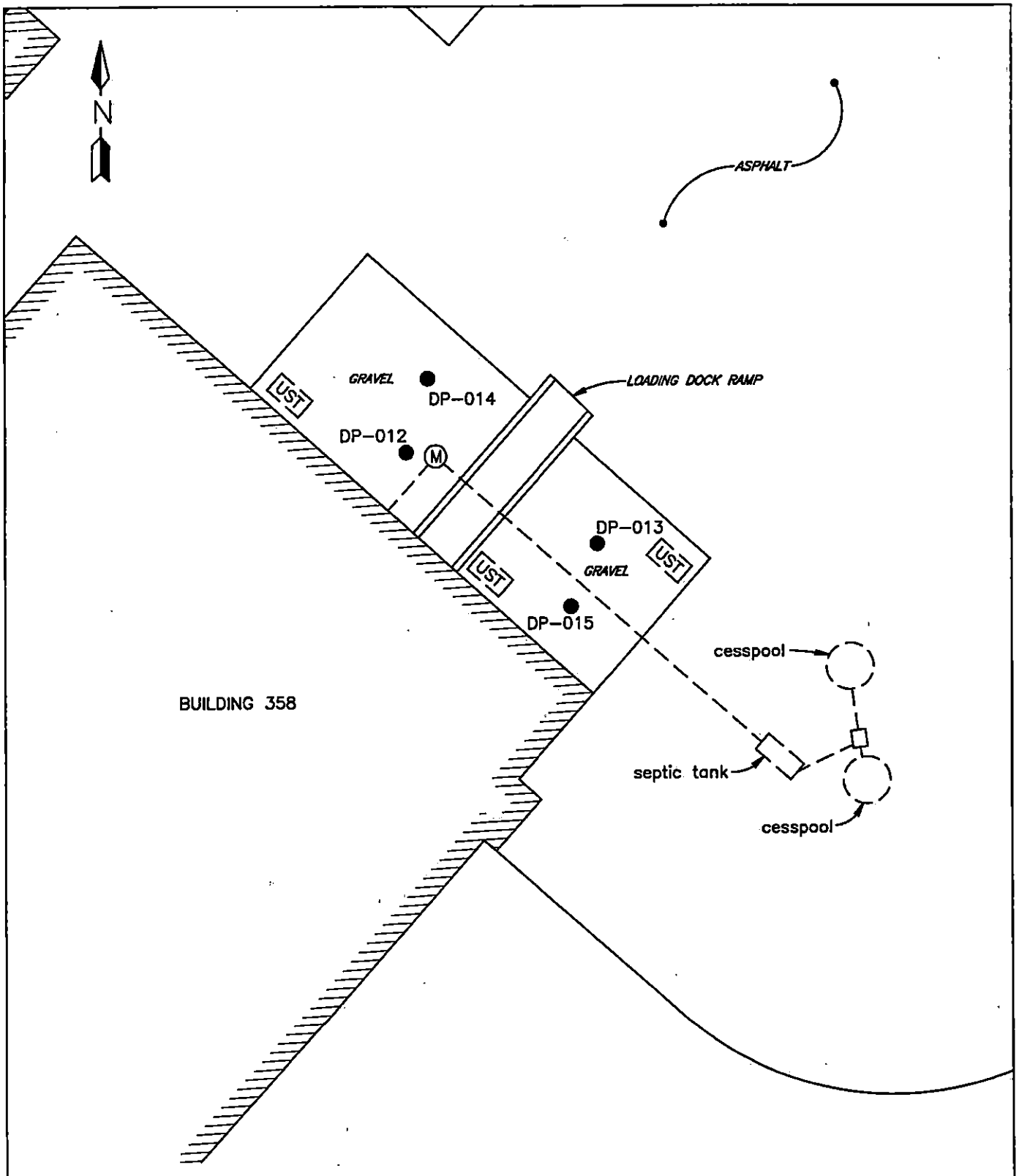


FIGURE 8-9
SITE 2 - FORMER
HAZARDOUS WASTE STORAGE AREA
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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Table 8-11
SURFACE SOIL HITS ABOVE ACTION LEVELS
Site 2 - Former Hazardous Waste Storage Area

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (mg/kg)	Action Level (mg/kg)
Arsenic	02SS001	DP-012	0.26	0.20

mg/kg milligrams per kilogram

Subsurface Soils Chromium was detected below the action level in one soil sample obtained from DP-012. No other constituents were found above reporting limits.

Groundwater Chromium was detected above action levels in the groundwater sample collected from DP-012 (Table 8-12). No other constituents were found above reporting limits.

Table 8-12
GROUNDWATER HITS ABOVE ACTION LEVELS
Site 2 - Former Hazardous Waste Storage Area

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (µg/L)	Action Level (µg/L)
Chromium	02GW001	DP-012	250	50

µg/L micrograms per liter

8.2.3.5 Site 2 Summary

The only analyte detected in Site 2 groundwater samples was chromium. These samples were collected from direct push borings. Such elevated concentrations are attributed to dissolution of chromium from solid phase material as a result of acidification (pH £ 2) during sample collection and are considered sampling artifacts. Chromium concentrations in samples obtained from the wells are much lower because

well development and purging removed much of the solid phase prior to sample preservation. As such, the water samples collected from the wells are considered to be more representative of actual groundwater quality. Chromium concentrations in groundwater samples obtained from wells nearest Site 2 (SDW-007, SDW-008, SDW-009, and SDW-010) do not exceed action levels (dissolution of chromium naturally is unlikely because the pH of groundwater at the facility is approximately neutral).

8.2.4 Site 3 - Former Hazardous Waste Storage Area (1984-1989)

8.2.4.1 Site Geology and Hydrogeology

Subsurface soil samples obtained from soil borings at Site 3 generally consisted of fine- to medium-grained sand. The surface soil was also found to contain some silt. These soils typify the glacial outwash deposits of the area that comprise the upper glacial aquifer beneath Long Island. The upper glacial aquifer is the principal aquifer of concern at Site 3.

Groundwater was encountered in a single boring (DP-016) at Site 3 at a depth of 35 feet bgs. A second boring did not penetrate this deeply. From basewide groundwater levels measured in all of the wells and piezometers in December 1994, groundwater movement is directed to the south-southeast with an average hydraulic gradient of 0.0014 ft/ft. Hydraulic gradient and groundwater flow are relatively uniform basewide, but may be locally influenced by topography and the infiltration of surface water runoff from man-made surface features. Much of the area in the vicinity of Site 3 is covered with asphalt and/or concrete pavement with narrow grassy strips located adjacent to the pavement margins.

Site 3 is hydraulically downgradient of Cell 1 of Site 8, but is hydraulically upgradient of Sites 4, 9, 10, and Cells 4 and 5 of Site 8.

8.2.4.2 Sampling Strategy

The conceptual model developed for Site 3 assumed that solvents, oils, and waste petroleum products stored in drums, if released at this site, would have impacted surface soils and migrated downward into the subsurface. Groundwater was not expected to have been impacted. Constituents of concern included

halogenated and aromatic hydrocarbons and metals. Figure 8-10 presents the sampling logic diagram developed for this site.

8.2.4.3 Sample Location and Description

Two borings, designated DP-016 and DP-017, were drilled at this site on October 19, 1994. The borings were terminated 17 and 38 ft bgs. One surface soil and two subsurface soil samples were collected from each boring, and one groundwater sample was obtained from DP-016. Organic vapors (10 ppm) were detected with the FID in one subsurface soil sample (03SB002) obtained at 15-17 ft bgs in DP-016. Sample location information is summarized in Table 8-13. Boring locations are shown on Figure 8-11.

Table 8-13
SAMPLE SUMMARY [1]
Site 3 - Former Hazardous Waste Storage Area (1984-1989)
106th Rescue Group, NYANG
Westhampton Beach, New York

Sample Location	Depth to Water (ft bgs)	Sample Designation	Sample Type	Depth/Interval (ft bgs)
DP-016	35	03SS001	Surface soil	0-2
		03SB001	Subsurface soil	5-7
		03SB002	Subsurface soil	15-17
		03GW001	Groundwater	36-38
DP-017	NE	03SS002	Surface soil	0-2
		03SB003	Subsurface soil	5-7
		03SB004	Subsurface soil	15-17

1 All samples were analyzed for VOCs, SVOCs, and metals
bgs below ground surface
NE Not encountered

8.2.4.4 Analytical Results For Surface Soils, Subsurface Soils, and Groundwater

Surface Soils One VOC and two metals were detected in the surface soil samples collected from this site. No other analytes were found above reporting limits. Toluene was detected below the reporting limit in the soil sample collected southeast of the storage area (DP-017). Chromium and lead were found in both surface samples. None of these constituents exceeds action levels.

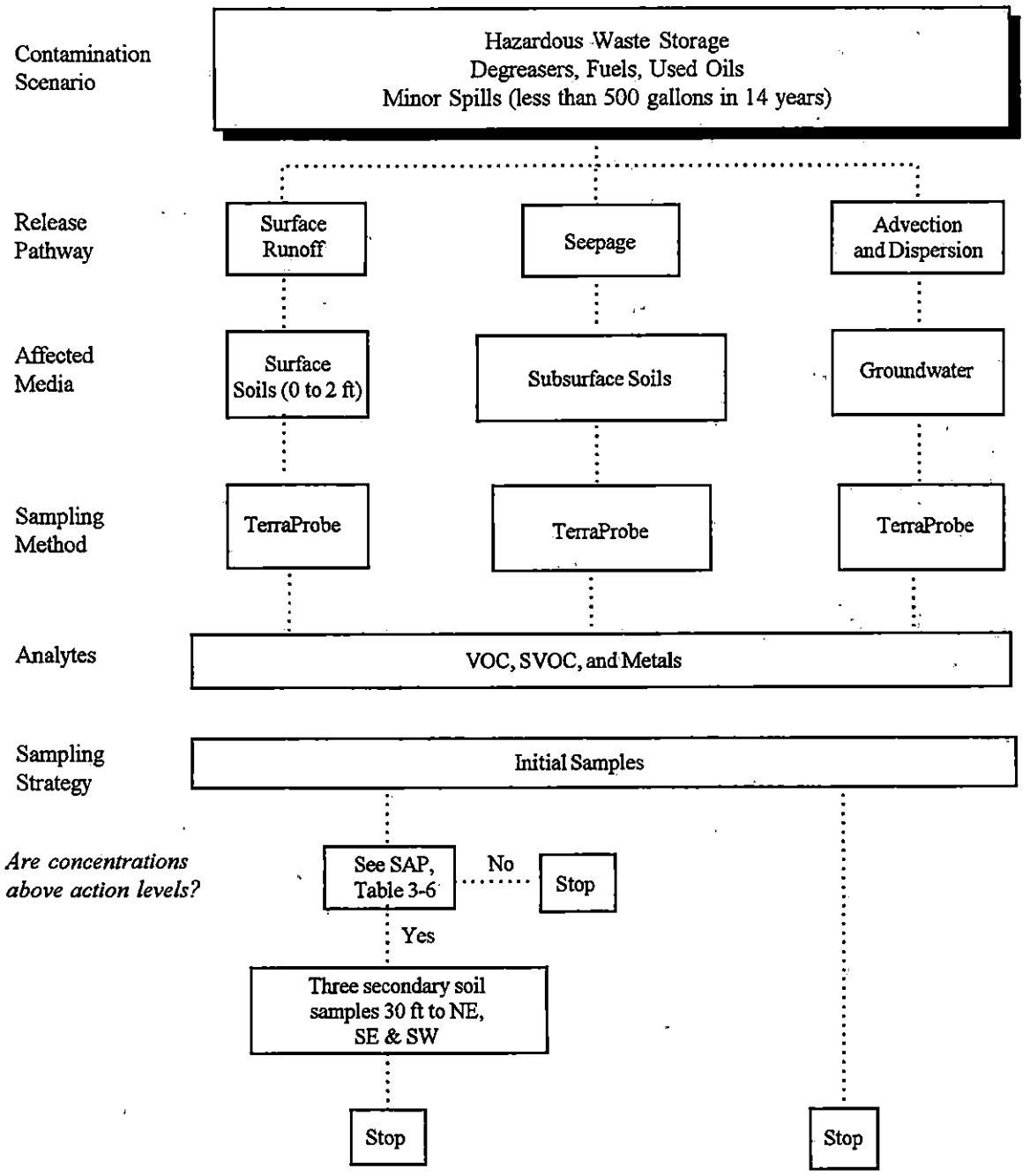


FIGURE 8-10
SAMPLING LOGIC DIAGRAM
SITE 3 - FORMER HAZARDOUS WASTE STORAGE AREA (1984 - 1989)
106 RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

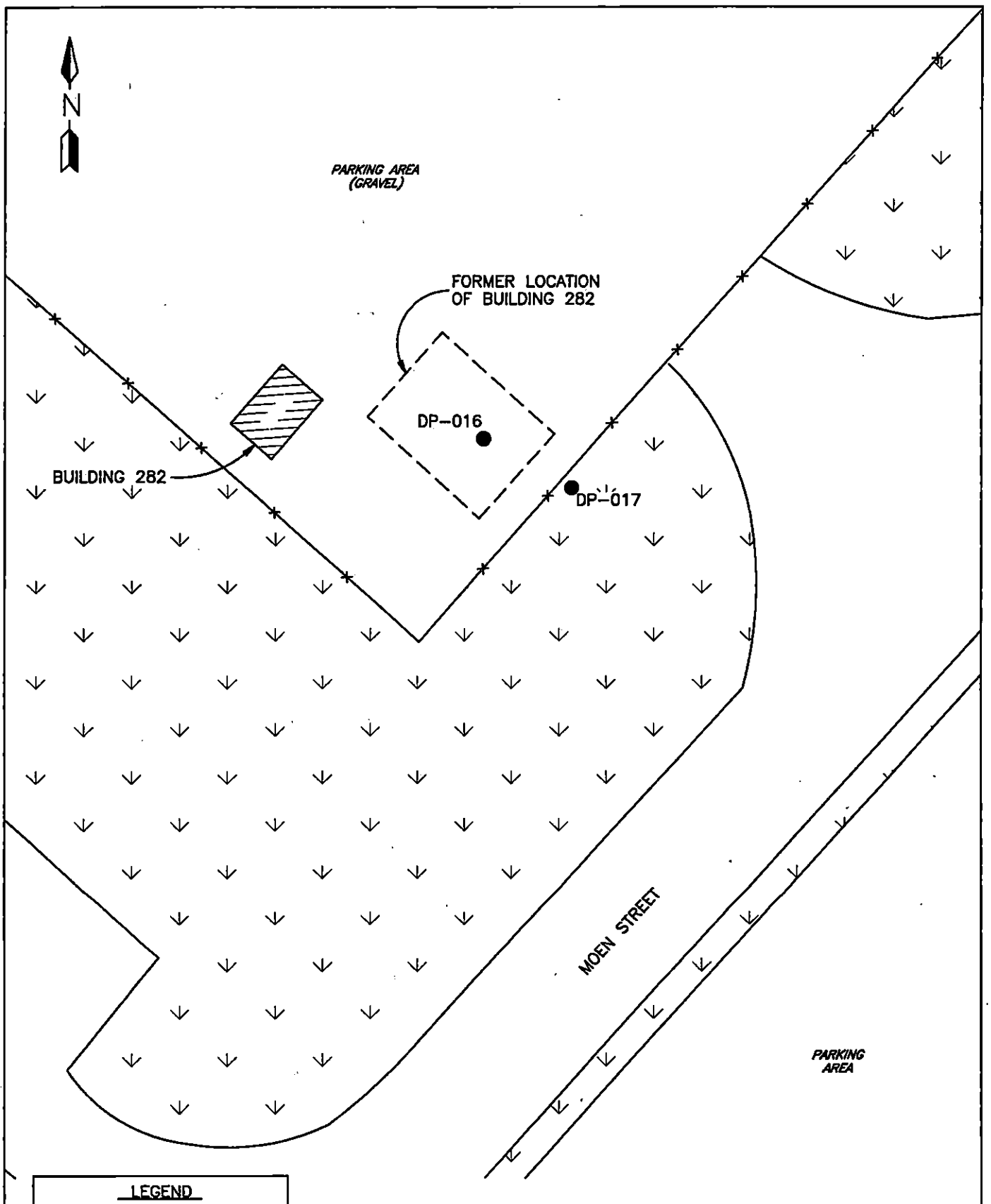


FIGURE 8-11
SITE 3 – FORMER HAZARDOUS
WASTE STORAGE AREA, (1984-1989)
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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Subsurface Soils Chromium and lead were detected in subsurface soils obtained from both borings drilled at this site, and silver was found in one sample collected at DP-017. No other analytes were detected above reporting limits. Silver was detected at the action level (Table 8-14).

Table 8-14
SUBSURFACE SOIL HITS ABOVE ACTION LEVELS
Site 3 - Former Hazardous Waste Storage Area (1984-1989)

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (mg/kg)	Action Level (mg/kg)
Silver	03SB004	DP-017	0.20	0.20

mg/kg milligrams per kilogram

Groundwater Chromium was the only analyte detected above reporting limits in the groundwater sample collected at this site. The metal exceeds action levels (Table 8-15).

Table 8-15
GROUNDWATER HITS ABOVE ACTION LEVELS
Site 3 - Former Hazardous Waste Storage Area (1984-1989)

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (µg/L)	Action Level (µg/L)
Chromium	03GW001	DP-016	67	50

µg/L micrograms per liter

8.2.4.5 Site 3 Summary

Silver was the only analyte detected above action levels in the soil samples obtained from this site. The metal was detected at very low concentration, is isolated at depth, and has not impacted groundwater above applicable guidance.

The only analyte detected in Site 3 groundwater was chromium. Because the groundwater sample was collected from a direct push boring, the presence of this metal at an elevated concentration is considered a sampling artifact (see Section 9.2.1). Chromium concentrations in groundwater samples obtained from nearby wells (SDW-003, SDW-004, and SDW-011) do not exceed action levels.

8.2.5 Site 4 - Aircraft Refueling Apron Spill Site

8.2.5.1 Site Geology and Hydrogeology

Subsurface soil samples obtained from soil borings at Site 4 generally consisted of fine- to medium-grained sand with intervals or lenses of sand and gravel. These soils typify the glacial outwash deposits of the area that comprise the upper glacial aquifer beneath Long Island. The upper glacial aquifer is the principal aquifer of concern at Site 4.

Groundwater was encountered in the site borings and wells at depths ranging from 24 to 32 feet bgs. From basewide groundwater levels measured in all of the wells and piezometers in December 1994, groundwater movement is directed to the south-southeast with an average hydraulic gradient of 0.0014 ft/ft. Hydraulic gradient and groundwater flow are relatively uniform basewide, but may be locally influenced by topography and the infiltration of surface water runoff from man-made surface features. Site 4 is a large, unpaved, sparsely vegetated area that is immediately adjoined to the northwest by a concrete flight apron. However, surface water runoff from this apron does not infiltrate into the subsurface at Site 4 as the runoff is diverted from the apron via drains to an outfall at Site 9. Site 4 is hydraulically downgradient of Sites 1, 2, 11 and Cells 1 and 2 of Site 8, but is hydraulically upgradient of Site 9.

8.2.5.2 Sampling Strategy

The conceptual model developed for Site 4 assumed that solvents, aviation fuels, and oil released at this site would have impacted surface and subsurface soils beneath the sump tank, pipelines, and/or pumps; subsurface soils in contact with fuel at the water table; and shallow groundwater in contact with subsurface fuel and contaminated soils. Constituents of concern included halogenated and aromatic hydrocarbons and metals.

Figure 8-12 presents the sampling logic diagram developed for this site. Metals analyses were amended to consist of lead only except for those samples collected from borings located at or near the storm drainage line (see FCR 1 in Section 4.4.4 of this report) and at SDW-023, SDW-024, and DP-090 through DP-092 (secondary locations).

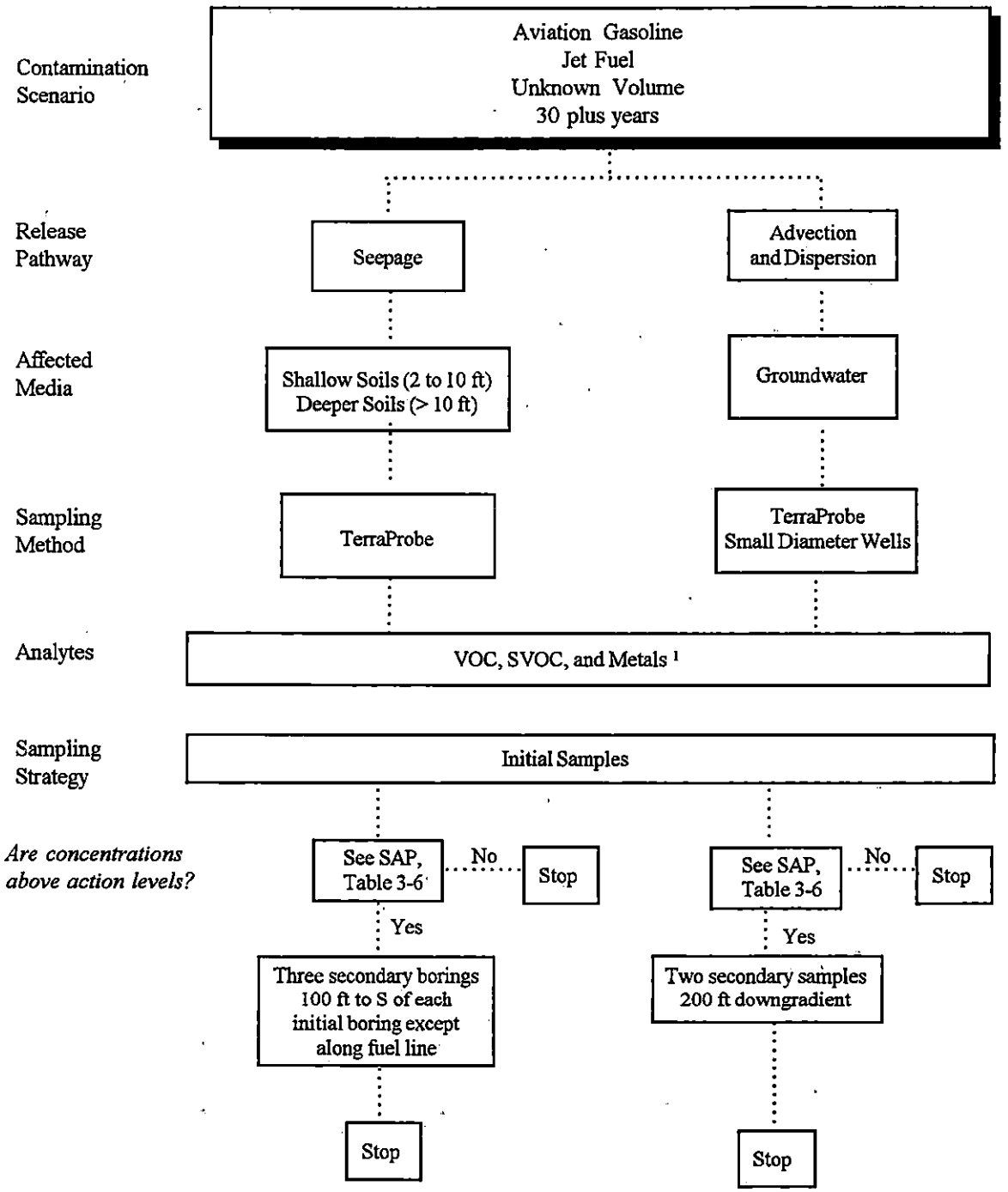
8.2.5.3 Sample Location and Description

Thirteen borings, designated DP-021 through DP-028, DP-031, DP-032, and DP-090 through DP-092, were drilled at this site from September 27 to October 30, 1994. The borings were terminated 29 to 45 ft bgs. Twenty-three subsurface soil samples were obtained from six borings, and groundwater samples were collected at nine locations. Organic vapors were detected with the FID in the saturated soils at 04SB008 (>5000 ppm) and 6 to 9 ft above the water table at 04SB011 (150 ppm). Fuel-like odors were noted in both samples and at 04SB004. Organic vapors in the wells ranged from one to six ppm. Sample location information and compounds analyzed are summarized in Table 8-16. Boring locations are shown on Figure 8-13 and a cross section through Site 4 is shown in Figure 8-14.

Two small diameter wells (SDW-023 and SDW-024) were installed at this site on October 5, 1994 (Figure 8-10). Well depth, screened interval, and static water levels are summarized in Table 4-1 and sampling intervals are shown on Table 8-16.

8.2.5.4 Analytical Results For Subsurface Soils and Groundwater

Subsurface Soils Nine VOCs, four SVOCs, and three metals have been detected in the subsurface soils at this site. Fuel-related compounds were detected in the unsaturated soils at the south fuel distribution pump (DP-021), the sump tank (DP-023), and the storm drainage line (DP-027). Fuel-related compounds were detected in the saturated soils at both fuel pumps (DP-021 and DP-022), along the fuel line (DP-024 and DP-026), and at the storm drainage line (DP-027). FID hits and fuel odors noted in samples collected during drilling correlate with aromatic compounds detected above action levels in the same samples.



[1] Lead analyses were supplemented with other metals at some locations. See Section 8.2.5.2 of this report for sampling strategies.

FIGURE 8-12
SAMPLING LOGIC DIAGRAM
SITE 4 - AIRCRAFT REFUELING APRON SPILL SITE
106 RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

Table 8-16
SAMPLE SUMMARY
Site 4 - Aircraft Refueling Apron Spill Site

106th Rescue Group, NYANG
Westhampton Beach, New York

Sample Location	Depth to Water (ft bgs)	Sample Designation	Sample Type	Depth/Interval (ft bgs)	Analysis
DP-021	30	04SB001	Subsurface soil	5-7	VOCs, SVOCs, Lead
		04SB002	Subsurface soil	15-17	VOCs, SVOCs, Lead
		04SB003	Subsurface soil	25-27	VOCs, SVOCs, Lead
		04SB004	Subsurface soil	40-42	VOCs, SVOCs, Lead
		04GW001	Groundwater	40-42	VOCs, SVOCs, Lead
DP-022	30	04SB005	Subsurface soil	5-7	VOCs, SVOCs, Lead
		04SB006	Subsurface soil	15-17	VOCs, SVOCs, Lead
		04SB007	Subsurface soil	23-25	VOCs, SVOCs, Lead
		04SB008	Subsurface soil	36-38	VOCs, SVOCs, Lead
		04GW002	Groundwater	36-38	VOCs, SVOCs, Lead
DP-023	30	04SB009	Subsurface soil	5-7	VOCs, SVOCs, Lead
		04SB010	Subsurface soil	15-17	VOCs, SVOCs, Lead
		04SB011	Subsurface soil	21-24	VOCs, SVOCs, Lead
		04GW003	Groundwater	37-39	VOCs, SVOCs, Lead
DP-024	25	04SB013	Subsurface soil	5-7	VOCs, SVOCs, Lead
		04SB014	Subsurface soil	15-17	VOCs, SVOCs, Lead
		04SB015	Subsurface soil	21-24	VOCs, SVOCs, Lead
		04SB016	Subsurface soil	37-39	VOCs, SVOCs, Lead
DP-025	26	04GW004	Groundwater	36-38	VOCs, SVOCs, Lead
DP-026	25	04SB017	Subsurface soil	5-7	VOCs, SVOCs, Lead
		04SB018	Subsurface soil	15-17	VOCs, SVOCs, Lead
		04SB019	Subsurface soil	22-24	VOCs, SVOCs, Lead
		04SB020	Subsurface soil	34-37.5	VOCs, SVOCs, Lead
DP-027	24	04SB021	Subsurface soil	4.5-7	VOCs, SVOCs, Metals
		04SB022	Subsurface soil	15-17	VOCs, SVOCs, Metals
		04SB023	Subsurface soil	21-23	VOCs, SVOCs, Metals
		04SB024	Subsurface soil	34-36	VOCs, SVOCs, Metals
DP-028	28	04GW005	Groundwater	37-39	VOCs, SVOCs, Metals
DP-031	31	04GW006	Groundwater	43-45	VOCs, SVOCs, Lead
DP-032	25	04GW007	Groundwater	35-37	VOCs, SVOCs, Metals
DP-090	26.5	04GW012	Groundwater	27-29	VOCs, SVOCs, Metals
DP-091	29	04GW013	Groundwater	29-31	VOCs, SVOCs, Metals
DP-092	32	04GW014	Groundwater	33-35	VOCs, SVOCs, Metals
SDW-023	26.8 [1]	04GW008	Groundwater	21.1-31.1	VOCs, SVOCs, Metals
		04GW009	Groundwater	21.1-31.1	VOCs, SVOCs, Metals
SDW-024	25.7 [1]	04GW010	Groundwater	20.8-30.8	VOCs, SVOCs, Metals
		04GW011	Groundwater	20.8-30.8	VOCs, SVOCs, Metals

[1] Measured December 2, 1994
bgs below ground surface

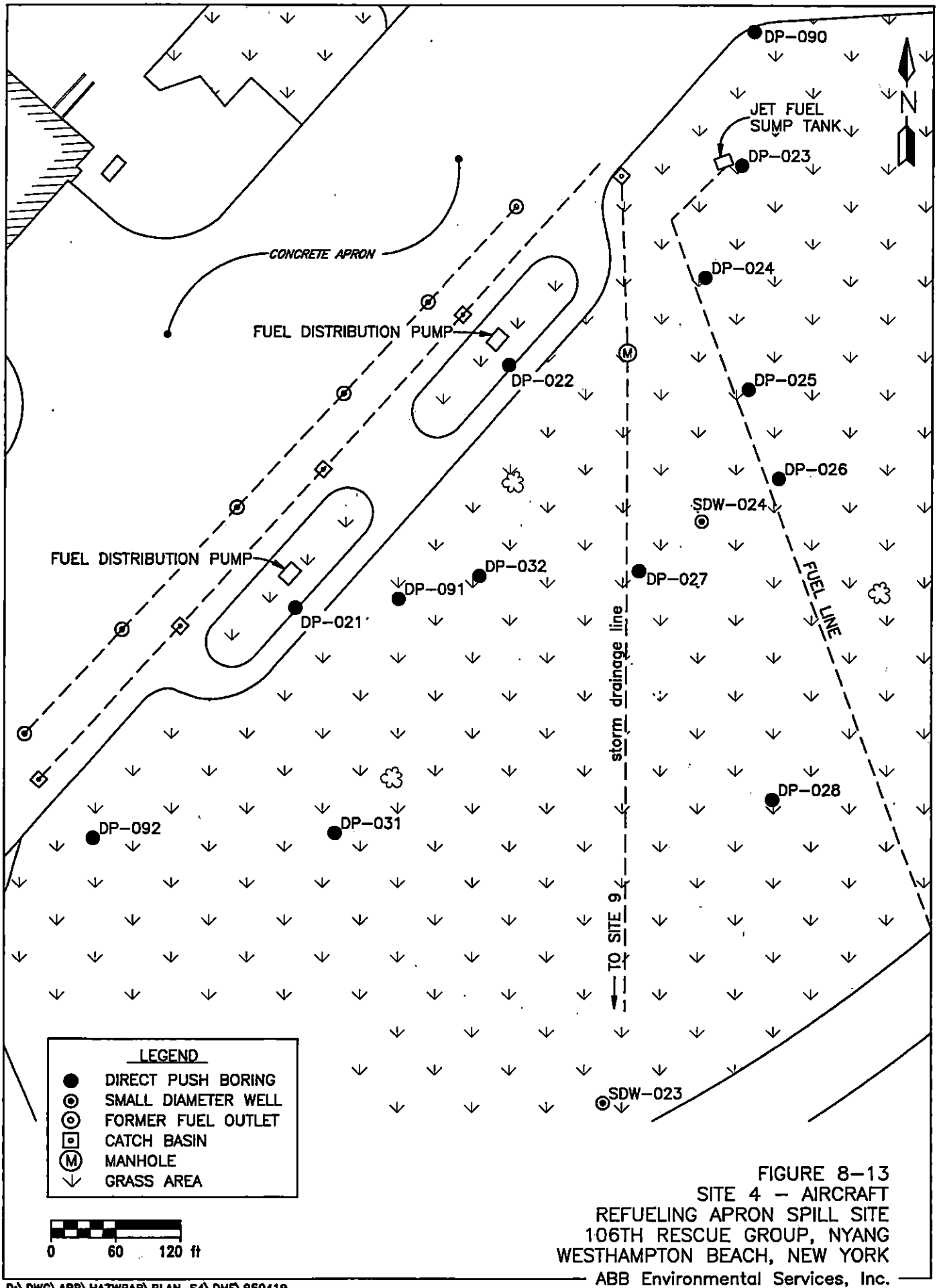
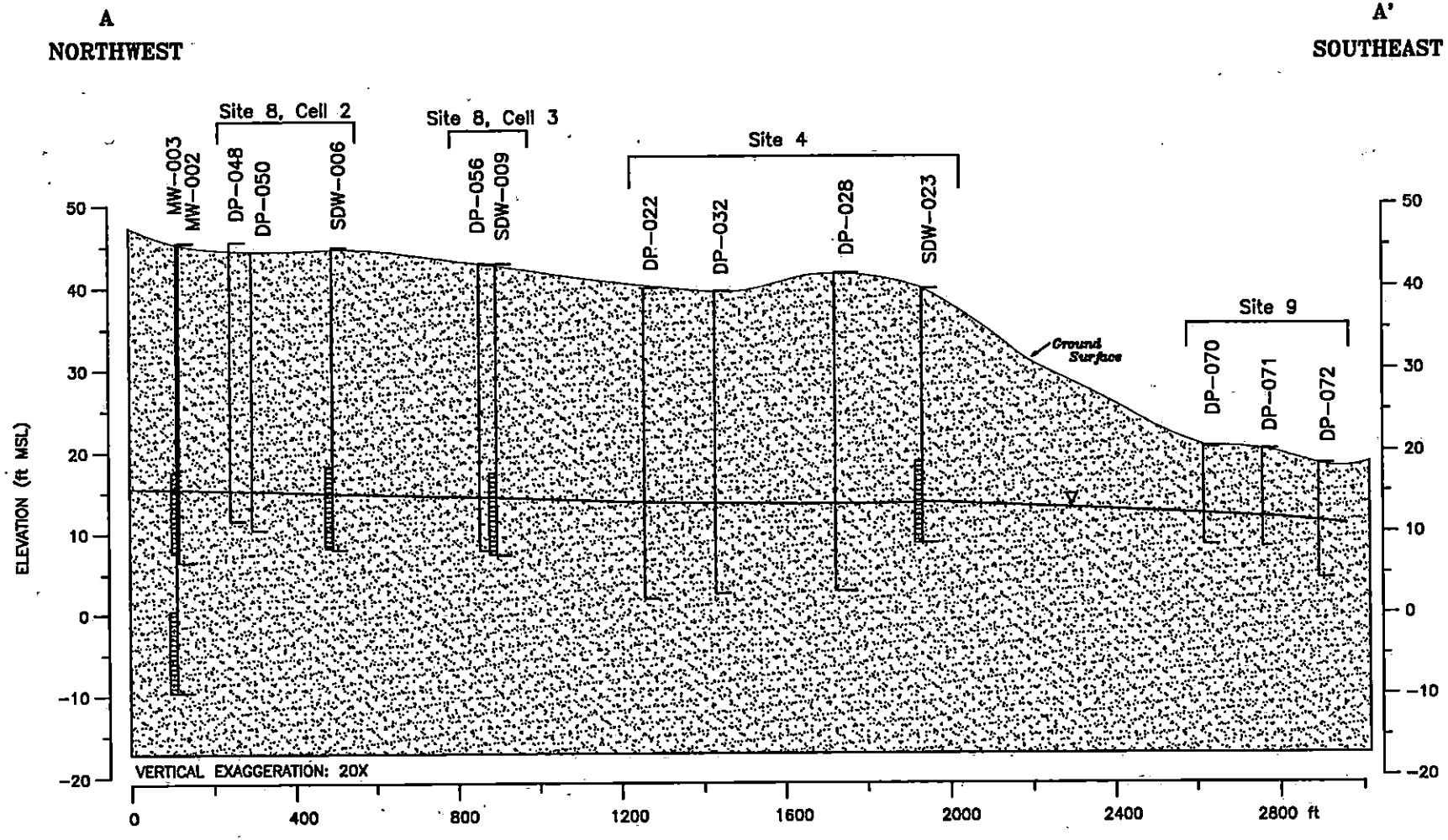


FIGURE 8-13
SITE 4 – AIRCRAFT REFUELING APRON SPILL SITE
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

D:\DWG\ABB\HAZWRAP\PLAN_S4\DMF\950419



Legend

- SDW-009 — Small diameter well
- DP-072 — Direct push boring
- Sand (SW)
- MSL — mean sea level
- Water level

FIGURE 8-14
CROSS SECTION A – A'
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

ABB Environmental Services, Inc.

K9609002/6943.30/G006

Solvent constituents were detected in the saturated soils at DP-021 and DP-024. None of these constituents were found above action levels. Arsenic and chromium were detected at DP-027, and lead is present at all boring locations. Hits above action levels are summarized in Table 8-17.

Groundwater Six VOCs, two SVOCs, and one metal were detected in the groundwater samples obtained from this site (Figures 8-15 and 8-16). Ethylbenzene, xylenes, toluene, chlorobenzene, and naphthalene were detected in groundwater collected from several borings and one small diameter well. Benzene is present in groundwater collected from two locations downgradient of the fuel distribution pumps (see benzene contours in Figure 8-17). 2-Methylnaphthalene was detected downgradient of the south fuel distribution pump at DP-021 and in the center of the site (DP-032). Total fuel concentrations are plotted vertically in Figure 8-18 along cross-section line A-A'. Profile lines are shown on Figure 8-19. Chromium was detected only in groundwater samples collected from the direct push borings. Hits above action levels are summarized in Table 8-18.

8.2.5.5 Site 4 Summary

Soil and groundwater samples collected from Site 4 contain fuel-related compounds at concentrations which exceed action levels. Suspected sources include spills at the fuel distribution pumps, release(s) at the sump tank, and leakage along the fuel line; however, the northern (upgradient) extent of contamination is not known. Concentrations are higher farther downgradient at DP-028, but the maximum probable concentrations in this plume have not been established because the southeastern (downgradient) limit and vertical extent of contamination has not been defined. It is apparent, however, that this plume is moving beyond the defined Site 4 area.

8.2.6 Site 5 - Southwest Storm Drainage Ditch

8.2.6.1 Site Geology and Hydrogeology

Subsurface soil samples obtained from soil borings at Site 5 generally consisted of fine- to medium-grained sand overlying a mixture of sand and gravel. Sediments within the ditch were found to consist of brown silty sand.

Table 8-17
SUBSURFACE SOIL HITS ABOVE ACTION LEVELS
Site 4 - Aircraft Refueling Apron Spill Site

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (mg/kg)	Action Level (mg/kg)
Benzene	04SB011	DP-023	3.6	0.06
Chlorobenzene	04SB011	DP-023	15	1.7
Ethylbenzene	04SB011	DP-023	13	5.5
	04SB016	DP-024	0.087	0.055
	04SB020	DP-026	0.11	0.055
m/p-Xylenes	04SB004	DP-021	0.038	0.012
	04SB008	DP-022	0.043	0.012
	04SB011	DP-023	19	1.2
	04SB016	DP-024	0.22	0.012
	04SB020	DP-026	0.38	0.012
	04SB024	DP-027	0.18	0.012
o-Xylene	04SB004	DP-021	0.014	0.012
	04SB008	DP-022	0.012	0.012
	04SB011	DP-023	70	1.2
	04SB016	DP-024	0.22	0.012
	04SB020	DP-026	0.38	0.012
	04SB024	DP-027	0.061	0.012
Toluene	04SB011	DP-023	5.7	1.5
	04SB016	DP-024	0.028	0.015
	04SB024	DP-027	0.016	0.015
Arsenic	04SB023	DP-027	0.26	0.20
Chromium	04SB021	DP-027	1.3	0.84
	04SB023	dp-027	0.95	0.84
Lead	04SB009	DP-023	0.70	0.65
	04SB010	DP-023	1.1	0.65
	04SB011	DP-023	1.0	0.65
	04SB017	DP-026	1.1	0.65
	04SB021	DP-027	0.76	0.65
	04SB023	DP-027	0.66	0.65
Odor	04SB004	DP-021	NA	Discernible odor
	04SB008	DP-022	5000 *	Discernible odor
	04SB011	DP-023	150 *	Discernible odor
	04SB024	DP-027	ND *	Discernible odor

NA Not available
ND Not detected
mg/kg milligrams per kilogram
* Detected with the FID

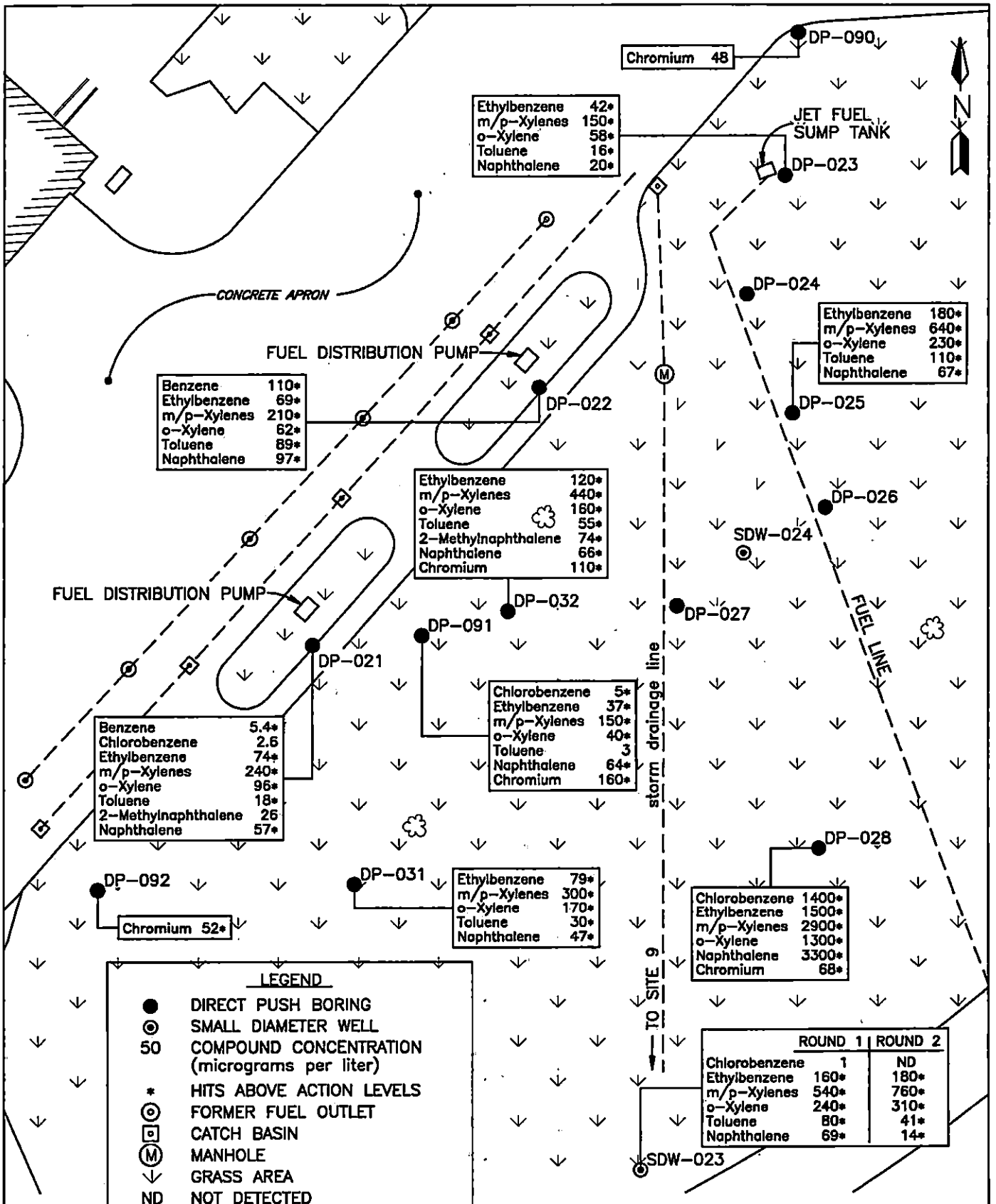
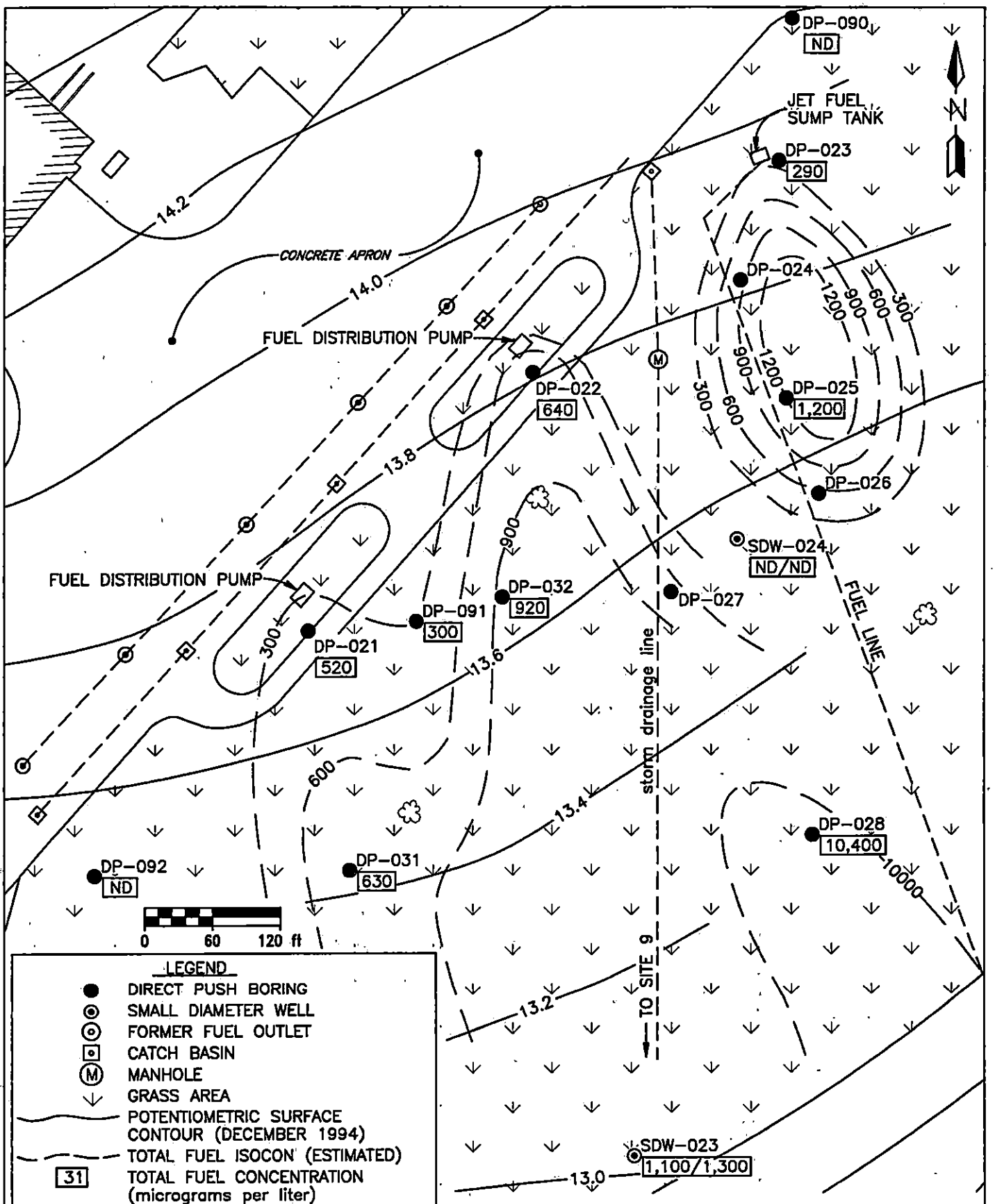


FIGURE 8-15
DETECTED CONCENTRATIONS IN GROUNDWATER
SITE 4 – AIRCRAFT REFUELING APRON SPILL SITE
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

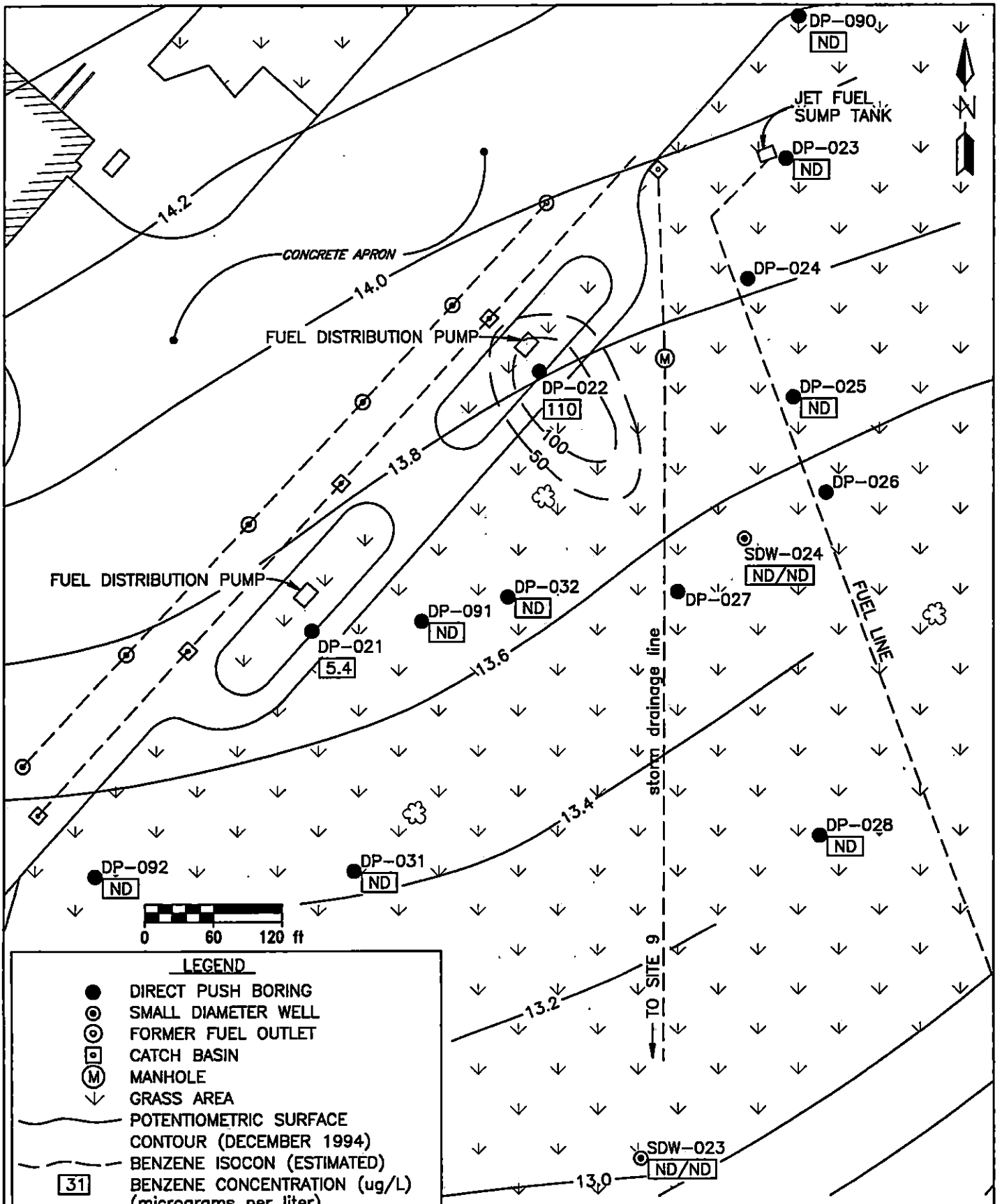
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NOTE:
ANALYTICAL DATA FROM THE DIRECT PUSH BORINGS AND SECOND ROUND SAMPLING RESULTS FROM THE SMALL DIAMETER WELLS (SEPTEMBER THROUGH NOVEMBER 1994) WERE USED TO CONSTRUCT THIS FIGURE.

FIGURE 8-16
TOTAL FUEL ISOCONCENTRATION CONTOURS
IN SHALLOW GROUNDWATER
SITE 4 – AIRCRAFT REFUELING APRON SPILL SITE
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

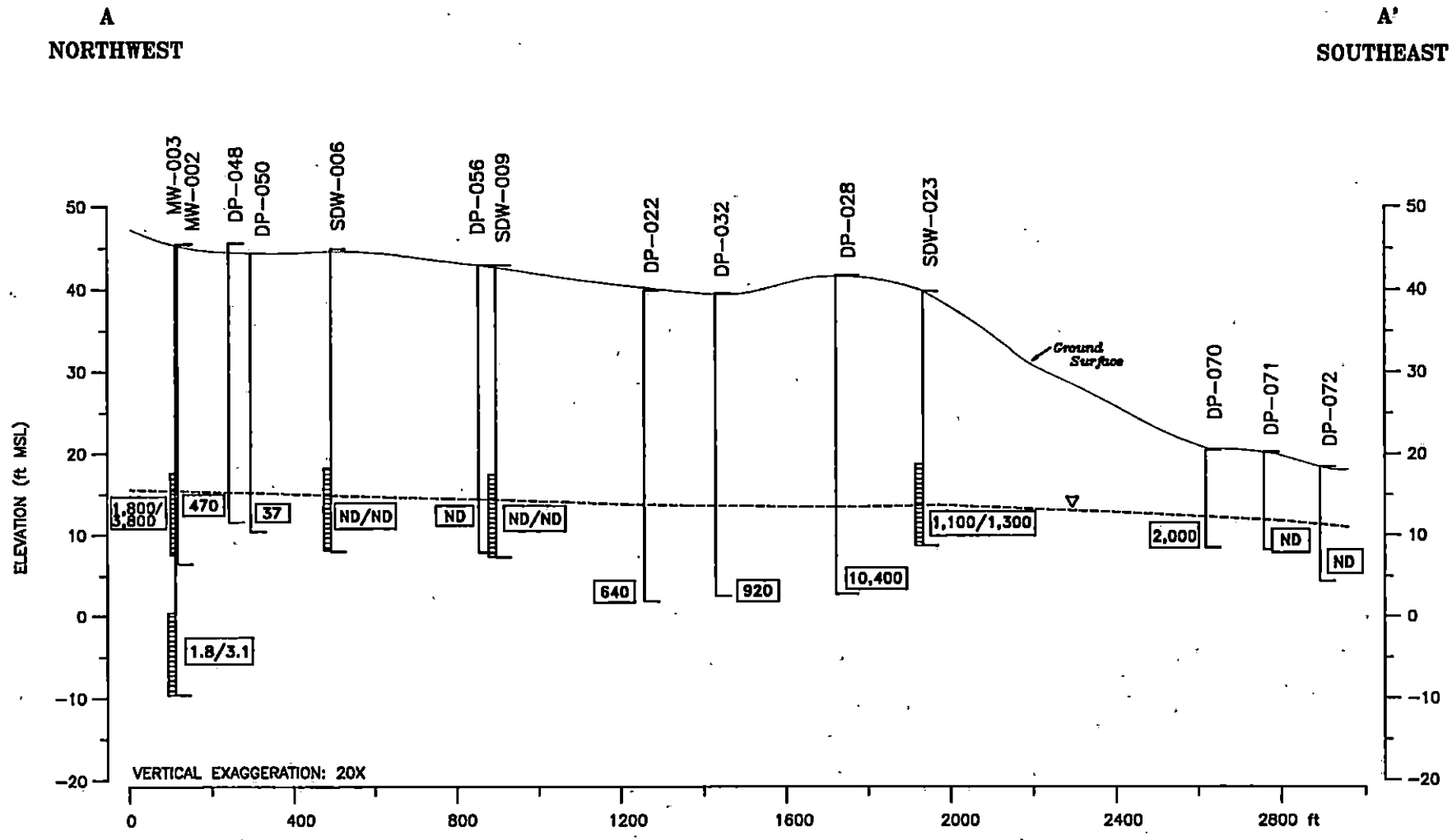
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NOTE:
ANALYTICAL DATA FROM THE DIRECT PUSH BORINGS AND SECOND ROUND SAMPLING RESULTS FROM THE SMALL DIAMETER WELLS (SEPTEMBER THROUGH NOVEMBER 1994) WERE USED TO CONSTRUCT THIS FIGURE.

FIGURE 8-17
BENZENE ISOCONCENTRATION CONTOURS IN SHALLOW GROUNDWATER
SITE 4 - AIRCRAFT REFUELING APRON SPILL SITE
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

D:\DWG\ABB\HAZWRAP\BENZ_S4\DMF\950405



Legend

- SDW-009 — Small diameter well
- DP-072 — Direct push boring
- 920 — Total fuel concentrations in ground water (micrograms per liter)
- 1.8/3.1 — 1st Round/2nd Round sampling results (micrograms per liter)
- ▽ — Water level

NOTES:

1. Placement of chemical concentration boxes denotes sample depth.
2. Groundwater samples were collected September through November 1994. Two rounds were collected from the small diameter and existing monitor wells.

MSL mean sea level

FIGURE 8-18
TOTAL FUEL CONCENTRATIONS IN GROUNDWATER
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

ABB Environmental Services, Inc.

K9503010/6943.30/G008

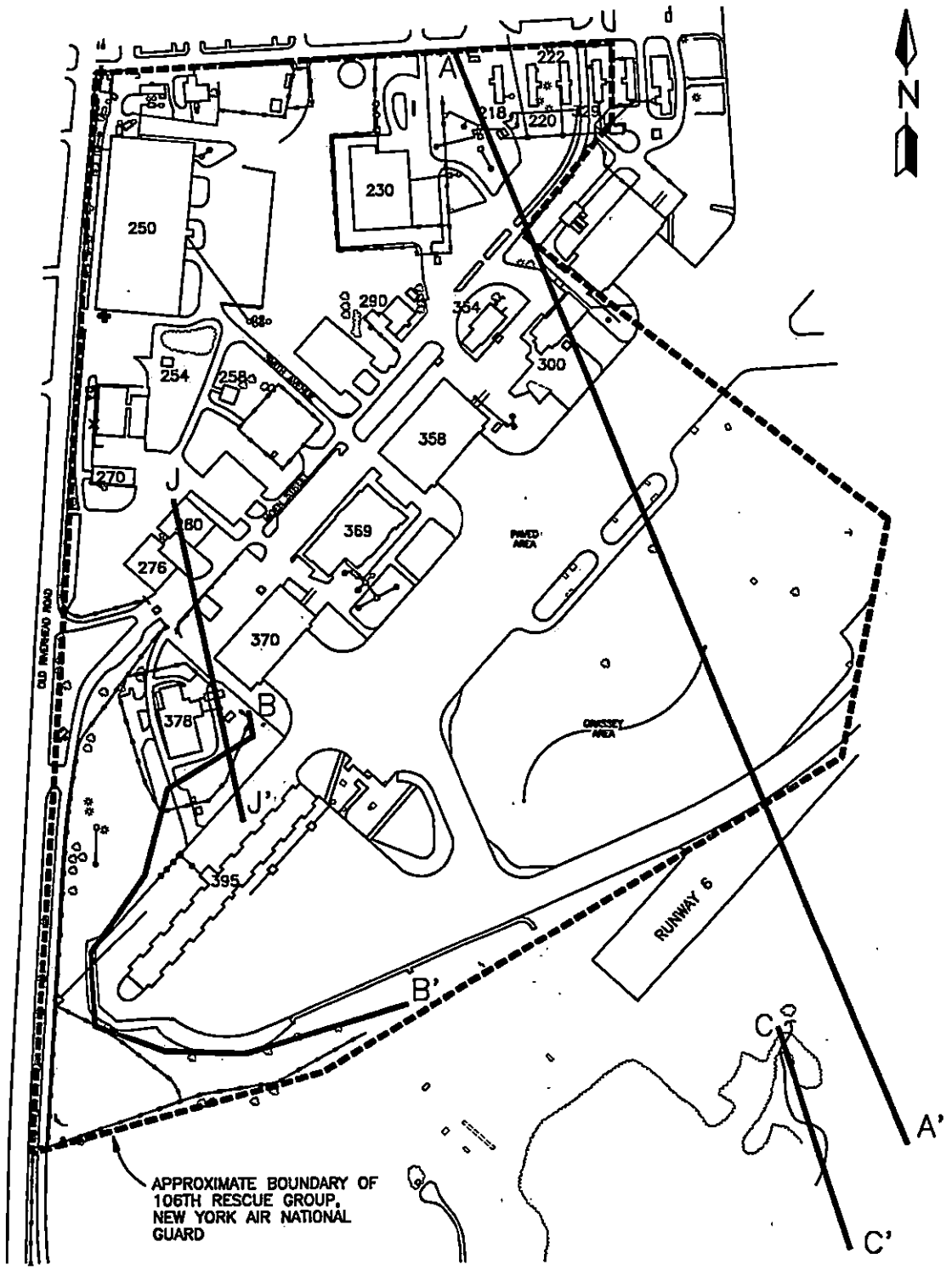


FIGURE 8–19
PROFILE LINES
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

ABB Environmental Services, Inc.

Table 8-18
GROUNDWATER HITS ABOVE ACTION LEVELS
Site 4 - Aircraft Refueling Apron Spill Site

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Site ID	Site Location	Concentration (µg/L)	Action Level (µg/L)
Benzene	04GW001	DP-021	5.4	5.0
	04GW002	DP-022	110	5.0
Chlorobenzene	04GW005	DP-028	1400	5.0
	04GW013	DP-091	5.0	5.0
Ethylbenzene	04GW001	DP-021	74	5.0
	04GW002	DP-022	69	5.0
	04GW003	DP-023	42	5.0
	04GW004	DP-025	180	5.0
	04GW005	DP-028	1500	5.0
	04GW006	DP-031	79	5.0
	04GW007	DP-032	120	5.0
	04GW008	SDW-023 *	160	5.0
	04GW009	SDW-023 **	180	5.0
	04GW013	DP-091	37	5.0
m/p-Xylenes	04GW001	DP-021	240	10
	04GW002	DP-022	210	10
	04GW003	DP-023	150	10
	04GW004	DP-025	640	10
	04GW005	DP-028	2900	10
	04GW006	DP-031	300	10
	04GW007	DP-032	440	10
	04GW008	SDW-023 *	540	10
	04GW009	SDW-023 **	760	10
	04GW013	DP-091	150	10
o-Xylene	04GW001	DP-021	96	5.0
	04GW002	DP-022	62	5.0
	04GW003	DP-023	58	5.0
	04GW004	DP-025	230	5.0
	04GW005	DP-028	1300	5.0
	04GW006	DP-031	170	5.0
	04GW007	DP-032	160	5.0
	04GW008	SDW-023 *	240	5.0
	04GW009	SDW-023 **	310	5.0
	04GW013	DP-091	40	5.0
2-Methylnaphthalene	04GW007	DP-032	74	50

Table 8-18 (Continued)
GROUNDWATER HITS ABOVE ACTION LEVELS
Site 4 - Aircraft Refueling Apron Spill Site

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Site ID	Site Location	Concentration (µg/L)	Action Level (µg/L)
Naphthalene	04GW001	DP-021	57	10
	04GW002	DP-022	97	10
	04GW003	DP-023	20	10
	04GW004	DP-025	67	10
	04GW005	DP-028	3300	10
	04GW006	DP-031	47	10
	04GW007	DP-032	66	10
	04GW008	SDW-023 *	69	10
	04GW009	SDW-023 **	14	10
	04GW0013	DP-091	64	10
Chromium	04GW005	DP-028	68	50
	04GW007	DP-032	110	50
	04GW0013	DP-091	160	50
	04GW0014	DP-092	52	50

* First round groundwater sampling
** Second round groundwater sampling
µg/L micrograms per liter

These soils typify the glacial outwash deposits of the area that comprise the upper glacial aquifer beneath Long Island. The upper glacial aquifer is the principal aquifer of concern at Site 5.

Groundwater was encountered in the site borings at a depth of 29 feet bgs. From basewide groundwater levels measured in all of the wells and piezometers in December 1994, groundwater movement is directed to the south-southeast with an average hydraulic gradient of 0.0014 ft/ft. Hydraulic gradient and groundwater flow are relatively uniform basewide, but may be locally influenced by topography and the infiltration of surface water runoff from man-made surface features. Site 5 is a sparsely vegetated ditch that receives surface water runoff from extensive paved areas at the southern end of the base. It appears that infiltration and recharge of surface water runoff may influence the local groundwater conditions in the vicinity of this ditch. Site 5 is hydraulically downgradient of all of the SI investigation sites except Site 9.

8.2.6.2 Sampling Strategy

The conceptual model for Site 5 assumed that fuels and oils would have contaminated surface water and sediments in the ditch and subsurface soils in the unsaturated zone. Groundwater was not expected to have been impacted. Constituents of concern included aromatic hydrocarbons and metals. Figure 8-20 presents the sampling logic diagram developed for this site.

8.2.6.3 Sample Location and Description

Three borings, designated DP-034, DP-035, and DP-036, were drilled at this site on October 2 and 3, 1994. The borings were terminated 32 ft bgs. Four subsurface soil samples were collected from each boring, excluding DP-036 where running sands prevented recovery of the deepest sample. One groundwater sample was collected from DP-035. Sample location information and compounds analyzed are summarized in Table 8-19. Boring locations are shown on Figure 8-21, and Figure 8-22 shows a cross section through Site 5.

Table 8-19
SAMPLE SUMMARY[1]
Site 5 - Southwest Storm Drainage Ditch

106th Rescue Group, NYANG
Westhampton Beach, New York

Sample Location	Depth to Water (ft bgs)	Sample Designation	Sample Type	Depth/Interval (ft bgs)
DP-034	29	05SB001	Subsurface soil	5-7
		05SB002	Subsurface soil	10-12
		05SB003	Subsurface soil	20-22
		05SB004	Subsurface soil	30-32
DP-035	29	05SB005	Subsurface soil	5-7
		05SB006	Subsurface soil	10-12
		05SB007	Subsurface soil	20-22
		05SB008	Subsurface soil	30-32
		05GW001	Groundwater	30-32
DP-036	29	05SB009	Subsurface soil	5-7
		05SB010	Subsurface soil	10-12
		05SB011	Subsurface soil	20-22
GB-001	NE	05SW001	Surface water	0.2 ft btw
		05SD001	Sediment	0.5-1
		05SD008	Sediment	1.5-2
GB-002	NE	05SD002	Sediment	0.5-1
GB-003	NE	05SD003	Sediment	0.5-1
GB-004	NE	05SD004	Sediment	0.5-1
GB-005	NE	05SD005	Sediment	0.5-1
GB-014	NE	05SD009	Sediment	0.5-1
GB-015	NE	05SD010	Sediment	0.5-1
GB-016	NE	05SD011	Sediment	0.5-1

[1] All samples were analyzed for VOCs, SVOCs, and metals except at GB-016 where SVOCs by GCMS were inadvertently not run.
btw below top of water
bgs below ground surface
NE Not encountered

One surface water sample was collected at GB-001 on October 15, 1994. Sediment samples were collected at GB-001 through GB-005, and GB-014 through GB-016 between October 15 and November 3, 1994. Grab sample locations are shown on Figure 8-21.

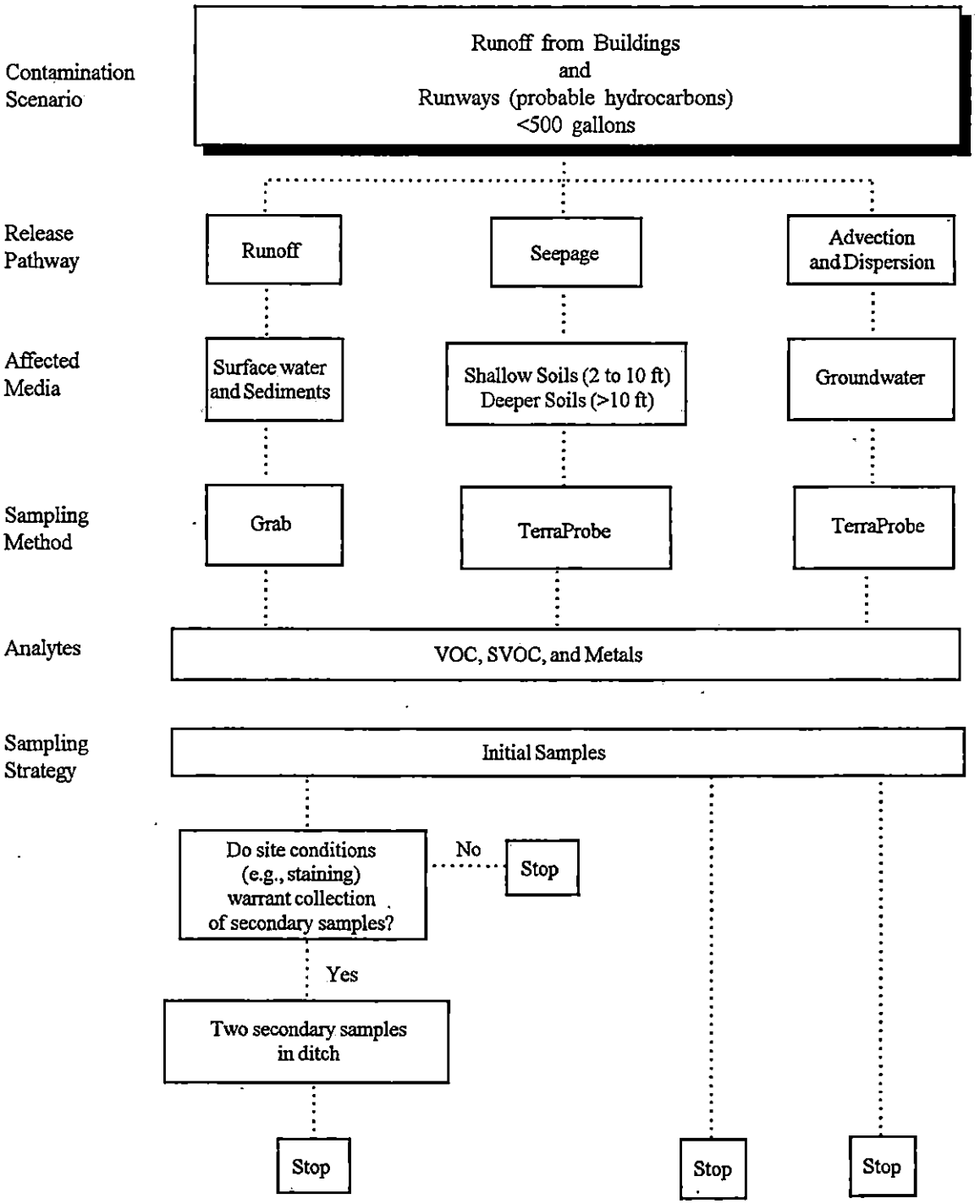


FIGURE 8-20
SAMPLING LOGIC DIAGRAM
SITE 5 - SOUTHWEST STORM DRAINAGE DITCH
106 RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

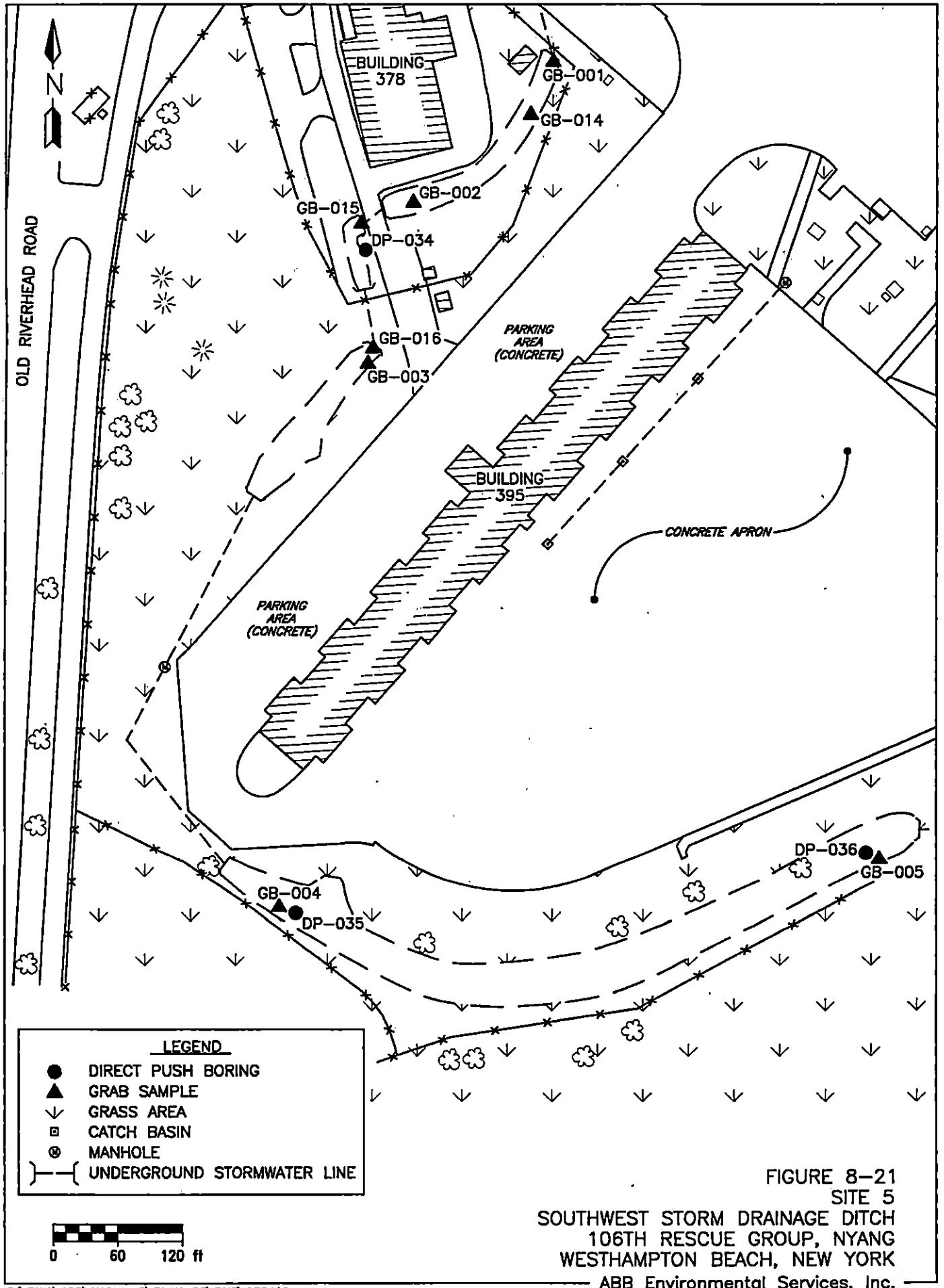
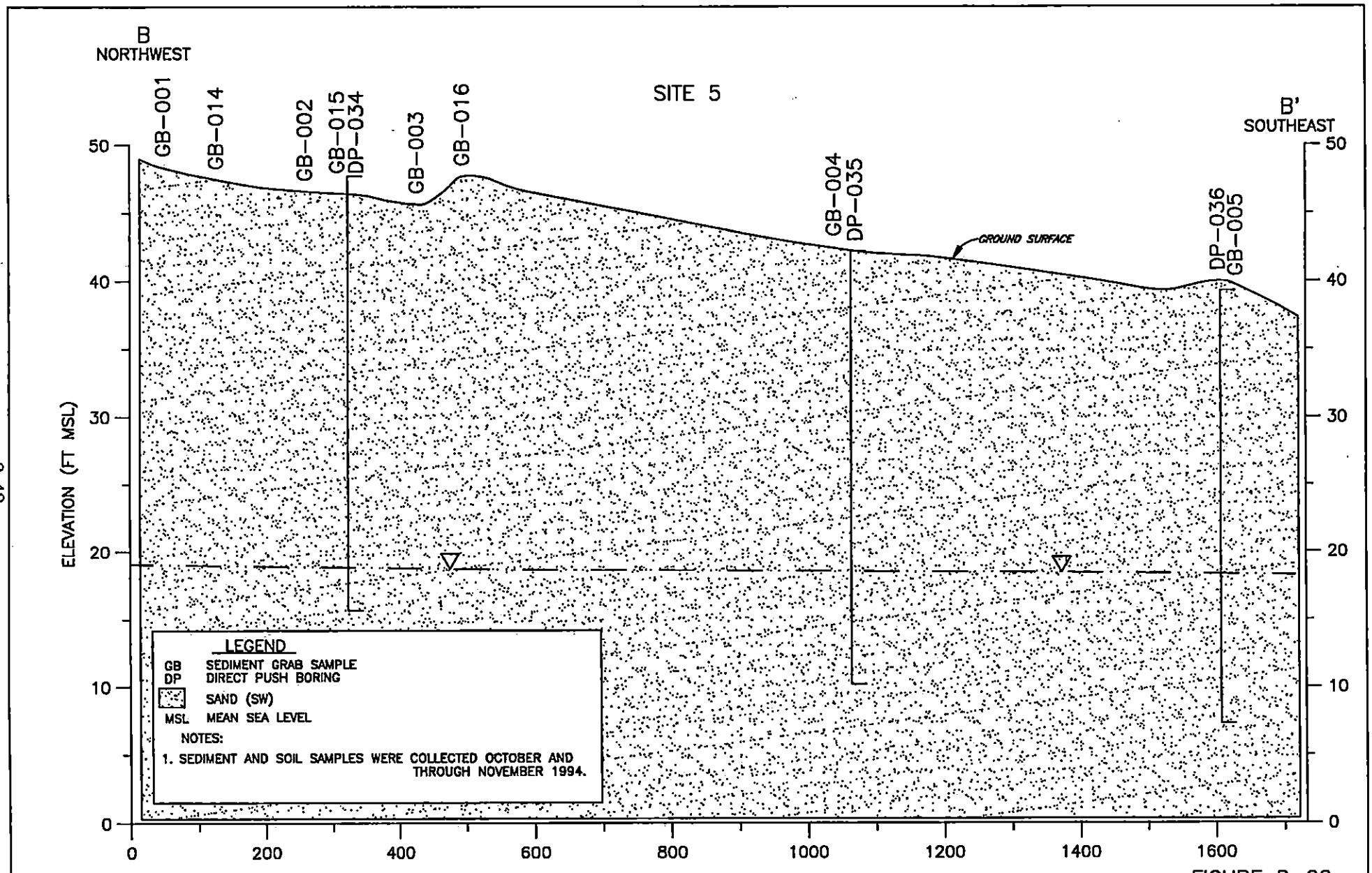


FIGURE 8-21
SITE 5
SOUTHWEST STORM DRAINAGE DITCH
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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NOTE: VERTICAL EXAGGERATION = 20X
SCALE: 1" = 10' VERTICAL, 1" = 200' HORIZONTAL

FIGURE 8-22
CROSS SECTION B-B'
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEWYORK

ABB Environmental Services, Inc.

K9609003/6943.30/G006

Organic vapors were detected with the FID in sediments obtained from GB-001 (110 ppm) and GB-004 (>1000 ppm), and an odor was noted at GB-004. Organic vapors were not detected in the subsurface soils.

8.2.6.4 Analytical Results For Surface Water, Sediment, Subsurface Soils, and Groundwater

Surface Water Lead was the only constituent detected above reporting limits in the surface water sample obtained from this site. The concentration exceeds action levels (see Table 8-20). The surface water from which the sample was collected was stagnate.

Table 8-20
SURFACE WATER HITS ABOVE ACTION LEVELS
Site 5 - Southwest Storm Drainage Ditch

106th Rescue Group, NYANG
Westhampton Beach, New York

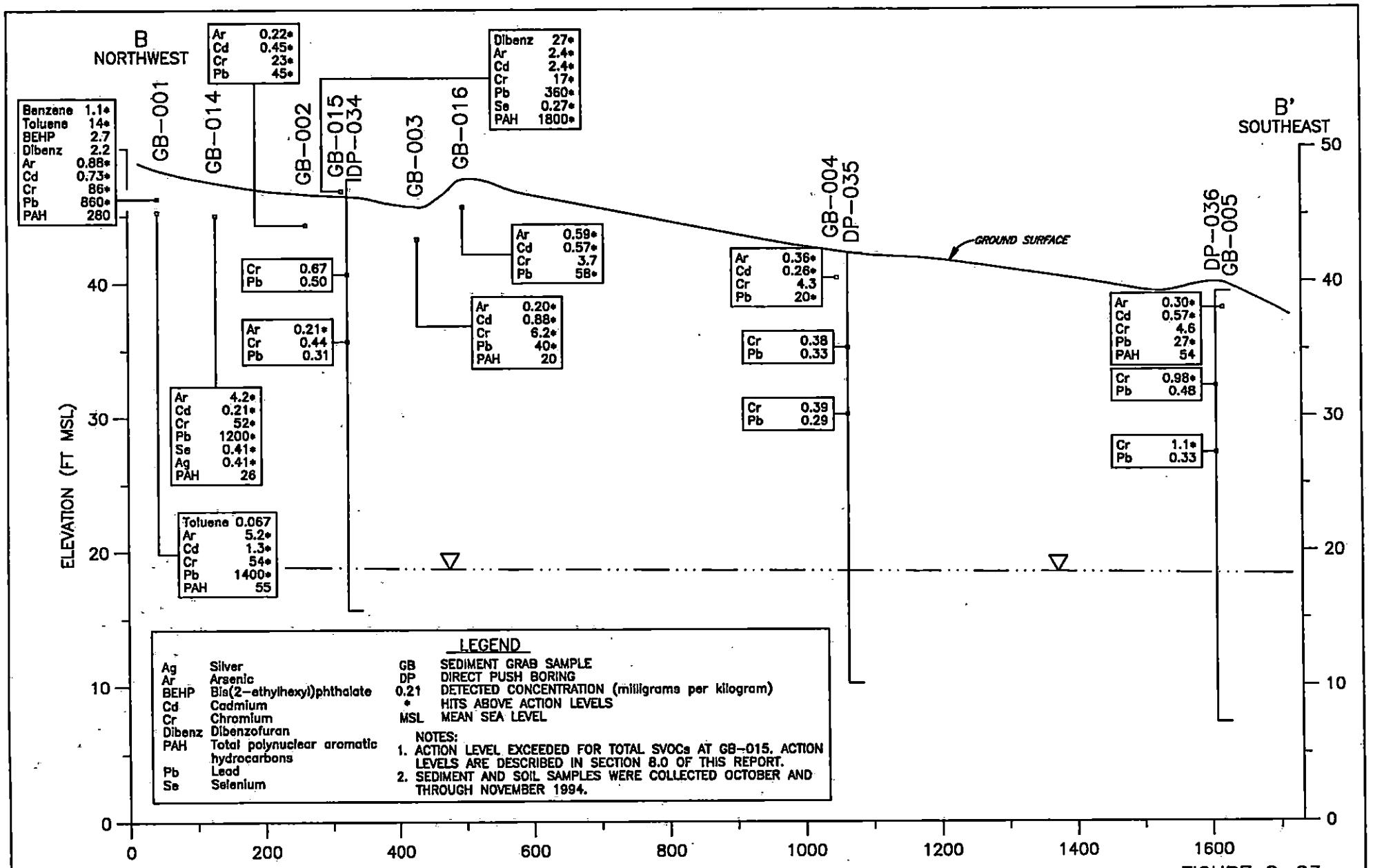
Analyte	Sample ID	Sample Location	Concentration (µg/L)	Action Level (µg/L)
Lead	05SW001	GB-001	260	25

µg/L micrograms per liter

Sediment Benzene, toluene, several SVOCs, and metals were detected in the sediment samples collected from Site 5 (Figure 8-23). The highest concentrations were detected in the upper portion of the ditch (Figure 8-24). Hits above action levels are summarized in Table 8-21.

Subsurface Soils Arsenic, chromium, and lead were detected in the subsurface soils obtained from this site. No other analytes were found above reporting limits. Arsenic was detected in one sample collected from DP-034; chromium and lead were found in every sample. Hits above action levels are summarized in Table 8-22.

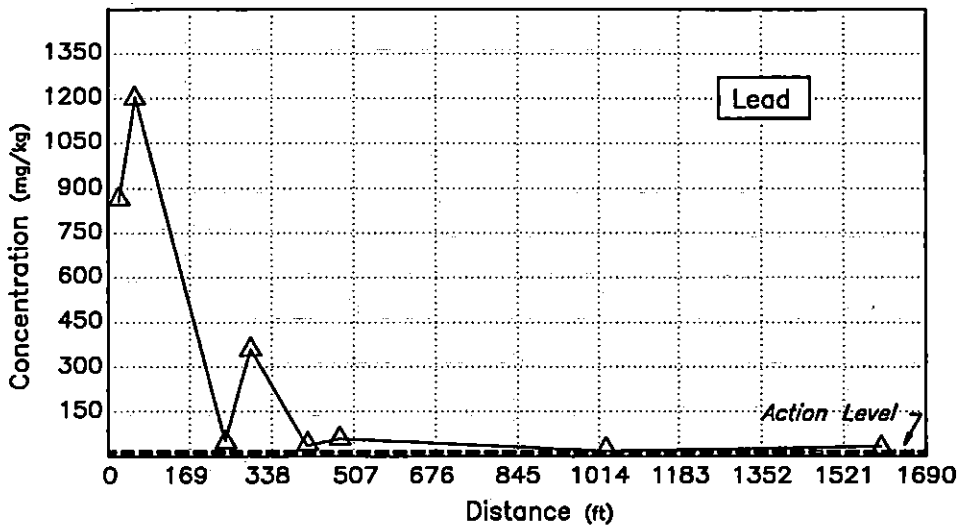
Groundwater Toluene and chromium were detected in the groundwater sample obtained from Site 5. No other analytes were found above reporting limits. Only chromium exceeds action levels (see Table 8-23).

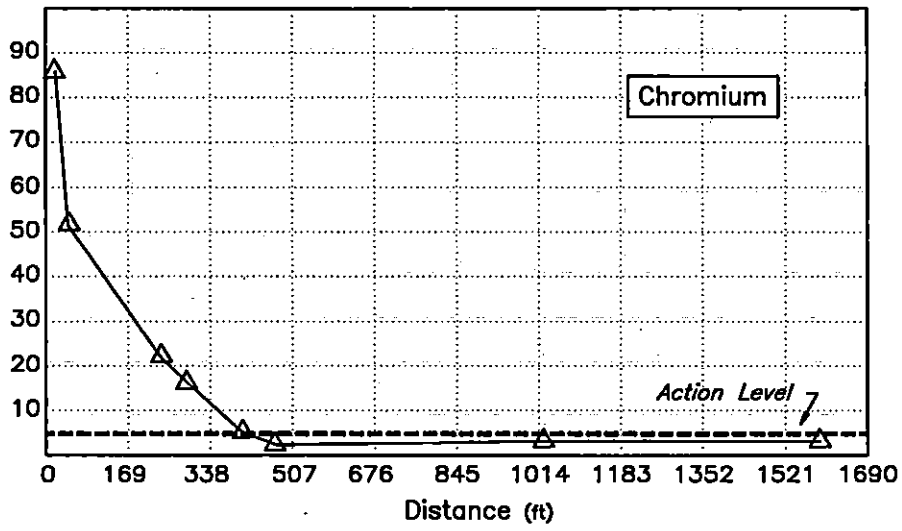


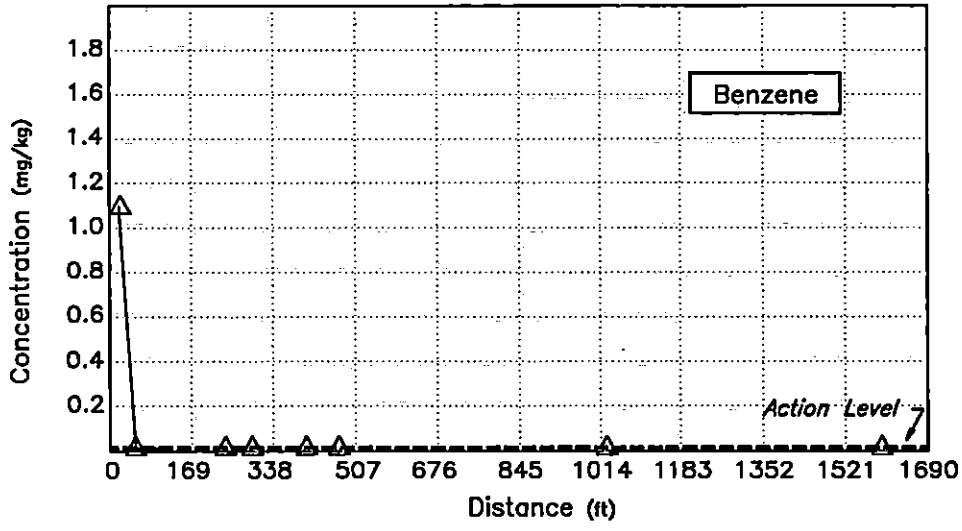
NOTE: VERTICAL EXAGGERATION = 20X
SCALE: 1" = 10' VERTICAL, 1" = 200' HORIZONTAL

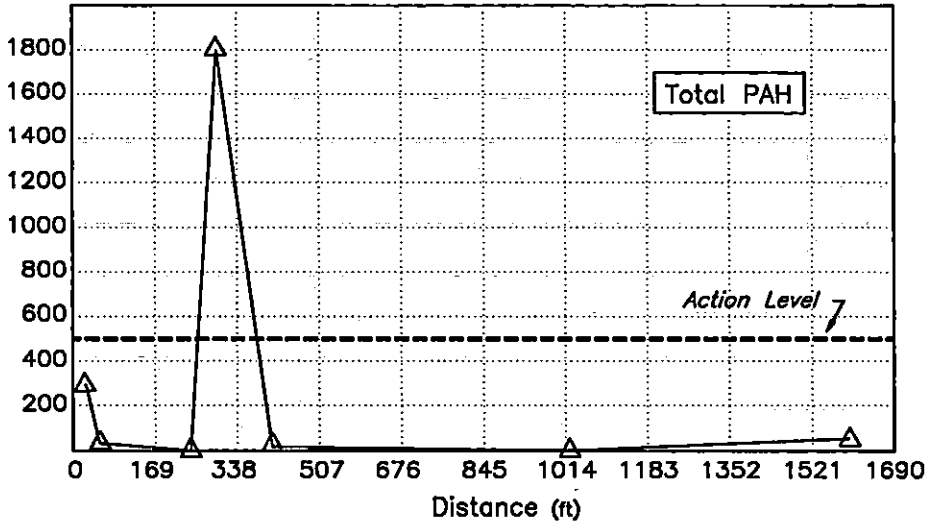
FIGURE 8–23
DETECTED CONCENTRATIONS IN SEDIMENT AND SUBSURFACE SOILS
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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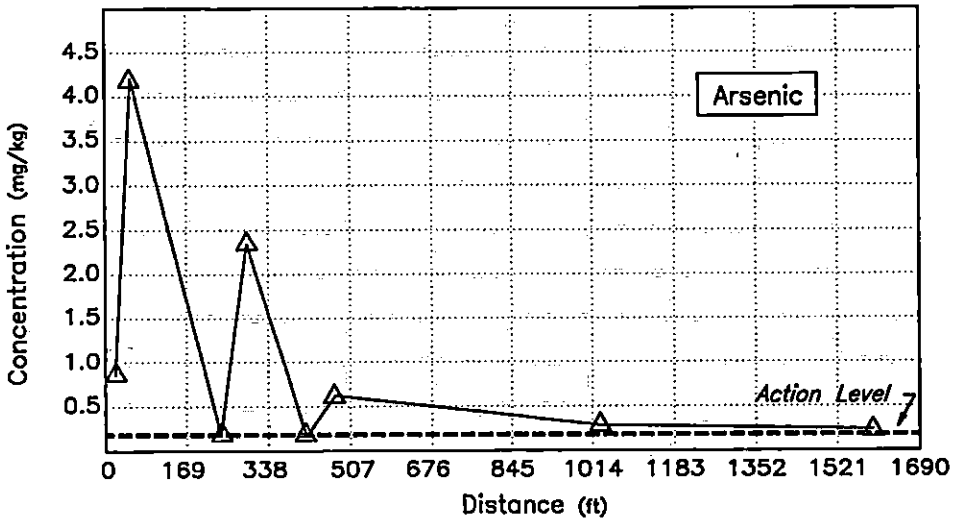


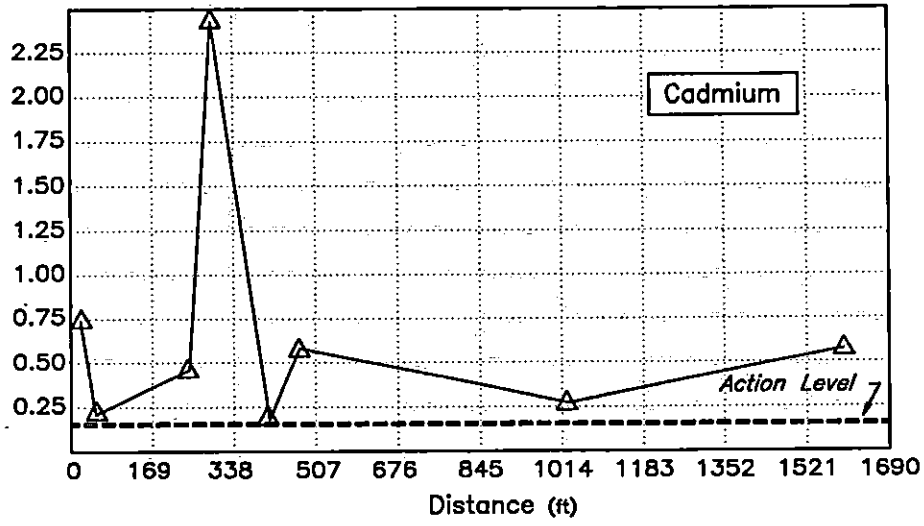


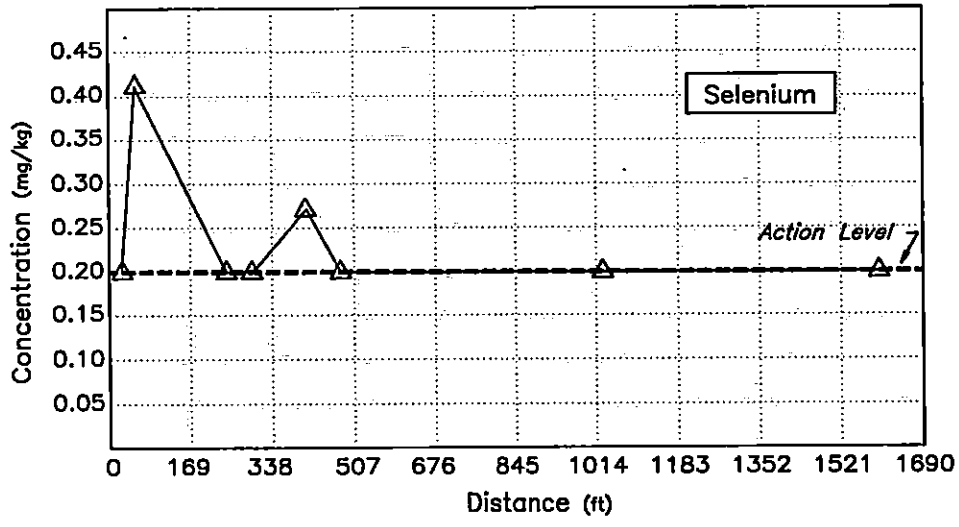
NOTES:
Sediment samples were collected in October and November 1994.
mg/kg milligrams per kilogram

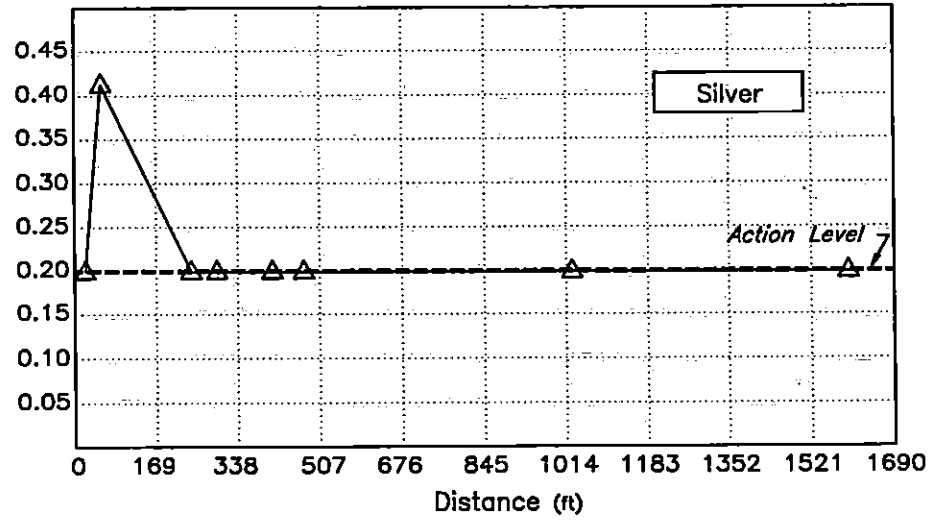
FIGURE 8-24
SEDIMENT CONCENTRATIONS VS. DISTANCE
SITE 5 – SOUTHWEST STORM DRAINAGE DITCH
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

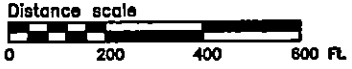
ABB Environmental Services, Inc.











NOTES:
Sediment samples were collected in October and November 1994.
mg/kg milligrams per kilogram

FIGURE 8-24, CONT.
SEDIMENT CONCENTRATIONS VS. DISTANCE
SITE 5 - SOUTHWEST STORM DRAINAGE DITCH
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

Table 8-21
SEDIMENT HITS ABOVE ACTION LEVELS
Site 5 - Southwest Storm Drainage Ditch

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (mg/kg)	Action Level (mg/kg)
Benzene	05SD001	GB-001	1.1	0.06
Toluene	05SD001	GB-001	14	1.5
Acenaphthene	05SD010	GB-015	58	50.0
Anthracene	05SD010	GB-015	76	50.0
Benzo(a)anthracene	05SD001	GB-001	19	1.0
	05SD003	GB-003	1.7	1.0
	05SD005	GB-005	4.9	1.0
	05SD009	GB-014	1.8	1.0
	05SD010	GB-015	140	1.0
Benzo(a)pyrene	05SD001	GB-001	22	1.0
	05SD003	GB-003	1.6	1.0
	05SD005	GB-005	4.3	1.0
	05SD009	GB-014	2.6	1.0
	05SD010	GB-015	120	1.0
Benzo(b)fluoranthene	05SD001	GB-001	21	1.1
	05SD008	GB-001	12	1.1
	05SD003	GB-003	1.6	1.1
	05SD005	GB-005	4.3	1.1
	05SD009	GB-014	3.5	1.1
	05SD010	GB-015	120	1.1
Benzo(g,h,i)perylene	05SD010	GB-015	71	50.0
Benzo(k)fluoranthene	05SD001	GB-001	20	1.1
	05SD003	GB-003	1.5	1.1
	05SD005	GB-005	3.8	1.1
	05SD009	GB-014	2.6	1.1
	05SD010	GB-015	91	1.1
Chrysene	05SD001	GB-001	19	1.0
	05SD003	GB-003	1.8	1.0
	05SD005	GB-005	5.5	1.0
	05SD009	GB-014	2.6	1.0
	05SD010	GB-015	140	1.0

Table continued on next page

Table 8-21 (cont'd)
SEDIMENT HITS ABOVE ACTION LEVELS
Site 5 - Southwest Storm Drainage Ditch

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (mg/kg)	Action Level (mg/kg)
Dibenz(a,h)anthracene	05SD001	GB-001	7.7	1.0
Dibenzofuran	05SD010	GB-015	27	6.2
Fluoranthene	05SD010	GB-015	340	50.0
Indeno(1,2,3-cd)pyrene	05SD001	GB-001	18	3.2
	05SD010	GB-015	68	3.2
Phenanthrene	05SD010	GB-015	300	50.0
Pyrene	05SD010	GB-015	270	50.0
Arsenic	05SD001	GB-001	0.88	0.20
	05SD008	GB-001	5.2	0.20
	05SD002	GB-002	0.22	0.20
	05SD003	GB-003	0.20	0.20
	05SD004	GB-004	0.36	0.20
	05SD005	GB-005	0.30	0.20
	05SD009	GB-014	4.2	0.20
	05SD010	GB-015	2.4	0.20
	05SD011	GB-016	0.59	0.20
Cadmium	05SD001	GB-001	0.73	0.20
	05SD008	GB-001	1.3	0.20
	05SD002	GB-002	0.45	0.20
	05SD003	GB-003	0.88	0.20
	05SD004	GB-004	0.26	0.20
	05SD005	GB-005	0.57	0.20
	05SD009	GB-014	0.21	0.20
	05SD010	GB-015	2.4	0.20
	05SD011	GB-016	0.57	0.20
Chromium	05SD001	GB-001	86	6.1
	05SD008	GB-001	54	6.1
	05SD002	GB-002	23	6.1
	05SD003	GB-003	6.2	6.1
	05SD009	GB-014	52	6.1
	05SD010	GB-015	17	6.1

Table continued on next page

Table 8-21 (cont'd)
SEDIMENT HITS ABOVE ACTION LEVELS
Site 5 - Southwest Storm Drainage Ditch

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (mg/kg)	Action Level (mg/kg)
Lead	05SD001	GB-001	864	4.4
	05SD008	GB-001	1400	4.4
	05SD002	GB-002	45	4.4
	05SD003	GB-003	40	4.4
	05SD004	GB-004	20	4.4
	05SD005	GB-005	27	4.4
	05SD009	GB-014	1200	4.4
	05SD010	GB-015	360	4.4
	05SD011	GB-016	58	4.4
Selenium	05SD009	GB-014	0.41	0.20
	05SD010	GB-015	0.27	0.20
Silver	05SD009	GB-014	0.41	0.20
Odor	05SD004	GB-004	>1000*	Discernible odor

* Detected with the FID
mg/kg milligrams per kilogram

Table 8-22
SUBSURFACE SOIL HITS ABOVE ACTION LEVELS
Site 5 - Southwest Storm Drainage Ditch

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (mg/kg)	Action Level (mg/kg)
Arsenic	05SB002	DP-034	0.21	0.20
Chromium	05SB009	DP-036	0.98	0.84
Chromium	05SB010	DP-036	1.1	0.84

mg/kg milligrams per kilogram

Table 8-23
GROUNDWATER HITS ABOVE ACTION LEVELS
Site 5 - Southwest Storm Drainage Ditch

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (µg/L)	Action Level (µg/L)
Chromium	05GW001	DP-035	60	50

µg/L micrograms per liter

8.2.6.5 Site 5 Summary

Sediments in the upper two sections of the drainage ditch contain VOCs, SVOCs, and metals, some of which exceed action levels. Subsurface soils do not contain organic compounds or metals in excess of the average range of concentrations in eastern US or NYS background soils. The only analyte detected in Site 5 groundwater was chromium. Because the sample was collected from a direct-push boring, the presence of this element at elevated concentration is considered a sampling artifact (Section 9.2.1). Chromium concentrations in groundwater samples obtained from nearby wells at SDW-014 and SDW-017 do not exceed action levels. Therefore, it appears that drainage entering the ditch has adversely impacted only

surface sediments or soils, and the lateral extent of contamination is generally limited to the first two sections of the ditch.

8.2.7 Site 8 - Old Base Septic Systems

8.2.7.1 Site Geology and Hydrogeology

Site 8 consists of approximately 96 underground structures which include septic tanks, cesspools, distribution boxes, and oil/mud traps that comprise the base septic system. In the past, some of these structures had received wastes from maintenance buildings in which hazardous materials had been used.

Due to the large number of septic system structures and their widespread distribution across the facility, the base was divided into five investigative areas or cells designated Cells 1 through 5. Among these cells, the underground structures were further divided into 21 subsites designated 8A through 8U. Subsite 8Q was still further subdivided into seven separate units associated with Building 250 (i.e., 8QA through 8QG). Because the aerial extent of the underground septic system covers the entire extent of the base, a general synopsis of geologic conditions encountered among the five cells comprising this site is provided below.

Subsurface soil samples obtained from Site 8 soil borings were consistent with those collected at the other investigation sites and generally consisted of fine- to medium-grained sand with discontinuous intervals or lenses of sand and gravel. These soils typify the glacial outwash deposits of the area that comprise the upper glacial aquifer beneath Long Island. The upper glacial aquifer is the principal aquifer of concern at Site 8.

Groundwater was encountered in Site 8 borings and wells at depths ranging from 32.5 to 44 ft bgs in Cell 1, 30 ft bgs at Cell 2, 28 to 32 ft bgs in Cell 3, 35 to 43 ft bgs in Cell 4, and 36 to 39 feet bgs in Cell 5. The varied depths to groundwater among the five cells reflect the local topographic conditions. From basewide groundwater levels measured in all of the wells and piezometers in December 1994, groundwater movement is generally directed to the south at Cell 1 and south-southeast at the remaining cells with a basewide, average hydraulic gradient of 0.0014 ft/ft. Hydraulic gradient and groundwater flow are relatively uniform basewide, but may be locally influenced by topography and the infiltration of surface water runoff from man-made surface features across the facility.

8.2.7.2 Sampling Strategy

The conceptual model for Site 8 assumed that liquids discharged to septic tanks, distribution boxes, and oil/mud traps could have been released to the subsurface through cracks in the walls of the containers. Liquids discharged to cesspools and drywells would have had direct access to the subsurface via open bottoms and perforated sides. Constituents of concern included the volatile and semi-volatile compounds detected previously and metals. Figure 8-25 presents the sampling logic diagram developed for this site.

8.2.7.3 Cell 1

Description Cell 1 encompasses the northwest portion of the base (Figure 8-26). Nine single structures or structure clusters were identified within this cell: 8QA, 8QB, 8QC/8N, 8QD, 8QE, 8QF, 8QG, 8M, and 8O. 8QC and 8N are considered a single unit because of their proximity to one another.

Sample Location and Description Nine borings, designated DP-037 through DP-045, were drilled at this cell from October 17 to 20, 1994. The borings were terminated between 41 and 47 ft bgs. Two subsurface soil samples and one groundwater sample were collected from each boring. Sample location information and compounds analyzed are summarized in Table 8-23. Boring locations are shown on Figure 8-27.

Four small diameter wells, designated SDW-001 through SDW-004, were installed at this cell between September 29 and October 1, 1994 (Figure 8-27). A shallow and deep well cluster was installed south of 8QD and two shallow wells were installed downgradient of 8QF and 8QG. Well depth, screened interval, and static water levels are summarized in Table 4-1 and sampling intervals are shown on Table 8-24.

Organic vapors were detected in the saturated soils at DP-045 (5 ppm) and in one unsaturated soil sample (3 ppm) obtained from DP-039. Organic vapors in the wells ranged from background to 15 ppm.

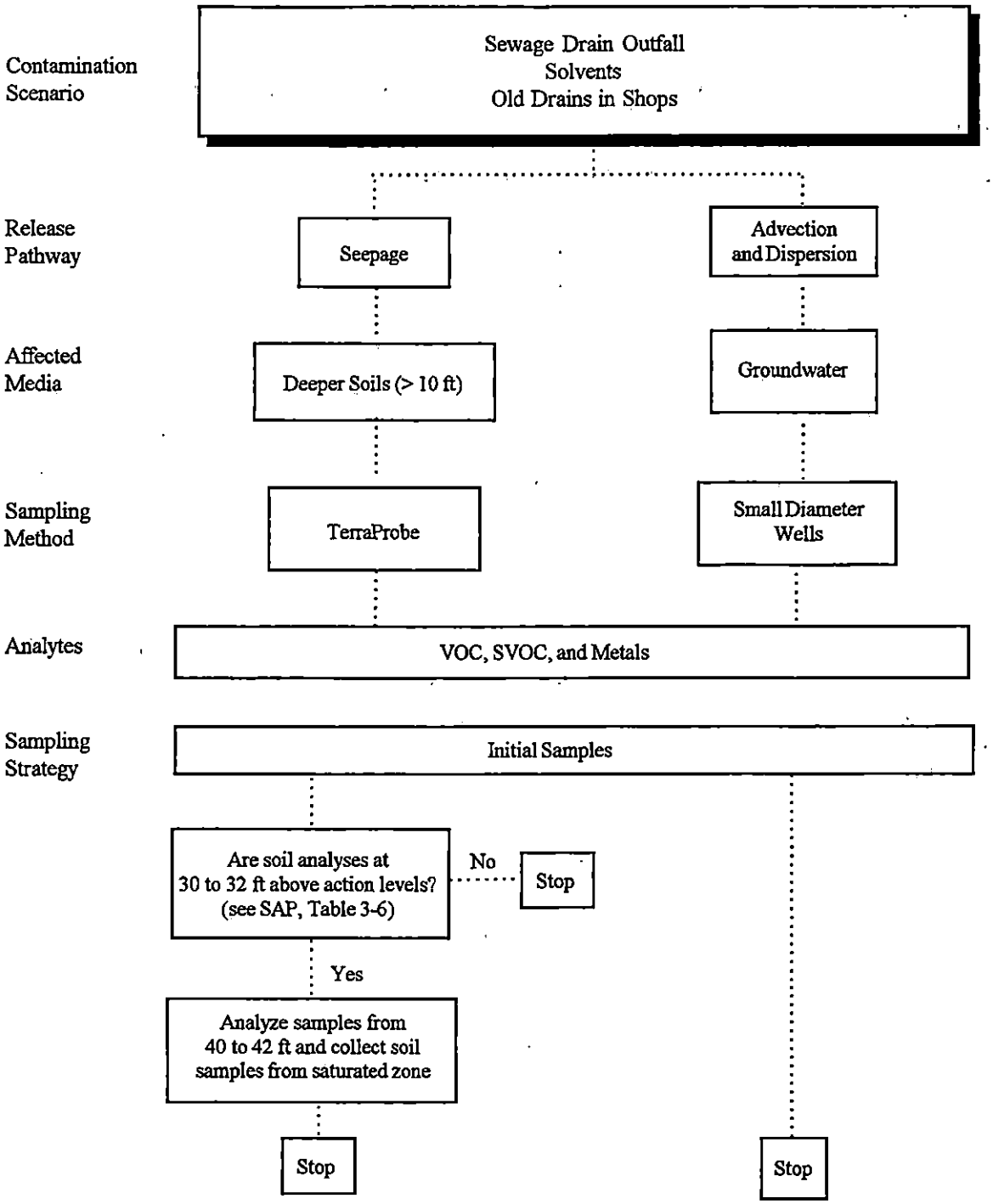


FIGURE 8-25
SAMPLING LOGIC DIAGRAM
SITE 8 - OLD BASE SEPTIC SYSTEMS
106 RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

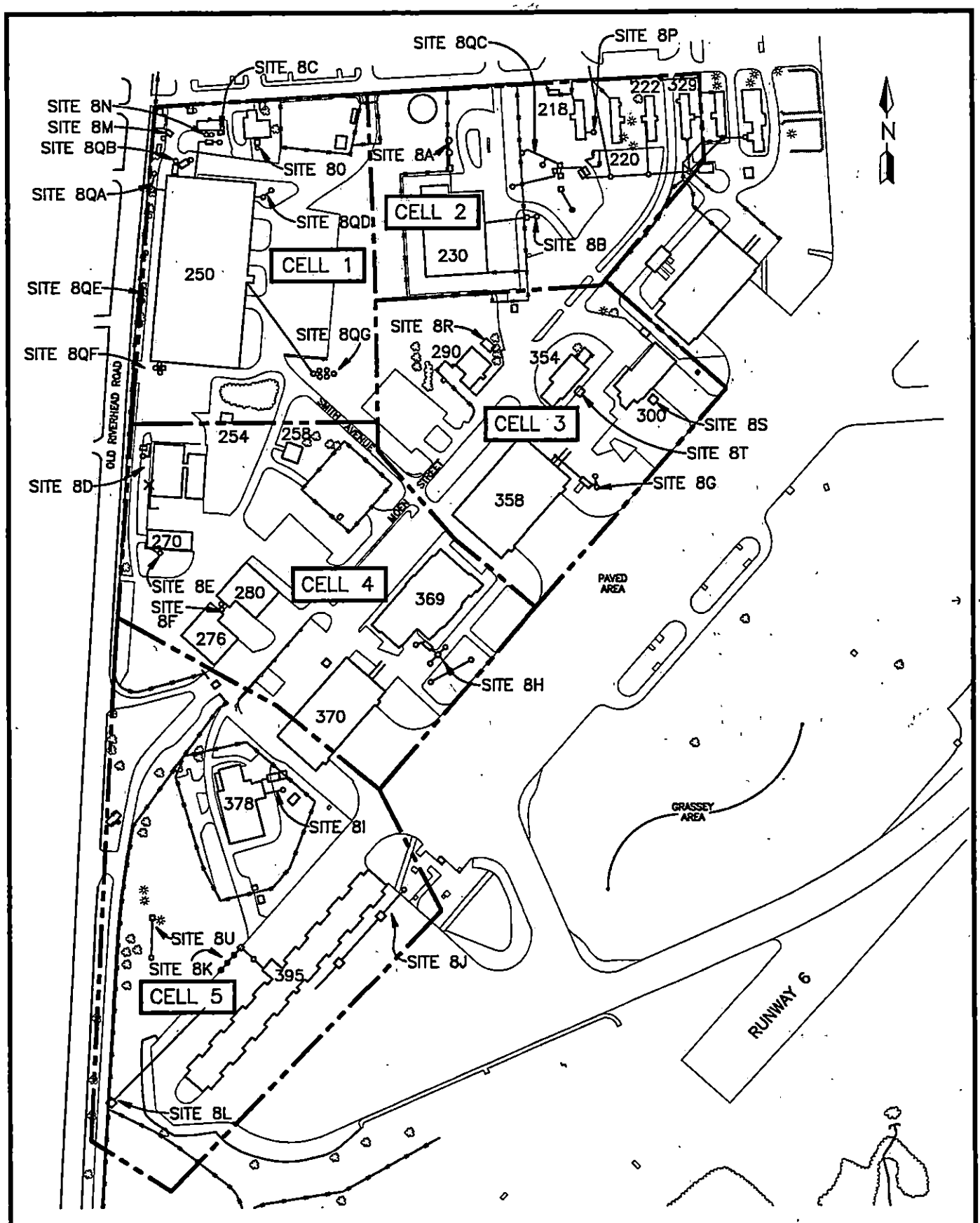


FIGURE 8–26
SITE 8 – OLD BASE SEPTIC SYSTEMS
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

ABB Environmental Services, Inc.

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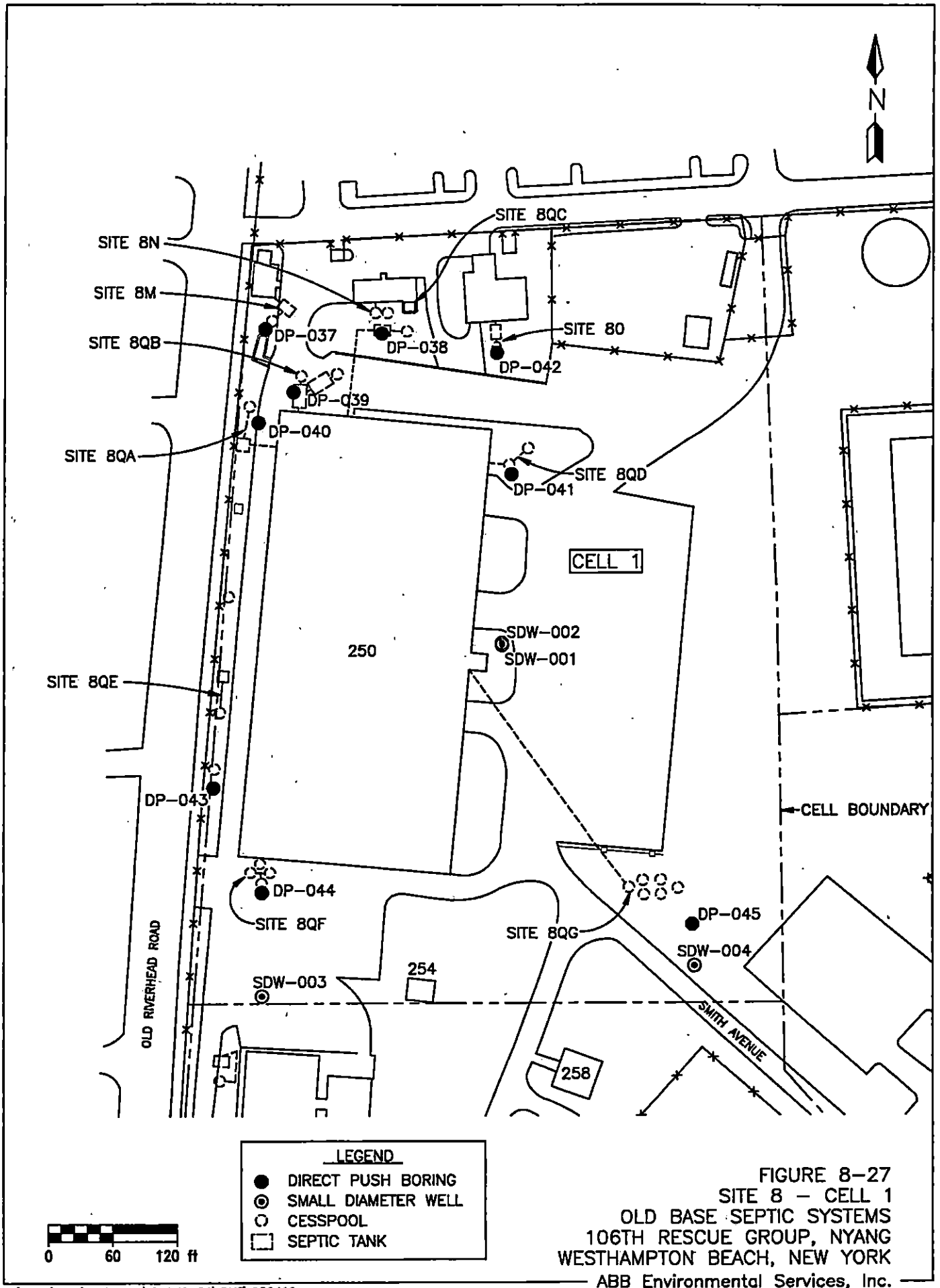


FIGURE 8-27
SITE 8 - CELL 1
OLD BASE SEPTIC SYSTEMS
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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Table 8-24
SAMPLE SUMMARY[1]
Site 8 - Old Base Septic Systems, Cell 1

106th Rescue Group, NYANG
Westhampton Beach, New York

Sample Location	Depth to Water (ft bgs)	Sample Designation	Sample Type	Depth/Interval (ft bgs)
DP-037	44	08SB001	Subsurface soil	20-22
		08SB002	Subsurface soil	30-32
		08GW035	Groundwater	45-47
DP-038	44	08SB004	Subsurface soil	20-22
		08SB005	Subsurface soil	30-32
		08GW036	Groundwater	45-47
DP-039	32.5	08SB007	Subsurface soil	20-22
		08SB008	Subsurface soil	30-32
		08GW037	Groundwater	43-45
DP-040	43	08SB010	Subsurface soil	20-22
		08SB011	Subsurface soil	30-32
		08GW038	Groundwater	43-45
DP-041	43	08SB013	Subsurface soil	20-22
		08SB014	Subsurface soil	30-32
		08GW039	Groundwater	43-45
DP-042	43.5	08SB016	Subsurface soil	20-22
		08SB017	Subsurface soil	30-32
		08GW040	Groundwater	45-47
DP-043	43	08SB019	Subsurface soil	20-22
		08SB020	Subsurface soil	30-32
		08GW041	Groundwater	43-45
DP-044	42	08SB022	Subsurface soil	20-22
		08SB023	Subsurface soil	30-32
		08GW042	Groundwater	43-45
DP-045	35	08SB025	Subsurface soil	20-22
		08SB026	Subsurface soil	30-32
		08GW043	Groundwater	39-41
SDW-001	38.8[2]	08GW001	Groundwater	34.6-44.6
		08GW002	Groundwater	34.6-44.6
SDW-002	39.0[2]	08GW003	Groundwater	64.8-69.8
		08GW004	Groundwater	64.8-69.8
SDW-003	42.2[2]	08GW005	Groundwater	36.7-46.7
		08GW006	Groundwater	36.7-46.7
SDW-004	35.8[2]	08GW007	Groundwater	32.0-42.0
		08GW008	Groundwater	32.0-42.0

[1] All samples were analyzed for VOCs, SVOCs, and metals except at DP-037 where the aromatic hydrocarbons were inadvertently not run.
[2] Measured December 2, 1994
bgs below ground surface

Analytical Results

Subsurface Soils Toluene, trans-1,2-dichloroethene, and three metals were identified in subsurface soils collected from this cell. Toluene was detected in five unsaturated soil samples obtained from DP-038 (cesspool 8C), DP-039 (8QB), DP-041 (8QD), and DP-042 (8O), and trans-1,2-dichloroethene was found in one unsaturated soil sample collected from DP-039. Chromium and lead were detected in one or more samples at all boring locations, and arsenic was found in the saturated sample obtained from DP-045 (8QG). No other analytes were found above reporting limits. Hits above action levels are summarized in Table 8-25.

Table 8-25
SUBSURFACE SOIL HITS ABOVE ACTION LEVELS
Site 8 - Old Base Septic Systems, Cell 1

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (mg/kg)	Action Level (mg/kg)
Arsenic	08SB026	DP-045	0.56	0.20
Chromium	08SB001	DP-037	0.96	0.84
	08SB023	DP-044	1.0	0.84
	08SB026	DP-045	0.90	0.84
Lead	08SB019	DP-043	1.2	0.65
	08SB020	DP-043	2.2	0.65
	08SB025	DP-045	0.90	0.65

mg/kg milligrams per kilogram

Groundwater 1,1,1-Trichloroethane, 1,1-dichloroethane, and cis-1,2-dichloroethene were detected in shallow groundwater at SDW-001 during the second round of groundwater monitoring. Bis(2ethylhexyl)phthalate was detected in the same well during the first round. Toluene was found at DP-045 (8QG). Chromium was detected in all groundwater samples obtained from direct push borings and at concentrations slightly greater than the reporting limit in two small diameter wells. No other analytes were found above reporting limits. Only chromium in groundwater samples collected from the direct push borings exceeds action levels (see Table 8-26).

Table 8-26
GROUNDWATER HITS ABOVE ACTION LEVELS
Site 8 - Old Base Septic Systems, Cell 1

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (µg/L)	Action Level (µg/L)
Chromium	08GW035	DP-037	260	50
	08GW036	DP-038	67	50
	08GW037	DP-039	110	50
	08GW038	DP-040	100	50
	08GW039	DP-041	540	50
	08GW042	DP-044	140	50
	08GW043	DP-045	290	50

µg/L micrograms per liter

8.2.7.4 Cell 2

Description Cell 2 encompasses the northeast part of the facility and is located east of and adjacent to Cell 1 (Figure 8-25). Four single structures or structure clusters were identified within this cell: 8A, 8B, 8C, and 8P. Sewage from buildings not located on NYANG leased property may be discharging into structures in Cell 2.

Sample Location and Description Eight borings, designated DP-046 through DP-053, were drilled at this cell between October 26 and 28, 1994. The borings were terminated between 29 and 34 ft bgs. Two subsurface soil samples were obtained from each boring, and groundwater samples were collected at four locations. Sample location information and compounds analyzed are summarized in Table 8-27. Boring locations are shown on Figure 8-25, and Figure 8-14 shows a cross section through Cell 2. Profile lines are shown in Figure 8-19.

Two shallow small diameter wells, designated SDW-005 and SDW-006, were installed in the southern portion of this cell on October 3 and 4, 1994 (Figure 8-28). Well depth, screened interval, and static water levels are summarized in Table 4-1. Sampling intervals are shown on Table 8-27.

Table 8-27
SAMPLE SUMMARY[1]
Site 8 - Old Base Septic Systems, Cell 2

106th Rescue Group, NYANG
Westhampton Beach, New York

Sample Location	Depth to Water (ft bgs)	Sample Designation	Sample Type	Depth/Interval (ft bgs)
DP-046	31	08SB031	Subsurface soil	20-22
		08SB032	Subsurface soil	27-29
		08GW044	Groundwater	32-34
DP-047	NE	08SB034	Subsurface soil	20-22
		08SB035	Subsurface soil	27-29
DP-048	30	08SB037	Subsurface soil	20-22
		08SB038	Subsurface soil	27-29
		08GW046	Groundwater	32-34
DP-049	NE	08SB040	Subsurface soil	20-22
		08SB041	Subsurface soil	27-29
DP-050	30	08SB043	Subsurface soil	20-22
		08SB044	Subsurface soil	27-29
		08GW048	Groundwater	32-34
DP-051	NE	08SB046	Subsurface soil	20-22
		08SB047	Subsurface soil	27-29
DP-052	30	08SB049	Subsurface soil	20-22
		08SB050	Subsurface soil	27-29
		08GW050	Groundwater	31-33
DP-053	NE	08SB052	Subsurface soil	20-22
		08SB053	Subsurface soil	27-29
SDW-005	31.1[2]	08GW009	Groundwater	27.5-37.5
		08GW010	Groundwater	27.5-37.5
SDW-006	30.0[2]	08GW011	Groundwater	26.4-36.4
		08GW012	Groundwater	26.4-36.4

1 All samples were analyzed for VOCs, SVOCs, and metals
2 Measured December 2, 1994
bgs below ground surface
NE Not encountered

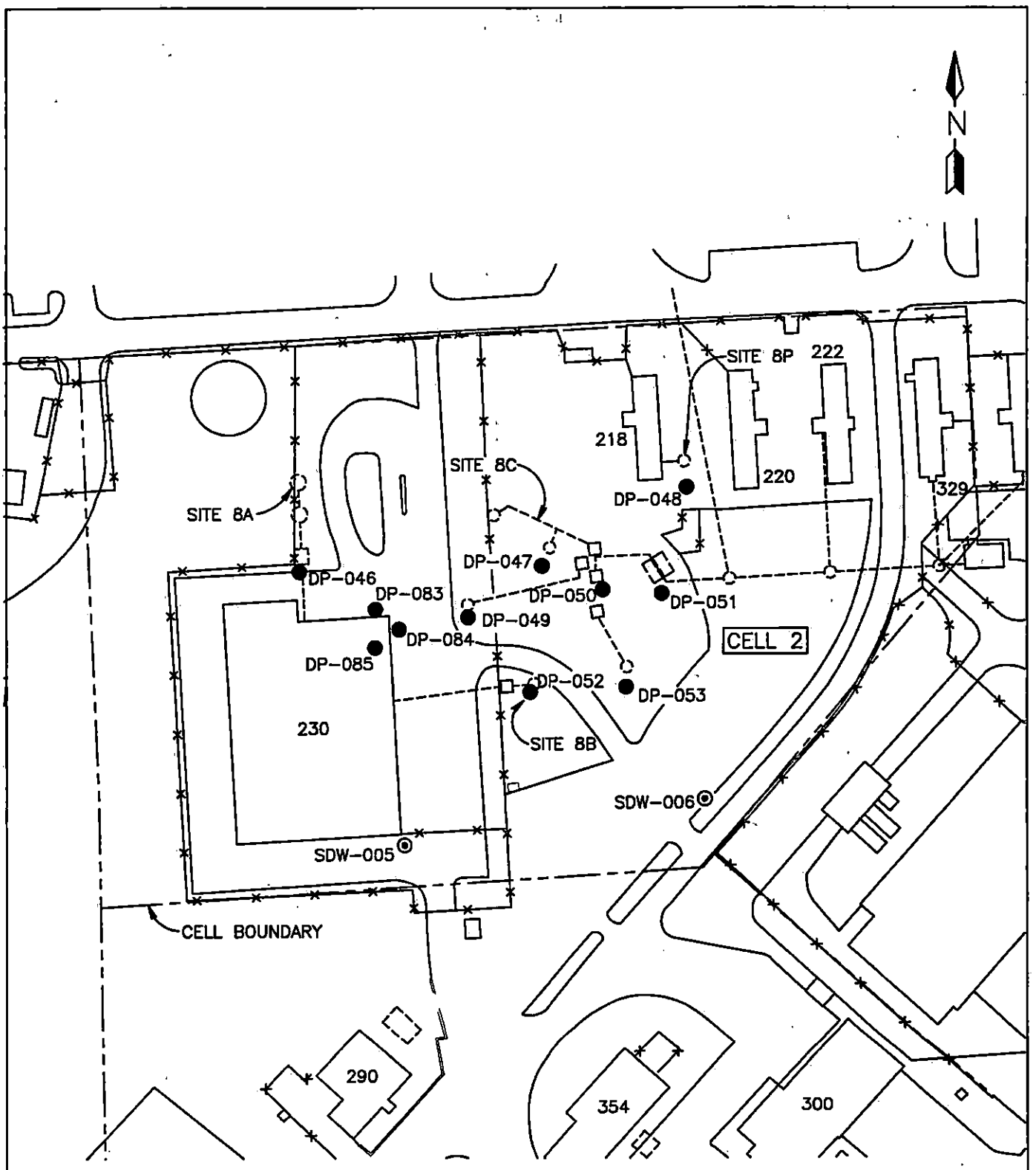


FIGURE 8-28
SITE 8 – CELL 2
OLD BASE SEPTIC SYSTEMS
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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Organic vapors were not detected with the FID in any sample. Organic vapors in the wells ranged from background to 2 ppm.

Analytical Results

Subsurface Soils One or more fuel-related compounds were detected in the saturated soils at DP-049 (8C) and the unsaturated soils at DP-048 (8P) and DP-050 (8C). 1,1,1-Trichloroethane was detected in the saturated soils at DP-051 (8C) . Chromium and lead are present in all subsurface samples, and silver was detected in six soils obtained from DP-047 (8C), DP-048, and DP-049. Hits above action levels are summarized in Table 8-28.

Groundwater Solvents and fuel-related compounds were detected in the groundwater samples obtained from SDW-005 (both sampling rounds) and DP-046 (8A). Fuel-related compounds were also detected at DP-048 (8P) and DP-050 (8C) (Figures 8-29 and 8-30). Chromium was detected only in the groundwater samples obtained from the direct push borings, and arsenic was detected in both monitoring rounds at SDW-005. Hits above action levels are summarized in Table 8-29.

8.2.7.5 Cell 3

Description Cell 3 encompasses the east-central part of the facility, southeast of Cell 1 and south of Cell 2 (Figure 8-25). Four single structures or structure clusters were identified within this cell: 8G, 8R, 8S, and 8T.

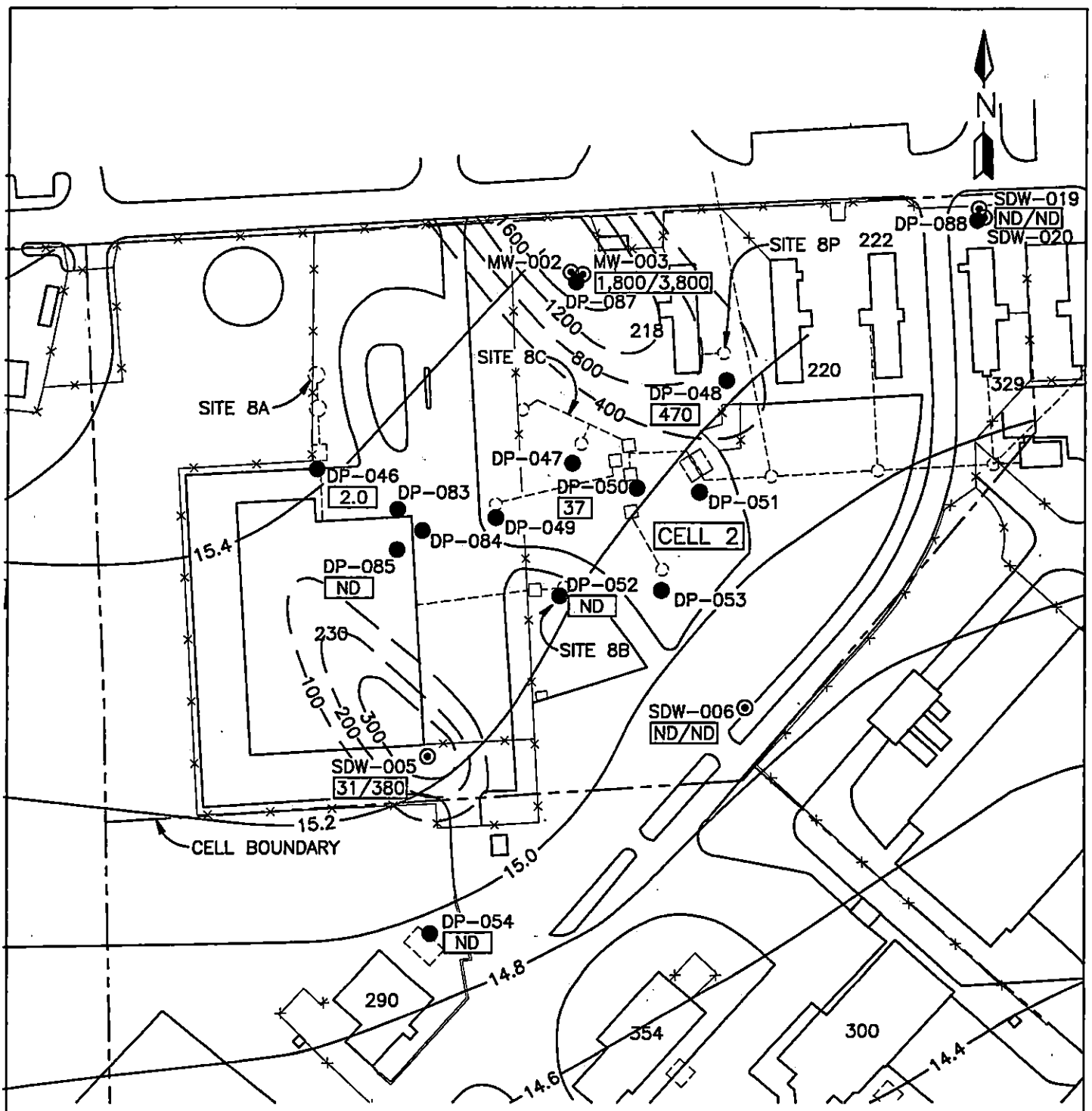
Sample Location and Description Four borings, designated DP-054 through DP-057, were drilled at this cell from October 26 through 29, 1994. The borings were terminated between 29 and 35 ft bgs. Two subsurface soil samples were obtained from each boring, and groundwater samples were collected at three locations. Sample location information and compounds analyzed are summarized in Table 8-30. Boring locations are shown on Figure 8-31, and Figure 8-14 shows a cross section through Cell 3. Profile lines are shown in Figure 8-19.

Table 8-28
SUBSURFACE SOIL HITS ABOVE ACTION LEVELS
Site 8 - Old Base Septic Systems, Cell 2

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (mg/kg)	Action Level (mg/kg)
m/p-Xylenes	08SB041	DP-049	0.013	0.012
Toluene	08SB041	DP-049	0.017	0.015
Chromium	08SB031	DP-046	4.5	0.84
	08SB034	DP-047	1.4	0.84
	08SB035	DP-047	1.3	0.84
	08SB040	DP-049	0.94	0.84
	08SB044	DP-050	0.87	0.84
	08SB050	DP-052	0.90	0.84
Lead	08SB034	DP-047	1.2	0.65
	08SB035	DP-047	1.0	0.65
	08SB040	DP-049	2.4	0.65
	08SB046	DP-051	1.1	0.65
	08SB049	DP-052	1.2	0.65
	08SB050	DP-052	0.93	0.65
	08SB052	DP-053	0.69	0.65
	08SB053	DP-053	0.82	0.65
Silver	08SB034	DP-047	0.82	0.20
	08SB035	DP-047	0.25	0.20
	08SB037	DP-048	17	0.20
	08SB038	DP-048	2.3	0.20
	08SB040	DP-049	3.0	0.20
	08SB041	DP-049	0.50	0.20

mg/kg milligrams per kilogram



LEGEND

- DIRECT PUSH BORING
- ⊙MW-001 EXISTING MONITOR WELL
- ⊙SDW-018 SMALL DIAMETER WELL
- CESSPOOL
- SEPTIC TANK
- POTENTIOMETRIC SURFACE CONTOUR (DECEMBER 1994)
- TOTAL FUEL ISOCON (ESTIMATED)
- 31 TOTAL FUEL CONCENTRATION (micrograms per liter)
- 31/380 1st ROUND/2nd ROUND SAMPLING RESULTS (micrograms per liter)
- ND NOT DETECTED

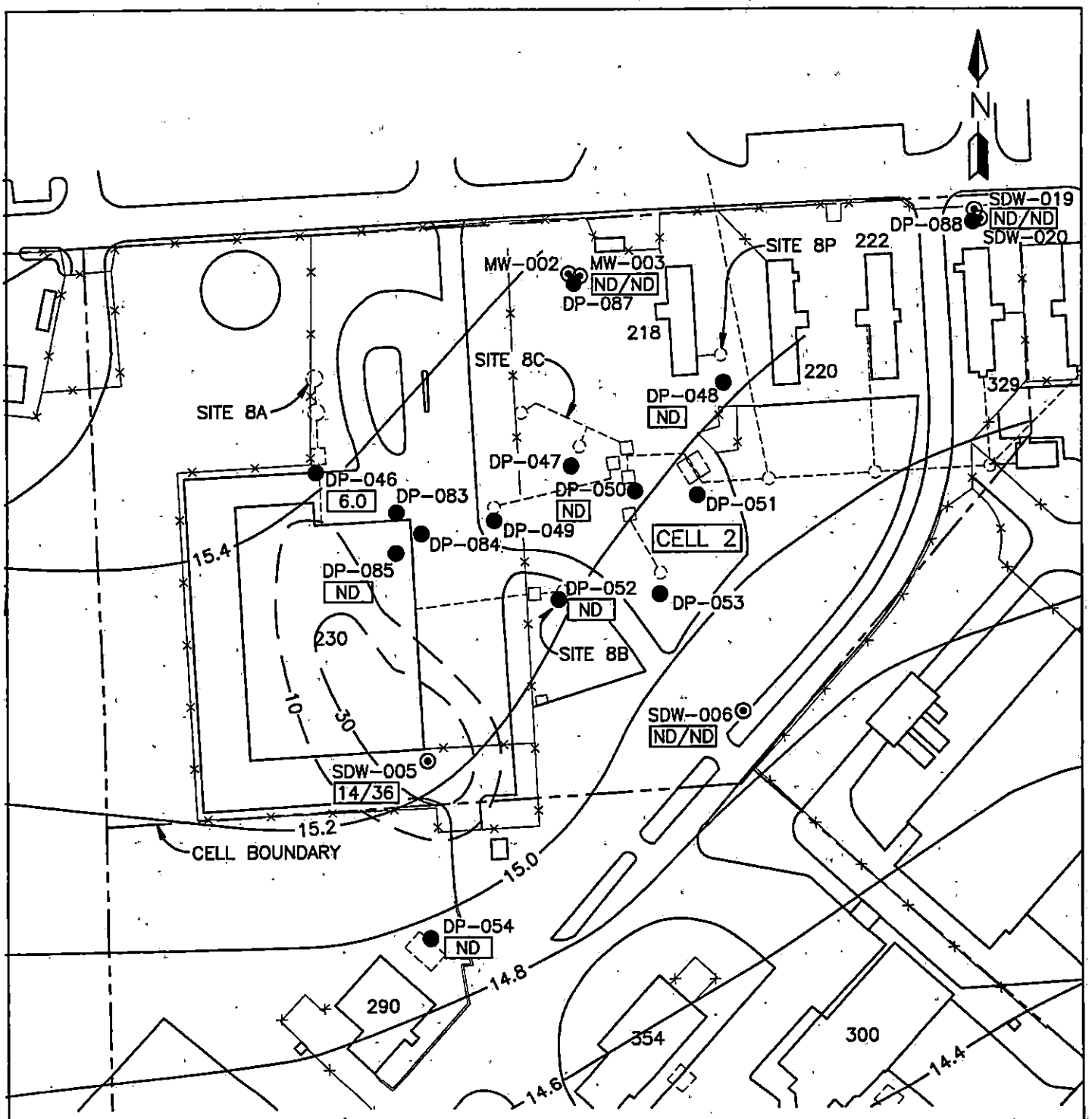
0 60 120 ft

NOTE:
ANALYTICAL DATA FROM THE DIRECT PUSH BORINGS AND SECOND ROUND SAMPLING RESULTS FROM THE SMALL DIAMETER WELLS (OCTOBER AND NOVEMBER 1994) WERE USED TO CONSTRUCT THIS FIGURE.

FIGURE 8-29
TOTAL FUEL ISOCONCENTRATION CONTOURS IN SHALLOW GROUNDWATER
SITE 8 – CELL 2
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

ABB Environmental Services, Inc.

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LEGEND

- DIRECT PUSH BORING
- ◉MW-001 EXISTING MONITOR WELL
- ◉SDW-018 SMALL DIAMETER WELL
- CESSPOOL
- SEPTIC TANK
- POTENTIOMETRIC SURFACE CONTOUR (DECEMBER 1994)
- TETRACHLOROETHENE ISOCON (ESTIMATED)
- 31 TETRACHLOROETHENE CONCENTRATION (micrograms per liter)
- 31/380 1st ROUND/2nd ROUND SAMPLING RESULTS (micrograms per liter)
- ND NOT DETECTED

0 60 120 ft

NOTE:
ANALYTICAL DATA FROM THE DIRECT PUSH BORINGS AND SECOND ROUND SAMPLING RESULTS FROM THE SMALL DIAMETER WELLS (OCTOBER AND NOVEMBER 1994) WERE USED TO CONSTRUCT THIS FIGURE.

FIGURE 8-30
TETRACHLOROETHENE ISOCONCENTRATION CONTOURS IN SHALLOW GROUNDWATER
SITE 8 – CELL 2
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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Table 8-29
GROUNDWATER HITS ABOVE ACTION LEVELS
Site 8 - Old Base Septic Systems, Cell 3

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (µg/L)	Action Level (µg/L)
Direct Push Borings				
Tetrachloroethene	08GW044	DP-046	6.0	5.0
Ethylbenzene	08GW046	DP-048	150	5.0
	08GW048	DP-050	11	5.0
m/p-Xylenes	08GW046	DP-048	190	10
o-Xylene	08GW046	DP-048	12	5.0
Naphthalene	08GW046	DP-048	120	10
	08GW048	DP-050	19	10
Chromium	08GW044	DP-046	69	50
	08GW050	DP-052	64	50
Small Diameter Wells				
1,2-Dichlorobenzene	08GW010 **	SDW-005	190	5.0
1,3-Dichlorobenzene	08GW009 *	SDW-005	18	5.0
	08GW010 **	SDW-005	81	5.0
1,4-Dichlorobenzene	08GW009 *	SDW-005	13	5.0
	08GW010 **	SDW-005	82	5.0
Ethylbenzene	08GW010 **	SDW-005	7.7	5.0
Tetrachloroethene	08GW009 *	SDW-005	14	5.0
	08GW010 **	SDW-005	36	5.0
Naphthalene	08GW010 **	SDW-005	16	10
Arsenic	08GW010 **	SDW-005	27	25

* First round groundwater sampling
** Second round groundwater sampling
µg/L micrograms per liter

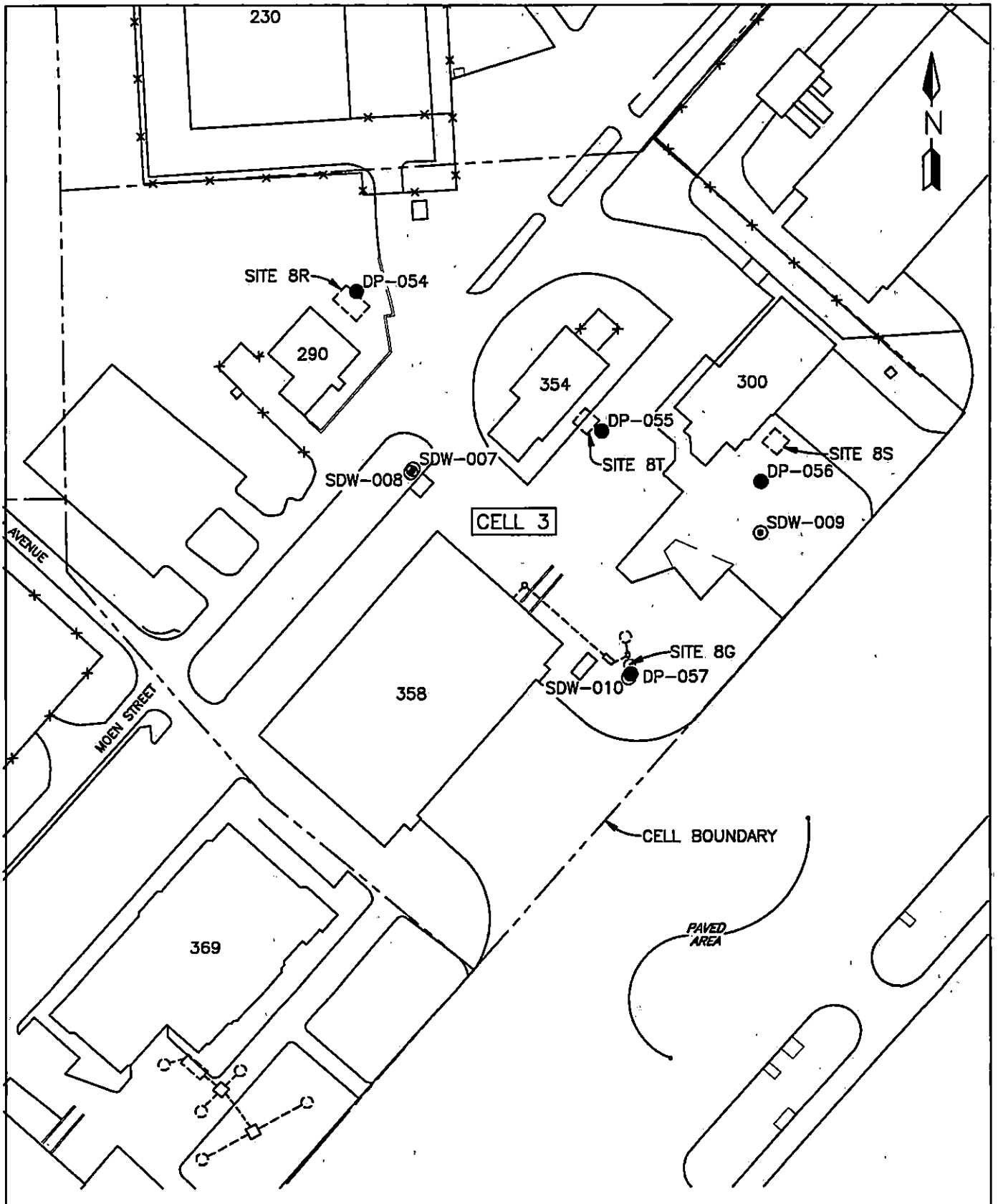


FIGURE 8-31
SITE 8 – CELL 3
OLD BASE SEPTIC SYSTEMS
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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Table 8-30
SAMPLE SUMMARY[1]
Site 8 - Old Base Septic Systems, Cell 3

106th Rescue Group, NYANG
Westhampton Beach, New York

Sample Location	Depth to Water (ft bgs)	Sample Designation	Sample Type	Depth/Interval (ft bgs)
DP-054	32	08SB056	Subsurface soil	20-22
		08SB057	Subsurface soil	28-30
		08GW052	Groundwater	33-35
DP-055	NE	08SB059	Subsurface soil	20-22
		08SB060	Subsurface soil	27-29
DP-056	28	08SB062	Subsurface soil	20-22
		08SB063	Subsurface soil	26-28
		08GW054	Groundwater	29-31
DP-057	30	08SB065	Subsurface soil	20-22
		08SB066	Subsurface soil	27-29
		08GW055	Groundwater	32-34
SDW-007	30.8[2]	08GW013	Groundwater	57.0-62.0
			Groundwater	57.0-62.0
SDW-008	30.6[2]	08GW015	Groundwater	26.5-36.5
		08GW016	Groundwater	26.5-36.5
SDW-009	28.6[2]	08GW017	Groundwater	25.3-35.3
		08GW018	Groundwater	25.3-35.3
SDW-010	30.3[2]	08GW019	Groundwater	27.7-37.7
		08GW020	Groundwater	27.7-37.7

[1] All samples were analyzed for VOCs, SVOCs, and metals
[2] Measured December 2, 1994
bgs below ground surface
NE Not encountered

Four small diameter wells, designated SDW-007 through SDW-010, were installed at this cell between September 29 and October 3, 1994 (Figure 8-31). One shallow and deep well cluster was installed southeast of Building 290, and two shallow wells were installed near 8G and south of 8S. Well depth, screened interval, and static water levels are summarized in Table 4-1 and sampling intervals are shown on Table 8-30.

Organic vapors were not detected with the FID in any sample. Organic vapors in the wells ranged from background to four ppm.

Analytical Results

Subsurface Soils Chromium and lead were the only analytes detected in the subsurface soil samples obtained from this cell . Lead was detected in one or more samples collected from every boring, and chromium was detected at three locations. Hits above action levels are summarized in Table 8-31.

Table 8-31
SUBSURFACE SOIL HITS ABOVE ACTION LEVELS
Site 8 - Old Base Septic Systems, Cell 3

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (mg/kg)	Action Level (mg/kg)
Chromium	08SB062	DP-056	1.2	0.84
Lead	08SB062	DP-056	0.68	0.65
	08SB066	DP-057	1.1	0.65

mg/kg milligrams per kilogram

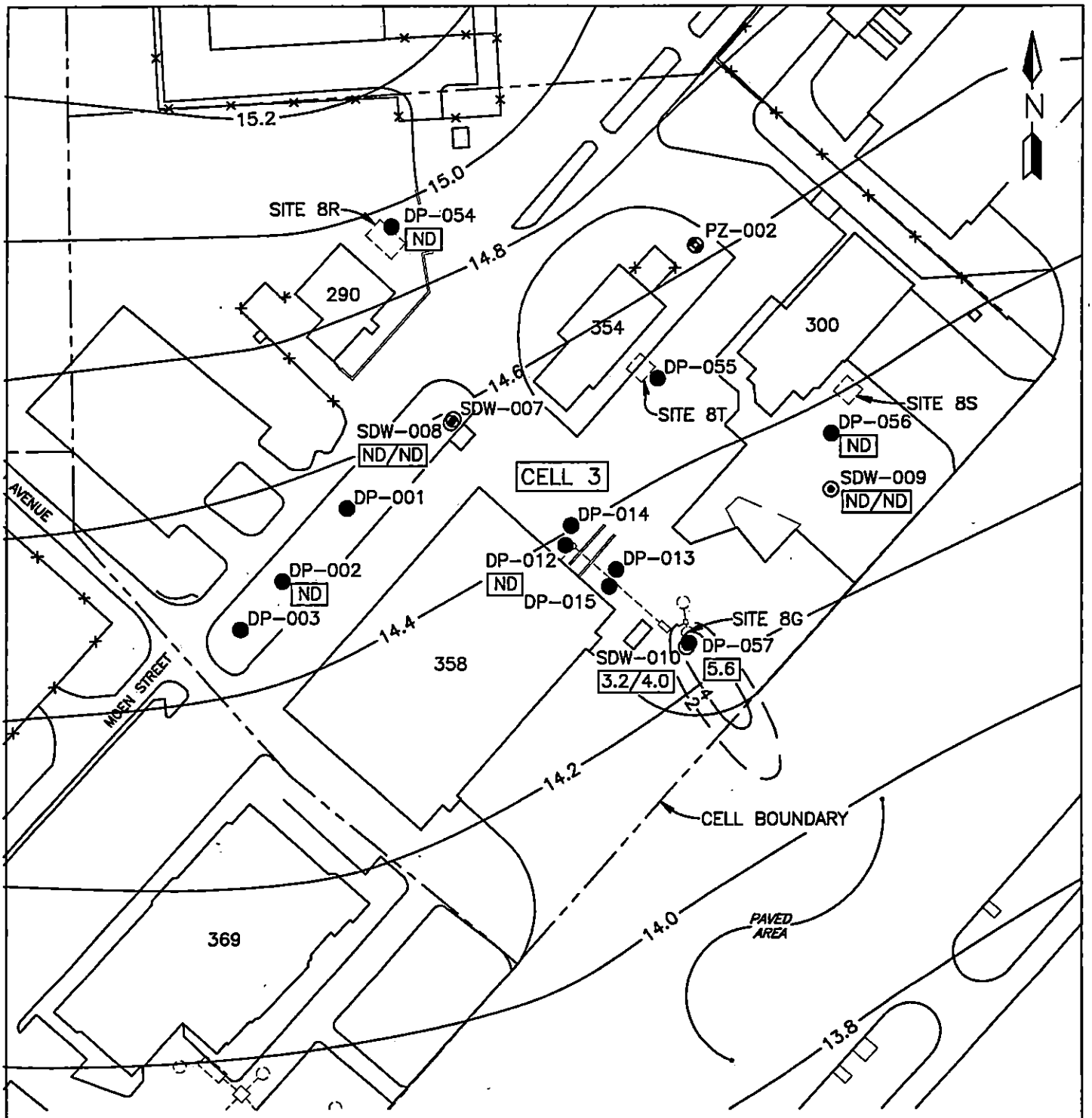
Groundwater Tetrachloroethene, trichloroethene, naphthalene, and chromium were detected in the groundwater samples obtained from this cell. No other analytes were found above reporting limits. Naphthalene was detected during the first sampling event in SDW-007, which is located in the Site 1 drainage swale. Tetrachloroethene was detected in groundwater south of 8G (east of Building 358) in DP-057 and at SDW-010 (both rounds) (Figure 8-32). Trichloroethene was also detected at DP-057. Chromium was detected at five locations. Hits above action levels are summarized in Table 8-32.

Table 8-32
GROUNDWATER HITS ABOVE ACTION LEVELS
Site 8 - Old Base Septic Systems, Cell 3

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (µg/L)	Action Level (µg/L)
Tetrachloroethene	08GW055	DP-057	5.6	5.0

µg/L micrograms per liter



NOTE:
ANALYTICAL DATA FROM THE DIRECT PUSH BORINGS AND SECOND ROUND SAMPLING RESULTS FROM THE SMALL DIAMETER WELLS (OCTOBER AND NOVEMBER 1994) WERE USED TO CONSTRUCT THIS FIGURE.

FIGURE 8-32
TETRACHLOROETHENE ISOCONCENTRATION CONTOURS IN SHALLOW GROUNDWATER
SITE 8 - CELL 3
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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8.2.7.6 Cell 4

Description Cell 4 encompasses the west-central portion of the facility and is located southwest of Cell 3 and south of Cell 1 (Figure 8-25). Four single structures or structure clusters were identified within this cell: 8D, 8E, 8F, and 8H.

Sample Location and Description Seven borings, designated DP-058 through DP-064, were drilled at this cell from October 20 through 27, 1994. The borings were terminated between 32 and 47 ft bgs. Two subsurface soil samples were obtained from each boring, and groundwater samples were collected at four locations. Sample location information and compounds analyzed are summarized in Table 8-33. Boring locations are shown on Figure 8-33, and Figure 8-34 shows a cross section through Cell 4. Profile lines are shown in Figure 8-19.

Three shallow small diameter wells, designated SDW-011 through SDW-013, were installed at this cell between September 30 and October 3, 1994 (Figure 8-33). Well depth, screened interval, and static water levels are summarized in Table 4-1 and sampling intervals are shown on Table 8-33.

Organic vapors (up to 900 ppm) were detected with the FID in two unsaturated soil samples collected at DP-060 (8F). Organic vapors in the wells ranged from background to two ppm.

Analytical Results

Subsurface Soils Fuel-related compounds, solvents, and metals were detected in unsaturated soil samples obtained from DP-060 (8F) at Buildings 276 and 280. Chromium and lead were detected in all samples, and arsenic and silver were found in the unsaturated soils at DP-064 (8H). Hits above action levels are summarized in Table 8-34.

Table 8-33
SAMPLE SUMMARY [1]
Site 8 - Old Base Septic Systems, Cell 4

106th Rescue Group, NYANG
Westhampton Beach, New York

Sample Location	Depth to Water (ft bgs)	Sample Designation	Sample Type	Depth/Interval (ft bgs)
DP-058	43	08SB070	Subsurface soil	20-22
		08SB071	Subsurface soil	30-32
		08GW056	Groundwater	45-47
DP-059	NE	08SB073	Subsurface soil	20-22
		08SB074	Subsurface soil	30-32
DP-060	43	08SB076	Subsurface soil	20-22
		08SB077	Subsurface soil	30-32
		08GW058	Groundwater	45-47
DP-061	NE	08SB079	Subsurface soil	20-22
		08SB080	Subsurface soil	30-32
DP-062	35	08SB082	Subsurface soil	20-22
		08SB083	Subsurface soil	30-32
		08GW060	Groundwater	36-38
DP-063	NE	08SB085	Subsurface soil	20-22
		08SB086	Subsurface soil	30-32
DP-064	35	08SB088	Subsurface soil	20-22
		08SB089	Subsurface soil	30-32
		08GW062	Groundwater	36-38
SDW-011	41.0 [2]	08GW021	Groundwater	37.7-47.7
		08GW022	Groundwater	37.7-47.7
SDW-012	36.1 [2]	08GW023	Groundwater	31.7-41.7
		08GW024	Groundwater	31.7-41.7
SDW-013	38.7 [2]	08GW025	Groundwater	35.3-45.3
		08GW026	Groundwater	35.3-45.3

1 All samples were analyzed for VOCs, SVOCs, and metals
2 Measured December 2, 1994
bgs below ground surface
NE Not encountered

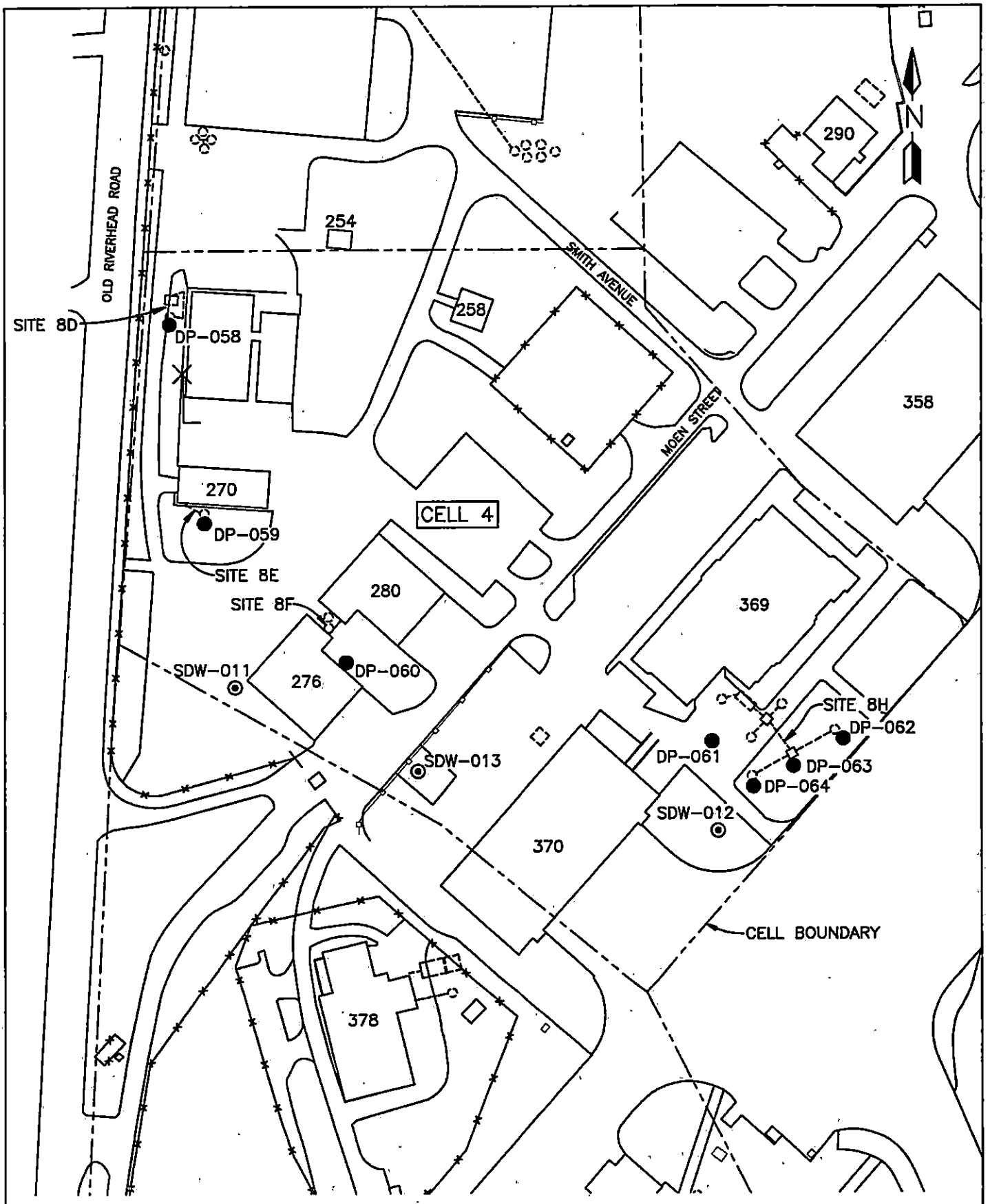


FIGURE 8-33
SITE 8 - CELL 4
OLD BASE SEPTIC SYSTEMS
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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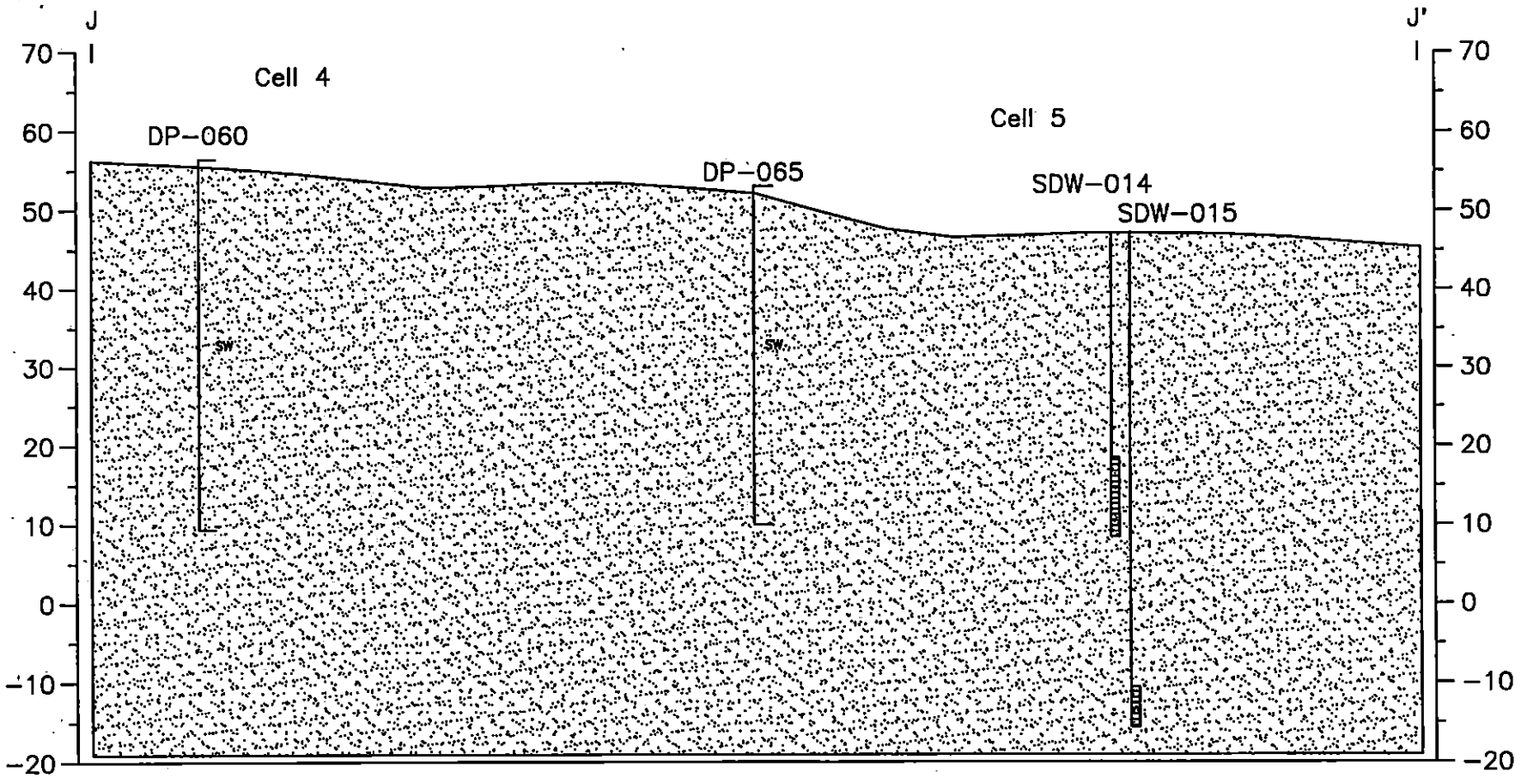


FIGURE 8-34
Cross Section J-J'
Site 8, Cells 4 & 5
106th rescue Group, NYANG
Westhampton Beach, New York

ABB Environmental Services, Inc.

A9609002/6943.30/A003

Table 8-34
SUBSURFACE SOIL HITS ABOVE ACTION LEVELS
Site 8 - Old Base Septic Systems, Cell 4

106th Rescue Group, NYANG
Westhampton Beach, New York

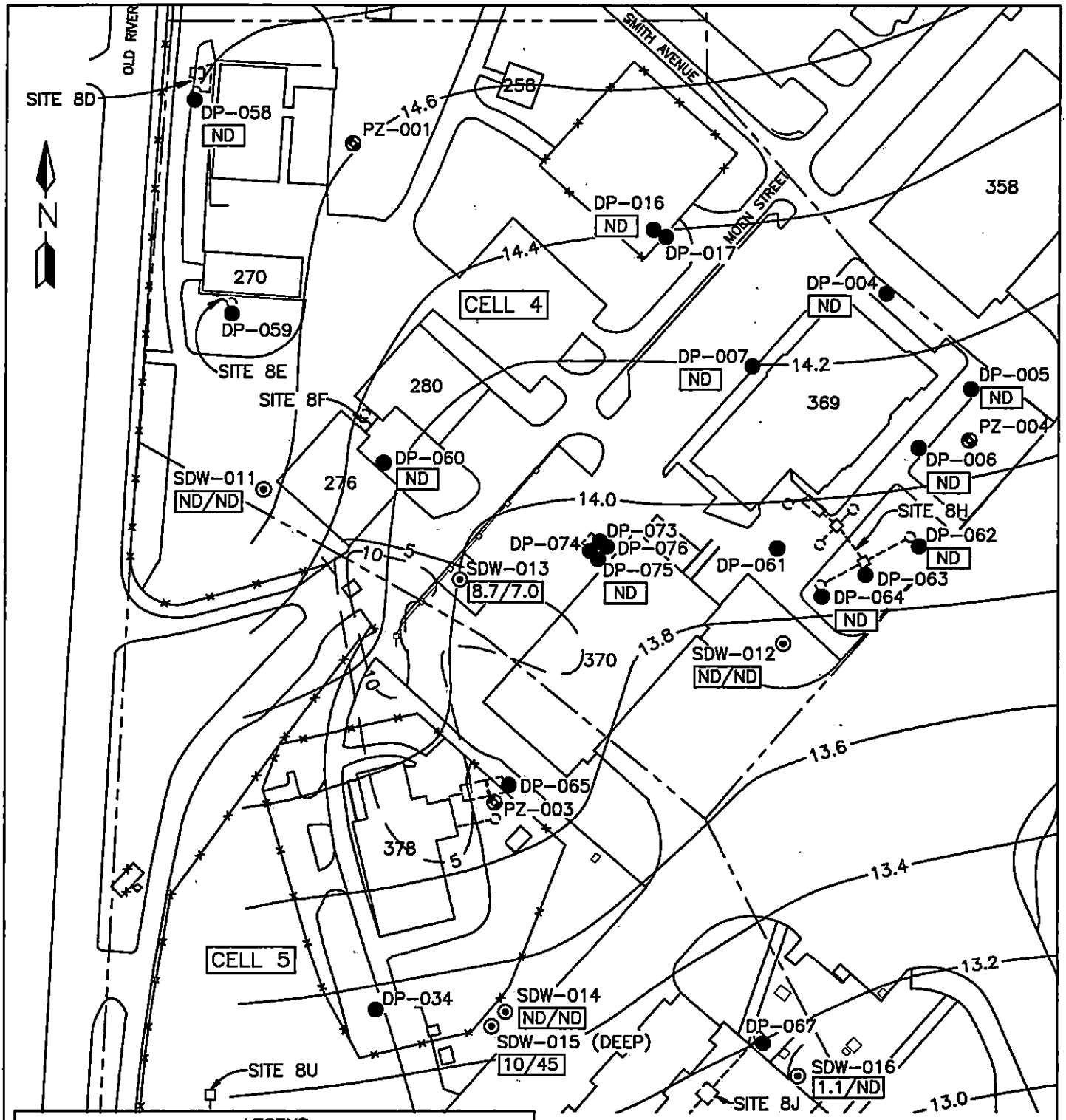
Analyte	Sample ID	Sample Location	Concentration (mg/kg)	Action Level (mg/kg)
Benzene	08SB076	DP-060	0.22	0.06
m/p-Xylenes	08SB076	DP-060	5.3	1.2
o-Xylene	08SB076	DP-060	27	1.2
Naphthalene	08SB076	DP-060	28	13
Arsenic	08SB076	DP-060	0.26	0.20
	08SB088	DP-064	0.35	0.20
Cadmium	08SB076	DP-060	0.22	0.20
Chromium	08SB076	DP-060	1.1	0.84
	08SB079	DP-061	1.3	0.84
Lead	08SB076	DP-060	3.6	0.65
	08SB077	DP-060	2.9	0.65
Silver	08SB088	DP-064	0.25	0.20

mg/kg milligrams per kilogram

Groundwater Fuel-related compounds were detected in the groundwater collected from DP-060. None of these constituents exceeds action levels. Solvents, including trichloroethene, were found at SDW-011 and southeast of Buildings 276 and 280 at SDW-013 (Figure 8-35). Chromium was detected in all groundwater samples but exceeds action levels only in the direct push borings. Hits above action levels are summarized in Table 8-35.

8.2.7.7 Cell 5

Description Cell 5 encompasses the southern portion of the facility south of Cell 4 (Figure 8-25). Five single structures or structure clusters were identified within this cell: 8I, 8J, 8K, 8L, and 8U.



LEGEND

- DIRECT PUSH BORING
- MW-001 EXISTING MONITOR WELL
- SDW-018 SMALL DIAMETER WELL
- PIEZOMETER
- CESSPOOL
- SEPTIC TANK
- POTENTIOMETRIC SURFACE CONTOUR (DECEMBER 1994)
- TRICHLOROETHENE ISOCON (ESTIMATED)
- 31 TRICHLOROETHENE CONCENTRATION (micrograms per liter)
- 31/380 1st-ROUND/2nd ROUND SAMPLING RESULTS (microgrags per liter)
- ND NOT DETECTED

NOTES:

1. ANALYTICAL DATA FROM THE DIRECT PUSH BORINGS AND SECOND ROUND SAMPLING RESULTS FROM THE SMALL DIAMETER WELLS (OCTOBER AND NOVEMBER 1994) WERE USED TO CONSTRUCT THIS FIGURE.
2. SOUTHWEST EXTENT OF PLUME IS ESTIMATED BASED ON THE PRESENCE OF TRICHLOROETHENE IN DEEPER GROUNDWATER SAMPLES OBTAINED FROM SDW-015 AND ITS ABSENCE IN SHALLOW SAMPLES COLLECTED FROM SDW-014.

FIGURE 8-35
TRICHLOROETHENE ISOCONCENTRATION CONTOURS IN SHALLOW GROUNDWATER
SITE 8 - CELLS 4 & 5
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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Table 8-35
GROUNDWATER HITS ABOVE ACTION LEVELS
Site 8 - Old Base Septic Systems, Cell 4

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (µg/L)	Action Level (µg/L)
Trichloroethene	08GW025 *	SDW-013	8.7	5.0
	08GW026 **	SDW-013	7.2	5.0
Chromium	08GW056	DP-058	56	50
	08GW058	DP-060	350	50
	08GW060	DP-062	61	50
	08GW062	DP-064	54	50

* First round groundwater sampling
** Second round groundwater sampling
µg/L micrograms per liter

Sample Location and Description Five borings, designated DP-065 through DP-069, were drilled at this cell on October 3 and 4, 1994. The borings were terminated at 39 and 42 ft bgs. Two to three subsurface soil samples were obtained from each boring. Sample location information is summarized in Table 8-36. Boring locations are shown on Figure 8-36, and Figure 8-35 shows a cross section through Cell 5. Profile lines are shown in Figure 8-19.

Four small diameter wells, designated SDW-014 through SDW-017, were installed at this cell on October 1 and 2, 1994 (Figure 8-36). A shallow and deep well cluster was installed southeast of Building 378, and two shallow wells were installed northeast of Building 395 and south of 8U. Well depth, screened interval, and static water levels are summarized in Table 4-1 and sampling intervals are shown on Table 8-36.

Organic vapors were not detected with the FID in any of the soil samples collected from this cell. Organic vapors in the wells ranged from background to seven ppm.

Table 8-36
SAMPLE SUMMARY [1]
Site 8 - Old Base Septic Systems, Cell 5

106th Rescue Group, NYANG
Westhampton Beach, New York

Sample Location	Depth to Water (ft bgs)	Sample Designation	Sample Type	Depth/Interval (ft bgs)
DP-065	39	08SB092	Subsurface soil	20-22
		08SB093	Subsurface soil	30-32
DP-066	39	08SB095	Subsurface soil	20-22
		08SB096	Subsurface soil	30-32
		08SB097	Subsurface soil	40-42
DP-067	36	08SB098	Subsurface soil	20-22
		08SB099	Subsurface soil	30-32
		08SB100	Subsurface soil	36-38
DP-068	39	08SB101	Subsurface soil	20-22
		08SB102	Subsurface soil	30-32
DP-069	39	08SB104	Subsurface soil	20-22
		08SB105	Subsurface soil	30-32
		08SB106	Subsurface soil	40-42
SDW-014	33.8 [2]	08GW027	Groundwater	28.6-38.6
		08GW028	Groundwater	28.6-38.6
SDW-015	34.0 [2]	08GW029	Groundwater	57.7-62.7
		08GW030	Groundwater	57.7-62.7
SDW-016	33.8 [2]	08GW031	Groundwater	29.4-39.4
		08GW032	Groundwater	29.4-39.4
SDW-017	34.2 [2]	08GW033	Groundwater	29.4-39.4
		08GW034	Groundwater	29.4-39.4

1 All samples were analyzed for VOCs, SVOCs, and metals
2 Measured December 2, 1994
bgs below ground surface

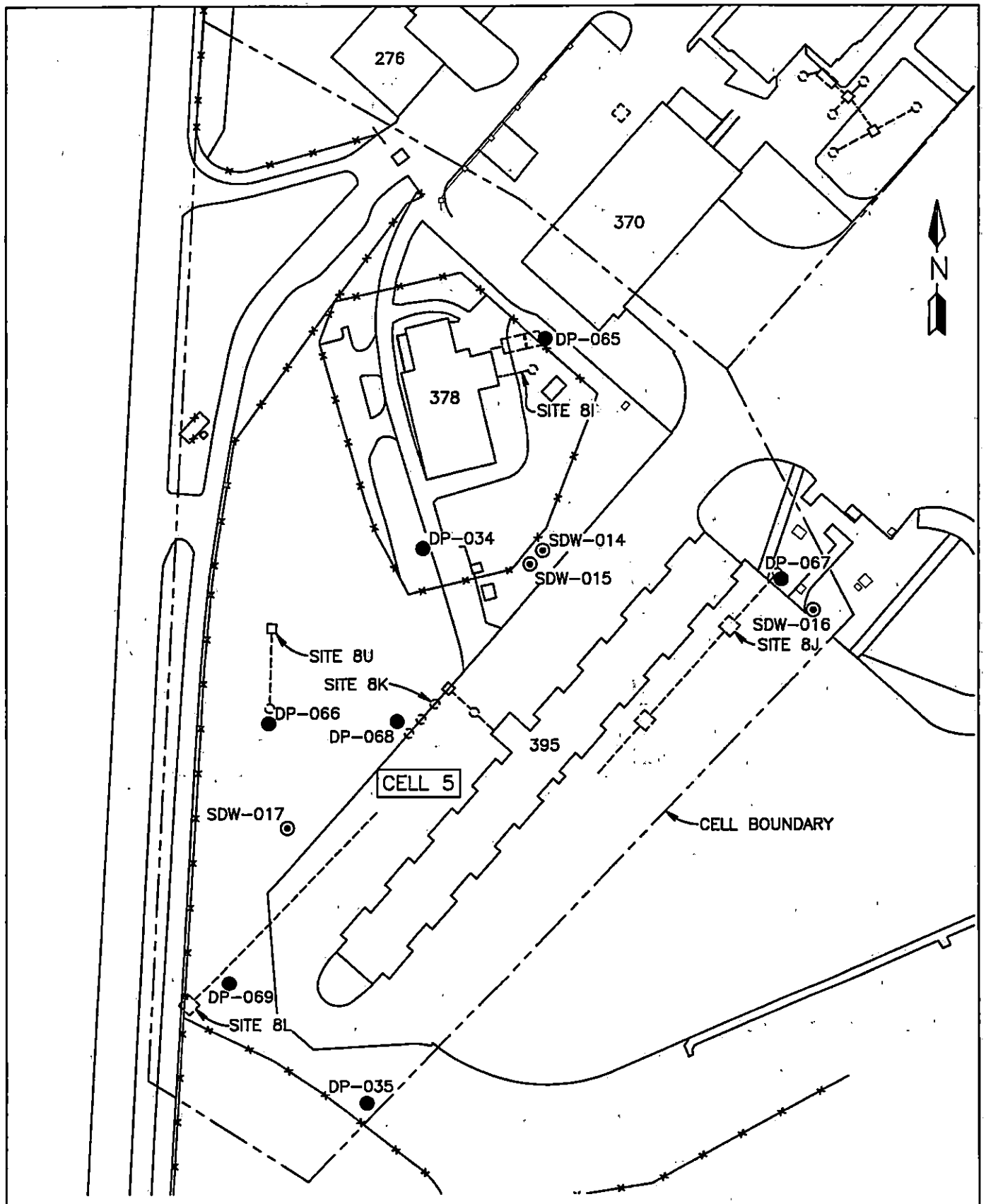


FIGURE 8-36
SITE 8 - CELL 5
OLD BASE SEPTIC SYSTEMS
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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Analytical Results

Subsurface Soils Four metals were detected in the subsurface soils obtained from this cell. No other analytes were found above reporting limits. Arsenic was detected in the unsaturated soils at DP-066 (8U) and DP-068 (8K). Chromium and lead were detected in every sample, and silver was found in one unsaturated soil sample collected from DP-066. Hits above action levels are summarized in Table 8-37.

Table 8-37
SUBSURFACE SOIL HITS ABOVE ACTION LEVELS
Site 8 - Old Base Septic Systems, Cell 5

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (mg/kg)	Action Level (mg/kg)
Arsenic	08SB095	DP-066	0.53	0.20
	08SB096	DP-066	0.23	0.20
	08SB102	DP-068	0.25	0.20
Chromium	08SB095	DP-066	2.6	0.84
Lead	08SB095	DP-066	0.71	0.65
Silver	08SB095	DP-066	0.22	0.20

mg/kg milligrams per kilogram

Groundwater Three VOCs, one SVOC, and one metal were detected in groundwater samples collected from this cell. No other analytes were found above reporting limits. Trichloroethene, benzene, and naphthalene were detected at SDW-015; trichloroethene and tetrachloroethene were detected at SDW-016. Chromium was found at three locations. Hits above action levels are summarized in Table 8-38.

Table 8-38
GROUNDWATER HITS ABOVE ACTION LEVELS
Site 8 - Old Base Septic Systems, Cell 5

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (µg/L)	Action Level (µg/L)
Benzene	08GW029 [1]	SDW-015	5.0	5.0
Trichloroethene	08GW029 [2]	SDW-015	10	5.0

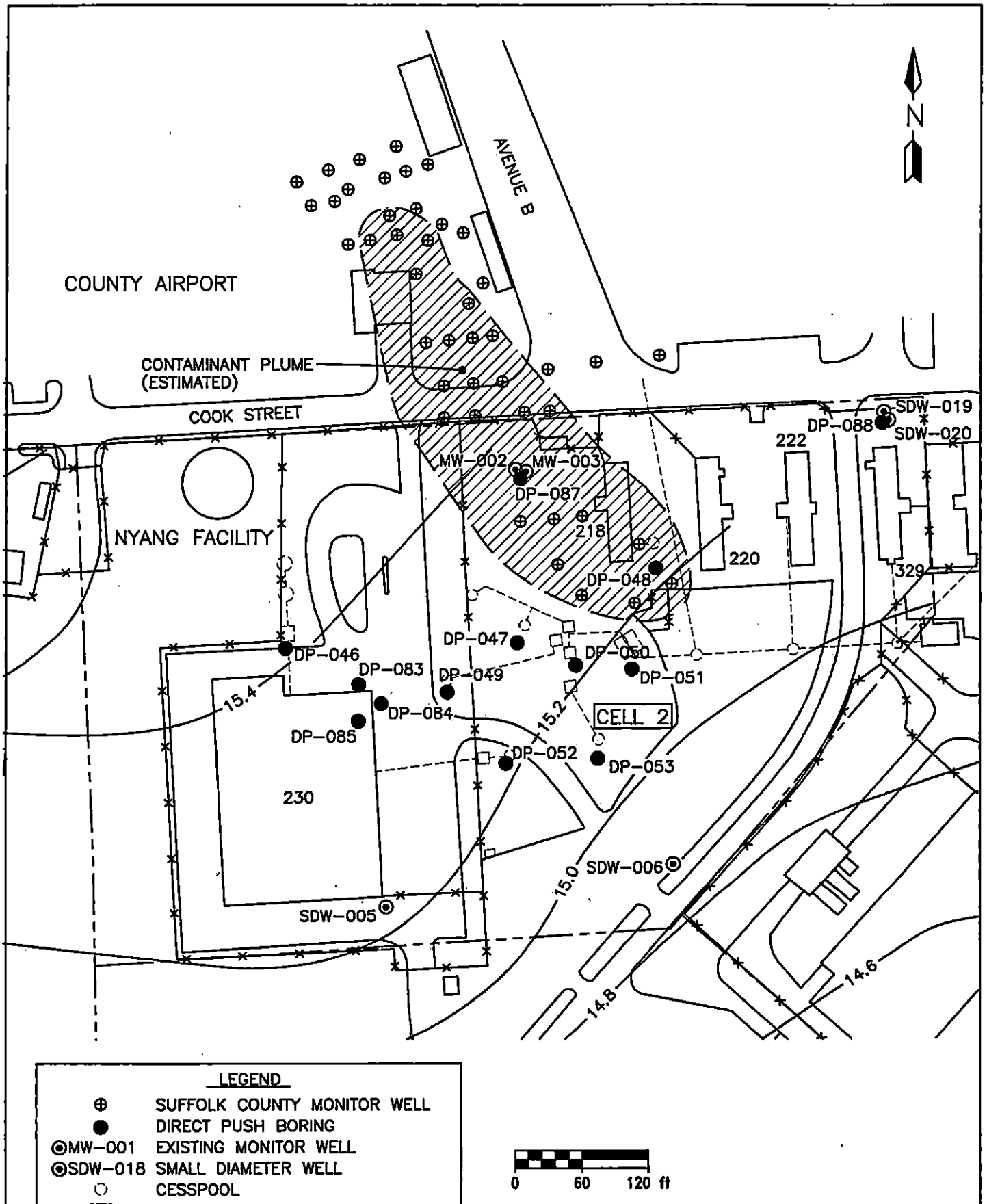
[1] Not detected at this well during the second round of groundwater monitoring
[2] Detected below action levels in the second round of groundwater monitoring
µg/L micrograms per liter

8.2.7.8 Site 8 Summary

Six areas of potential concern have been identified at Site 8 based on the presence of VOCs, SVOCs, and/or metals above action levels in soil or groundwater . These areas are:

- Fuel-related compounds in saturated soils and groundwater at the NYANG facility property line (Cell 2)
- Tetrachloroethene and fuel-related compounds in groundwater at Building 230 (Cell 2)
- Silver in subsurface soils between Buildings 220 and 230 (Cell 2)
- Tetrachloroethene in groundwater at Building 358 (Cell 3)
- Fuel-related compounds in subsurface soils between Buildings 276 and 280 (Cell 4), and
- Trichloroethene in groundwater southeast of Building 276 (Cells 4 and 5).

Petroleum fuels migrating southeastward from the county-operated portion of the airport appear to have contaminated soil and groundwater above action levels in the northern portion of Cell 2 (Figure 8-37). The plume extends at least as far south as DP-050, but the leading edge is not well defined.



SOURCE: UNC, GEOTECH, 1988. SOUTHEAST EXTENT OF PLUME HAS BEEN MODIFIED BASED ON ANALYTICAL DATA OBTAINED DURING THIS SITE INVESTIGATION.

FIGURE 8-37
PETROLEUM PLUME
AT THE COUNTY AIRPORT
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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Tetrachloroethene and fuel-related compounds exceed action levels in groundwater north and south of Building 230. The source of this contamination is not known. Although the lateral extent and the impact to deeper groundwater, if any, has not been defined, it appears that this contamination has not migrated off NYANG-leased property because organic compounds were not detected in downgradient wells at SDW-007, SDW-008, and SDW-009.

Silver was detected in subsurface soils between Buildings 220 and 230 and appears to be a result of wastewater discharges to cesspools at 8C and 8P. However, it is unlikely that accessible (surface) soils have been impacted and the metal has not affected groundwater quality above applicable NYS guidance.

Tetrachloroethene is present slightly above action levels in groundwater east of Building 358. The compound was not detected further north (upgradient) at Site 2 and therefore could be a result of wastewater discharges to a cesspool at 8G. The downgradient and vertical extent of contamination, if any, is not known; however, it appears that this contamination has not migrated off NYANG-leased property because tetreachloroethene has not been detected in Site 4 groundwater.

Fuel-related compounds in the unsaturated subsurface soils at DP-060 appear to have been released from wastewater discharges to cesspools located between Buildings 276 and 280. However, it is unlikely that accessible (surface) soils have been impacted, and the fuels have not impacted groundwater quality above applicable NYS guidance.

Trichloroethene detected southeast of Building 276 probably forms a small plume which sinks as it migrates toward SDW-015. The overall vertical and horizontal extent of concentrations above action levels has not been established but may be quite limited since the detected concentrations are relatively low.

8.2.8 Site 9 - Ramp Drainage Outfall

8.2.8.1 Site Geology and Hydrology

Subsurface soil samples obtained from soil borings at Site 9 consisted of fine- to medium-grained sand. Surface soil and sediment consisted of silty, fine-grained sand. These soils typify the glacial outwash deposits of the area that comprise the upper glacial aquifer beneath Long Island. The upper glacial aquifer is the principal aquifer of concern at Site 9.

Groundwater was encountered in the site borings at a depth of approximately 8 feet bgs. From basewide groundwater levels measured in all of the wells and piezometers in December 1994, groundwater movement is directed to the south-southeast with an average hydraulic gradient of 0.0014 ft/ft. Hydraulic gradient and groundwater flow are relatively uniform basewide, but may be locally influenced by topography and the infiltration of surface water runoff from man-made surface features. Site 9 receives stormwater runoff from the aircraft apron adjacent to Site 4. Depending on the amount of stormwater discharged at the outfall, the discharge may flow along a temporary stream for several hundred feet before eventually infiltrating into the subsurface. The area is moderately to sparsely vegetated. Site 9 is hydraulically downgradient of Sites 1, 2, 4, 11 and Cells 1 and 2 of Site 8.

8.2.8.2 Sampling Strategy

The conceptual model for Site 9 assumed that fuels, oils, and solvents, if released at Site 4, would have drained to the outfall at Site 9, discharged from the outfall to the drainage ditch, and infiltrated the ground surface south of the outfall for a distance of at least 400 ft. Although releases to the ditch were expected to have been minimal, groundwater contamination was considered a possibility because of an inferred shallow water table. Constituents of concern included halogenated and aromatic hydrocarbons and metals. Figure 8-38 presents the sampling logic diagram developed for this site.

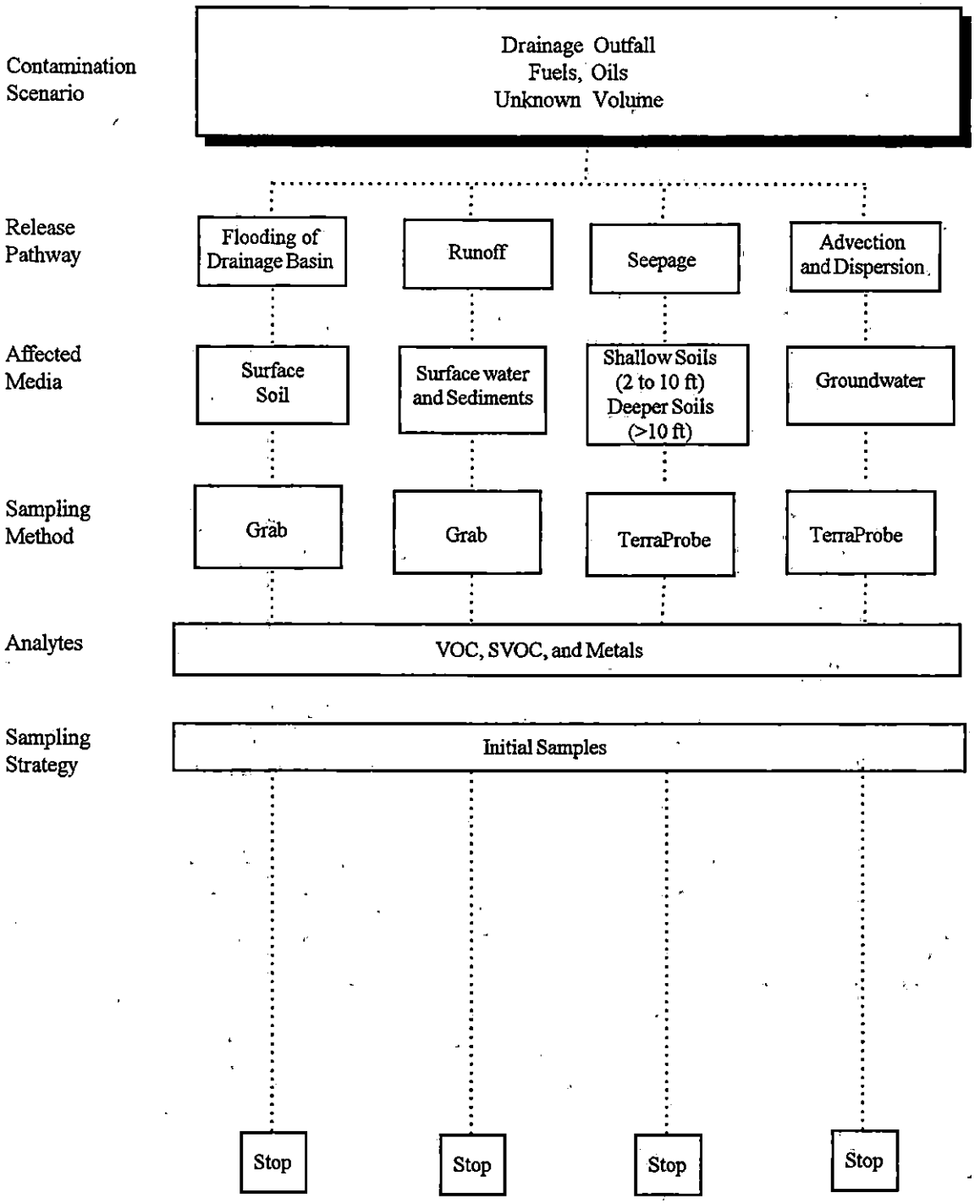


FIGURE 8-38
SAMPLING LOGIC DIAGRAM
SITE 9 - RAMP DRAINAGE OUTFALL
106 RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

8.2.8.3 Sample Location and Description

Three borings, designated DP-070, DP-071, and DP-072, were drilled at this site on October 1, 1994. The borings were terminated 12-14 ft bgs. Two subsurface soil samples and one groundwater sample were collected from each boring. Sample location is summarized in Table 8-39. Boring locations are shown on Figure 8-39, and Figure 8-25 shows a cross section through Site 9. Profile lines are shown in Figure 8-19.

Table 8-39
SAMPLE SUMMARY [1]
Site 9 - Ramp Drainage Outfall

106th Rescue Group, NYANG
Westhampton Beach, New York

Sample Location	(ft bgs)	Sample Designation	Sample Type	Depth/Interval (ft bgs)
DP-070	8	09SB001	Subsurface soil	5-7
		09SB002	Subsurface soil	10-12
		09GW001	Groundwater	10-12
DP-071	8	09SB003	Subsurface soil	5-7
		09SB004	Subsurface soil	10-12
		09GW002	Groundwater	10-12
DP-072	8	09SB005	Subsurface soil	5-7
		09SB006	Subsurface soil	12-14
		09GW003	Groundwater	12-14
GB-008	NE	09SD001	Sediment	0.5-1
GB-009	NE	09SS001	Surface soil	0.5-1
GB-010	NE	09SD002	Sediment	0.5-1
GB-011	NE	09SS002	Surface soil	0.5-1
GB-012	NE	09SD003	Sediment	0.5-1
GB-013	NE	09SS003	Surface soil	0.5-1

[1] All samples were analyzed for VOCs, SVOCs, and metals
bgs below ground surface
NE Not encountered

Three surface soil samples were collected at GB-009, GB-011, and GB-013 on October 15, 1994 (Table 8-39), and three sediment samples were collected at GB-008, GB-010, and GB-012 the same day. Grab sample locations are shown on Figure 8-39. Staining was observed on bank soils at the outfall; however, organic vapors were not detected with the FID in any sample.

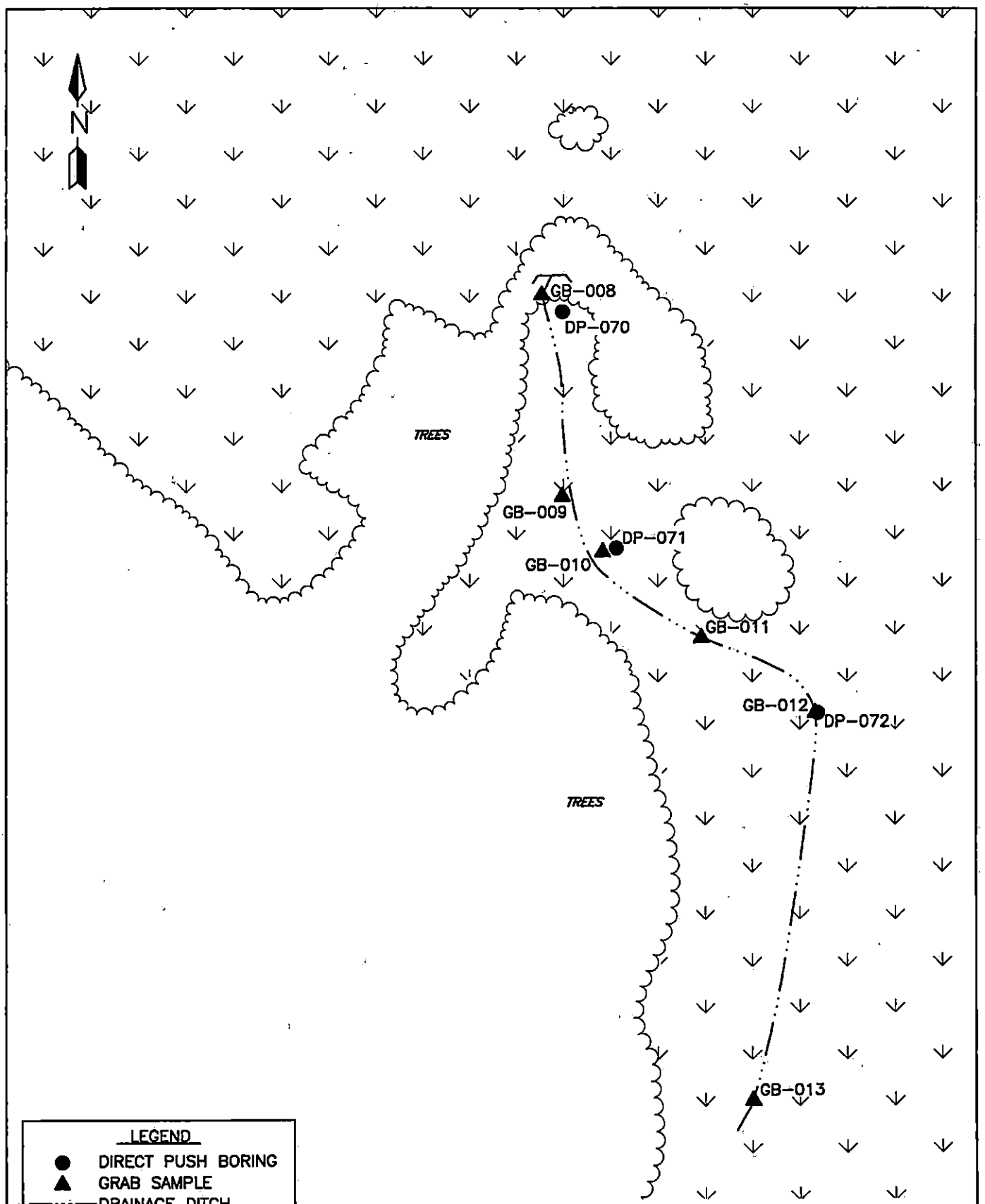


FIGURE 8-39
SITE 9 – RAMP DRAINAGE OUTFALL
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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8.2.8.4 Analytical Results For Sediment, Surface Soils, Subsurface Soils, and Groundwater

Sediment Bis(2-ethylhexyl)phthalate and naphthalene were detected in the sediment sampled at the outfall. Cadmium was found in the two samples nearest the outfall, and arsenic was detected at GB-010. Chromium and lead were found in all sediment samples. Hits above action levels are summarized in Table 8-40.

Table 8-40
SEDIMENT HITS ABOVE ACTION LEVELS
Site 9 - Ramp Drainage Outfall

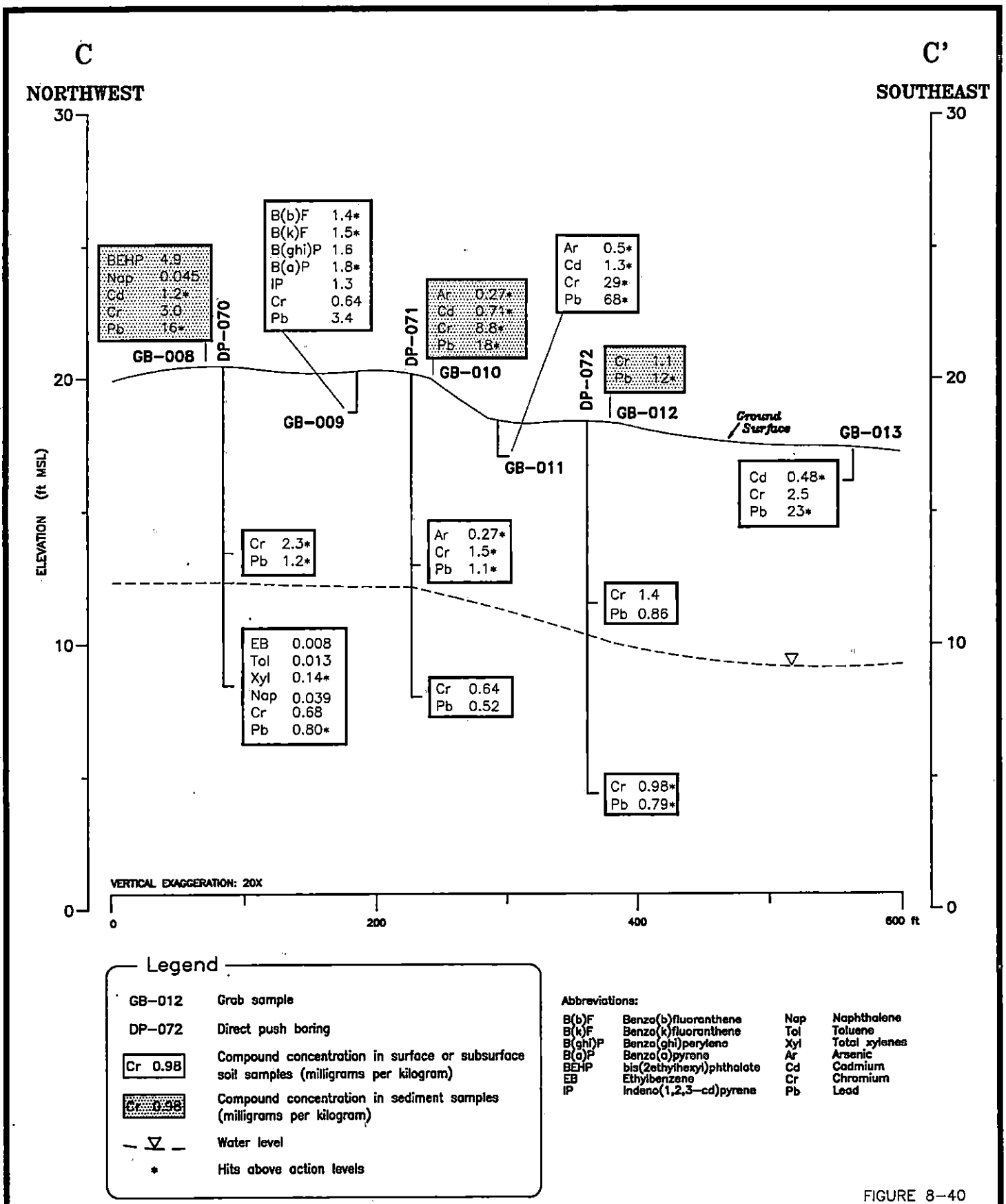
106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (mg/kg)	Action Level (mg/kg)
Arsenic	09SD002	GB-010	0.27	0.20
Cadmium	09SD001	GB-008	1.2	0.20
	09SD002	GB-010	0.71	0.20
Chromium	09SD002	GB-010	8.8	6.1
Lead	09SD001	GB-008	16	4.4
	09SD002	GB-010	18	4.4
	09SD003	GB-012	12	4.4

mg/kg milligrams per kilogram

Surface Soils PAH compounds and four metals were detected in the surface soils at this site (Figure 8-40). Volatile organic compounds were not found above reporting limits. Hits above action levels are summarized in Table 8-41.

Subsurface Soils Fuel-related compounds and three metals were identified in the subsurface soil samples obtained from this site. Ethylbenzene, xylenes, toluene, and naphthalene were detected in the saturated soils located below the outfall at DP-070. Chromium and lead were detected in all subsurface soil samples, and arsenic was found in one saturated sample at DP-071. No other analytes were found above reporting limits. Hits above action levels are summarized in Table 8-42.



Legend

GB–012	Grab sample
DP–072	Direct push boring
Cr 0.98	Compound concentration in surface or subsurface soil samples (milligrams per kilogram)
Cr 0.98	Compound concentration in sediment samples (milligrams per kilogram)
▽	Water level
*	Hits above action levels

Abbreviations:

B(b)F	Benzo(b)fluoranthene	Nap	Naphthalene
B(k)F	Benzo(k)fluoranthene	Tol	Toluene
B(ghi)P	Benzo(ghi)perylene	Xyl	Total xylenes
B(a)P	Benzo(a)pyrene	Ar	Arsenic
BEHP	bis(2ethylhexyl)phthalate	Cd	Cadmium
EB	Ethylbenzene	Cr	Chromium
IP	Indeno(1,2,3–cd)pyrene	Pb	Lead

NOTES:

1. Groundwater samples were collected September through November 1994. Two rounds were collected from the small diameter and existing monitor wells.
2. Action levels are described in Section 8.0 of this report.

MSL mean sea level

FIGURE 8–40
DETECTED COMPOUNDS IN SEDIMENT, SURFACE SOIL, AND SUBSURFACE SOIL
SITE 9 – RAMP DRAINAGE OUTFALL
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

Table 8-41
SURFACE SOIL HITS ABOVE ACTION LEVELS
Site 9 - Ramp Drainage Outfall

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (mg/kg)	Action Level (mg/kg)
Benzo(a)pyrene	09SS001	GB-009	1.8	1.0
Benzo(b)fluoranthene	09SS001	GB-009	1.4	1.1
Benzo(k)fluoranthene	09SS001	GB-009	1.5	1.1
Arsenic	09SS002	GB-011	0.50	0.20
Cadmium	09SS002	GB-011	1.3	0.20
	09SS003	GB-013	0.48	0.20
Chromium	09SS002	GB-011	29	6.1
Lead	09SS002	GB-011	68	4.4
	09SS003	GB-013	23	4.4

mg/kg milligrams per kilogram

Table 8-42
SUBSURFACE SOIL HITS ABOVE ACTION LEVELS
Site 9 - Ramp Drainage Outfall

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (mg/kg)	Action Level (mg/kg)
m/p-Xylenes	09SB002	DP-070	0.087	0.012
o-Xylene	09SB002	DP-070	0.049	0.012
Arsenic	09SB003	DP-071	0.27	0.20
Chromium	09SB001	DP-070	2.3	0.84
	09SB003	DP-071	1.5	0.84
	09SB005	DP-072	1.4	0.84
	09SB006	DP-072	0.98	0.84
Lead	09SB001	DP-070	1.2	0.65
	09SB002	DP-070	0.8	0.65
	09SB003	DP-071	1.1	0.65
	09SB005	DP-072	0.86	0.65
	09SB006	DP-072	0.79	0.65

mg/kg milligrams per kilogram

Groundwater Fuel-related compounds were detected in the groundwater sample collected at the outfall (Figure 8-41). None of these constituents was found farther south at DP-071 or DP-072. Chromium and lead were detected in all samples. No other analytes were found above reporting limits. Hits above action levels are summarized in Table 8-43.

Table 8-43
GROUNDWATER HITS ABOVE ACTION LEVELS
Site 9 - Ramp Drainage Outfall

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (µg/L)	Action Level (µg/L)
Ethylbenzene	09GW001	DP-070	100	5
m/p-Xylenes	09GW001	DP-070	700	10
o-Xylene	09GW001	DP-070	450	5
Toluene	09GW001	DP-070	350	5
2-Methylnaphthalene	09GW001	DP-070	100	50
Naphthalene	09GW001	DP-070	290	10
Chromium	09GW001	DP-070	160	50
	09GW002	DP-071	50	50

µg/L micrograms per liter

8.2.8.5 Site 9 Summary

Sediments and surface soils in the upper portion of the ramp drainage ditch contain PAH compounds and metals, some of which exceed action levels and/or the average range of concentrations in eastern US or NYS background soils, respectively. Subsurface soils do not contain metal concentrations which exceed the range of U.S. or NY background concentrations or PAH compounds in excess of action levels. This suggests that constituents released at the outfall have impacted only surface materials near the outfall but the overall areal extent or the level of risk associated with this release has not been established.

Fuel-related compounds were also detected in the groundwater and saturated soils located below the outfall at DP-070. The contaminants do not appear to be related to a release at the ditch and

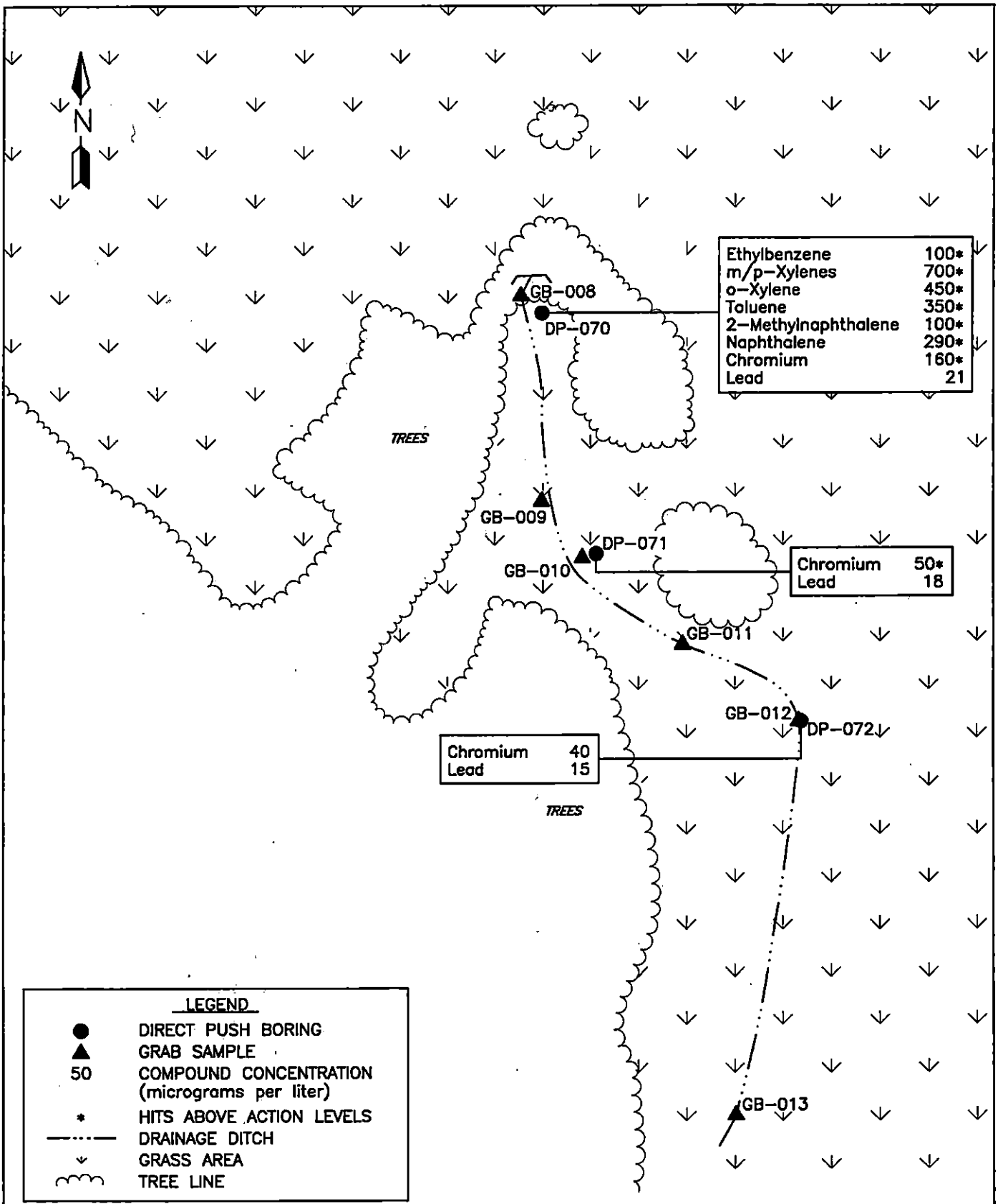


FIGURE 8-41
DETECTED CONCENTRATIONS
IN GROUNDWATER
SITE 9 – RAMP DRAINAGE OUTFALL
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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may originate from the plume migrating southward from Site 4. The plume does not appear to extend southwest as far as DP-071; however, the lateral (east) and vertical extent of contamination has not been defined.

8.2.9 Site 10 - Waste Stripper Tank #61, Building 370

8.2.9.1 Site Geology and Hydrogeology

Subsurface soil samples obtained from soil borings at Site 10 consisted of fine- to medium-grained sand with intervals or lenses of sand and gravel. These soils typify the glacial outwash deposits of the area that comprise the upper glacial aquifer beneath Long Island. The upper glacial aquifer is the principal aquifer of concern at Site 10.

Groundwater was encountered in one of the site boring (DP-075) at a depth of 40 feet bgs. The remaining site borings did not penetrate this deeply. From basewide groundwater levels measured in all of the wells and piezometers in December 1994, groundwater movement is directed to the south-southeast with an average hydraulic gradient of 0.0014 ft/ft. Hydraulic gradient and groundwater flow are relatively uniform basewide, but may be locally influenced by topography and the infiltration of surface water runoff from man-made surface features. Site 10 consists of UST beneath a paved area adjacent to Building 370. An unpaved area immediately adjacent to Building 370 exists approximately 10 feet southwest of the UST. Site 10 is hydraulically downgradient of Site 3 and Cell 1 of Site 8, but is hydraulically upgradient of Site 5 and Cell 5 of Site 8.

8.2.9.2 Sampling Strategy

The conceptual model for Site 10 assumed that liquids, if released from the tank or piping, would have impacted groundwater and subsurface soils adjacent to the tank. Constituents of concern included solvents, aromatic hydrocarbons, and metals. Figure 8-42 presents the sampling logic diagram developed for this site.

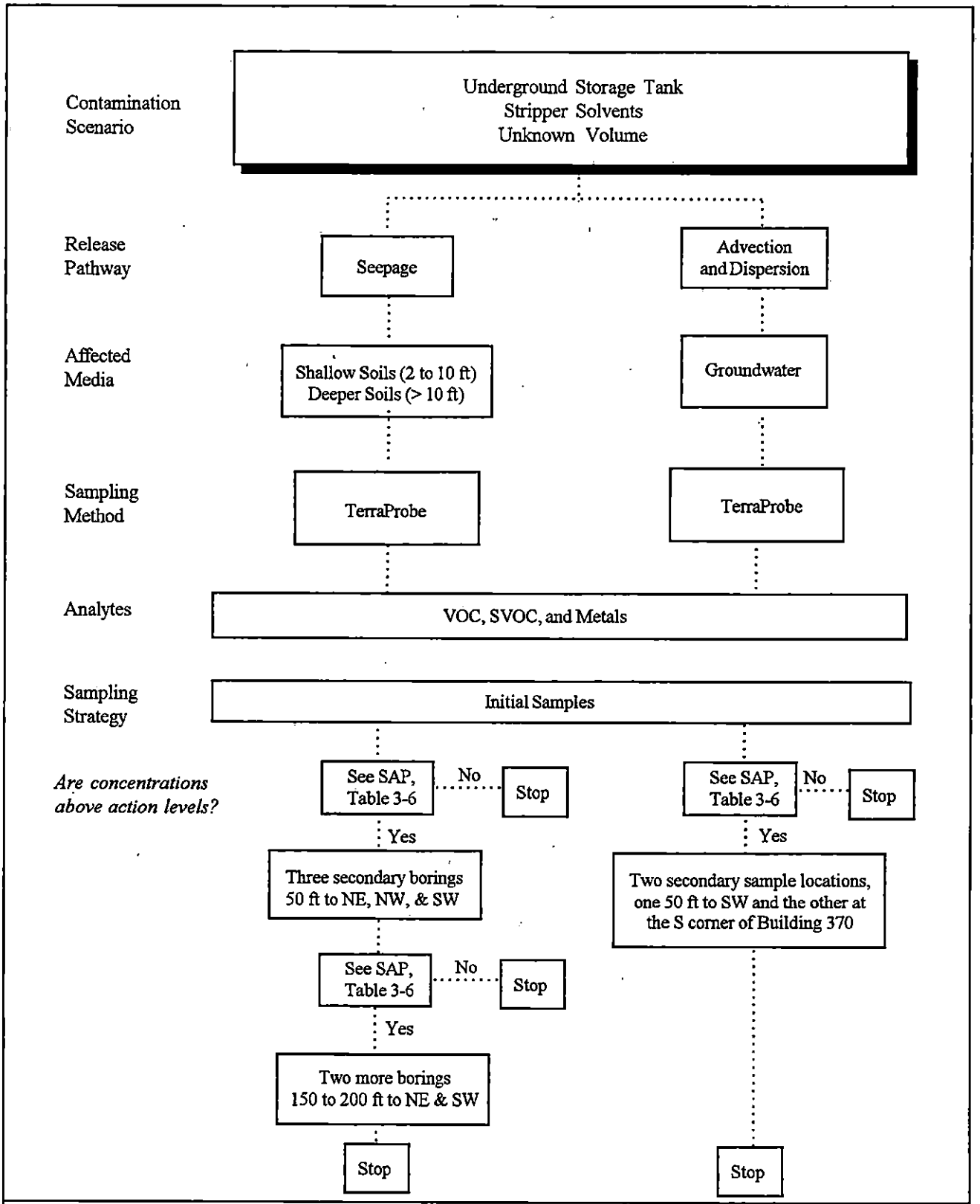


FIGURE 8-42
SAMPLING LOGIC DIAGRAM
SITE 10 - WASTE STRIPPER TANK #61, BLDG. 370
106 RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

8.2.9.3 Sample Location and Description

Four borings, designated DP-073 through DP-076, were drilled at this site on October 5 and 6, 1994. The borings were terminated at 30 or 60 ft bgs. Three subsurface soil samples were collected from each boring, and two groundwater samples were obtained from DP-075. Organic vapors were not detected with the FID in any sample. Sample location information is summarized in Table 8-44. Boring locations are shown on Figure 8-43.

Table 8-44
SAMPLE SUMMARY [1]
Site 10 - Waste Stripper Tank #61, Building 370
106th Rescue Group, NYANG
Westhampton Beach, New York

Sample Location	Depth to Water (ft bgs)	Sample Designation	Sample Type	Depth/Interval (ft bgs)
DP-073	NE	10SB001	Subsurface soil	5-7
		10SB002	Subsurface soil	12-14
		10SB003	Subsurface soil	28-30
DP-074	NE	10SB005	Subsurface soil	5-7
		10SB006	Subsurface soil	12-14
		10SB007	Subsurface soil	28-30
DP-075	40	10SB009	Subsurface soil	5-7
		10SB010	Subsurface soil	12-14
		10SB011	Subsurface soil	28-30
		10GW001	Groundwater	42-44
		10GW002	Groundwater	58-60
DP-076	NE	10SB013	Subsurface soil	5-7
		10SB014	Subsurface soil	14-16
		10SB015	Subsurface soil	29-30

[1] All samples were analyzed for VOCs, SVOCs, and metals
bgs below ground surface
NE Not encountered

8.2.9.4 Analytical Results

Subsurface Soils One VOC and two metals were detected in subsurface soils at this site. No other analytes were found above reporting limits. Tetrachloroethene was detected in three samples collected at two corners of the tank. Chromium and lead were detected in all samples. Hits above action levels are summarized in Table 8-45.

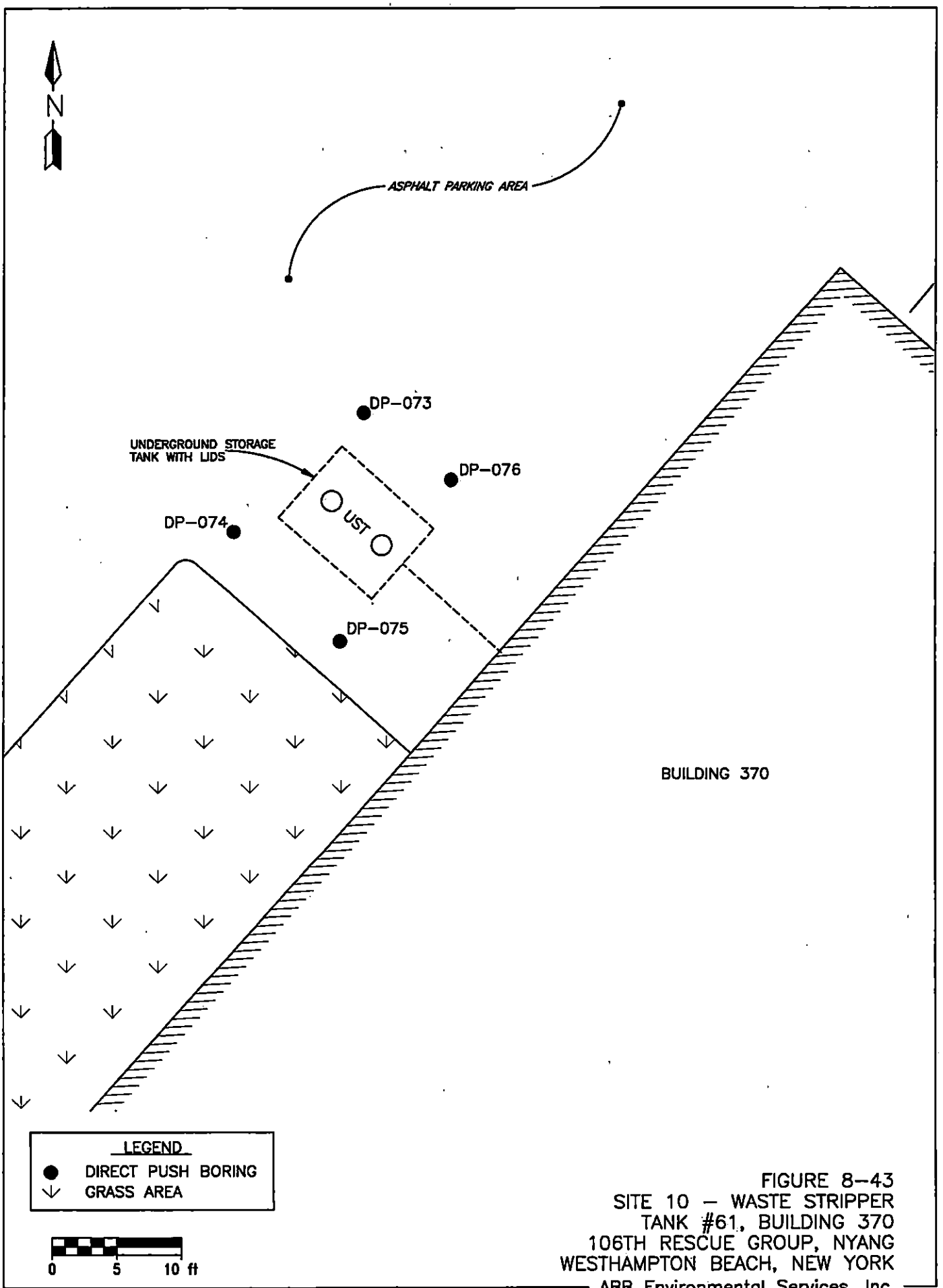


FIGURE 8-43
SITE 10 – WASTE STRIPPER
TANK #61, BUILDING 370
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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Table 8-45
SUBSURFACE SOIL HITS ABOVE ACTION LEVELS
Site 10 - Waste Stripper Tank #61, Building 370

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (mg/kg)	Action Level (mg/kg)
Chromium	10SB006	DP-074	1.4	0.84

mg/kg milligrams per kilogram

Groundwater Tetrachloroethene and chromium were the only analytes detected above reporting limits in the groundwater samples collected from this site. Hits above action levels are summarized in Table 8-46.

Table 8-46
GROUNDWATER HITS ABOVE ACTION LEVELS
Site 10 - Waste Stripper Tank #61, Building 370

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (µg/L)	Action Level (µg/L)
Chromium	10GW001	DP-075	70	50
	10GW002	DP-075	70	50

µg/L micrograms per liter

8.2.9.5 Site 10 Summary

Tetrachloroethene was detected in three unsaturated soil samples and groundwater at this site. None of the soil concentrations exceed NYS guidance for the protection of groundwater quality, and groundwater has not been impacted above applicable guidance. Chromium concentrations which exceed action levels in one subsurface soil sample do not exceed NYS recommended soil cleanup objectives and occur below average concentrations in NYS background soils. Elevated concentrations of chromium in direct push groundwater samples are considered sampling artifacts (see Section 9.2.1). Chromium concentrations in groundwater samples from nearby wells (SDW-012 and SDW-013) do not exceed action levels.

8.2.10 Site 11 - Waste Oil Vessel, Building 230

8.2.10.1 Site Geology and Hydrogeology

Subsurface soil samples obtained from soil borings at Site 11 consisted of fine- to medium-grained sand with fine gravel. These soils typify the glacial outwash deposits of the area that comprise the upper glacial aquifer beneath Long Island. The upper glacial aquifer is the principal aquifer of concern at Site 11.

Groundwater was encountered in one of the site borings (DP-085) at a depth of 33 feet bgs. The remaining site borings did not penetrate this deeply. From basewide groundwater levels measured in all of the wells and piezometers in December 1994, groundwater movement is directed to the south-southeast with an average hydraulic gradient of 0.0014 ft/ft. Hydraulic gradient and groundwater flow are relatively uniform basewide, but may be locally influenced by topography and the infiltration of surface water runoff from man-made surface features. Site 11 is located inside of Building 230 and is surrounded by pavement outside of this building.

Site 11 is hydraulically upgradient of Sites 1, 2, 4, 9 and Cell 3 of Site 8.

8.2.10.2 Sampling Strategy

The conceptual model for Site 11 assumed that oil was stored in the vessel, and that this oil contained solvent, fuel, and/or metal constituents. If a release occurred, these materials would have migrated downward through the subsurface below the vessel and into groundwater. Figure 8-44 presents the sampling logic diagram developed for this site.

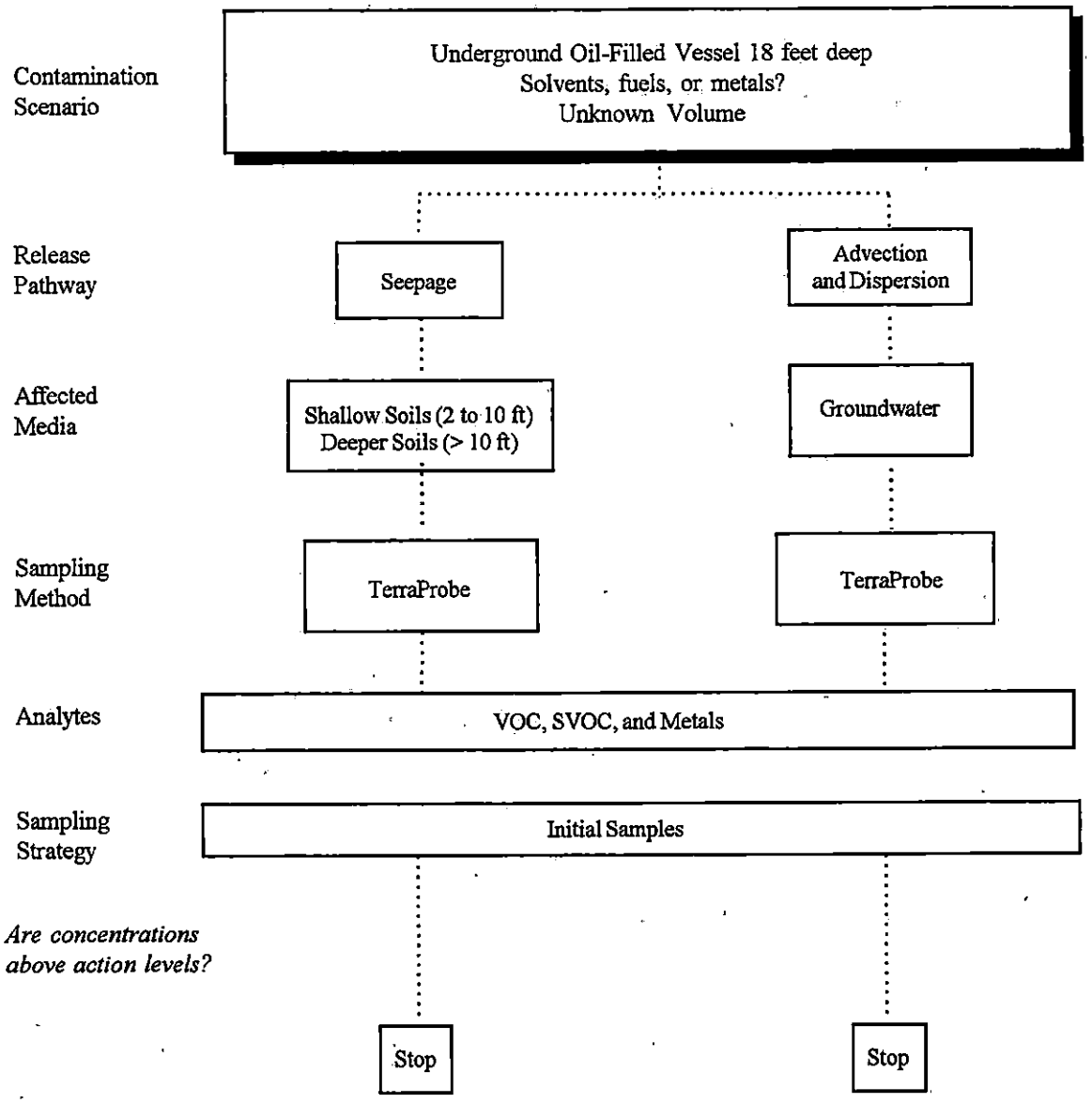


FIGURE 8-44
SAMPLING LOGIC DIAGRAM
SITE 11 - WASTE OIL VESSEL, BLDG. 230
106 RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

8.2.10.3 Sample Location and Description

Three borings, designated DP-083, DP-084, and DP-085 were drilled at this site on October 13, 1994. The borings were terminated 32 to 35 ft bgs. Three subsurface soil samples were collected at each boring and one groundwater sample was obtained from DP-085. Organic vapors were not detected in any sample. Sample location information is summarized in Table 8-47. Boring locations are shown on Figure 8-45.

Table 8-47
SAMPLE SUMMARY [1]
Site 11 - Waste Oil Vessel, Building 230

106th Rescue Group, NYANG
Westhampton Beach, New York

Sample Location	Depth to Water (ft bgs)	Sample Designation	Sample Type	Depth/Interval (ft bgs)
DP-083	NE	11SB001	Subsurface soil	8-10
		11SB002	Subsurface soil	17-19
		11SB003	Subsurface soil	29-30
DP-084	NE	11SB005	Subsurface soil	8-10
		11SB006	Subsurface soil	15-17
		11SB007	Subsurface soil	29-30
DP-085	33	11SB009	Subsurface soil	8-10
		11SB010	Subsurface soil	15-17
		11SB011	Subsurface soil	27-29
		11GW001	Groundwater	33-35

1 All samples were analyzed for VOCs, SVOCs, and metals
bgs below ground surface
NE Not encountered

8.2.10.4 Analytical Results For Subsurface Soils and Groundwater

Subsurface Soils Arsenic, chromium and lead were detected in the subsurface soils collected from this site. No other analytes were found above reporting limits. Each constituent exceeds action levels in two or more borings (Table 8-48).

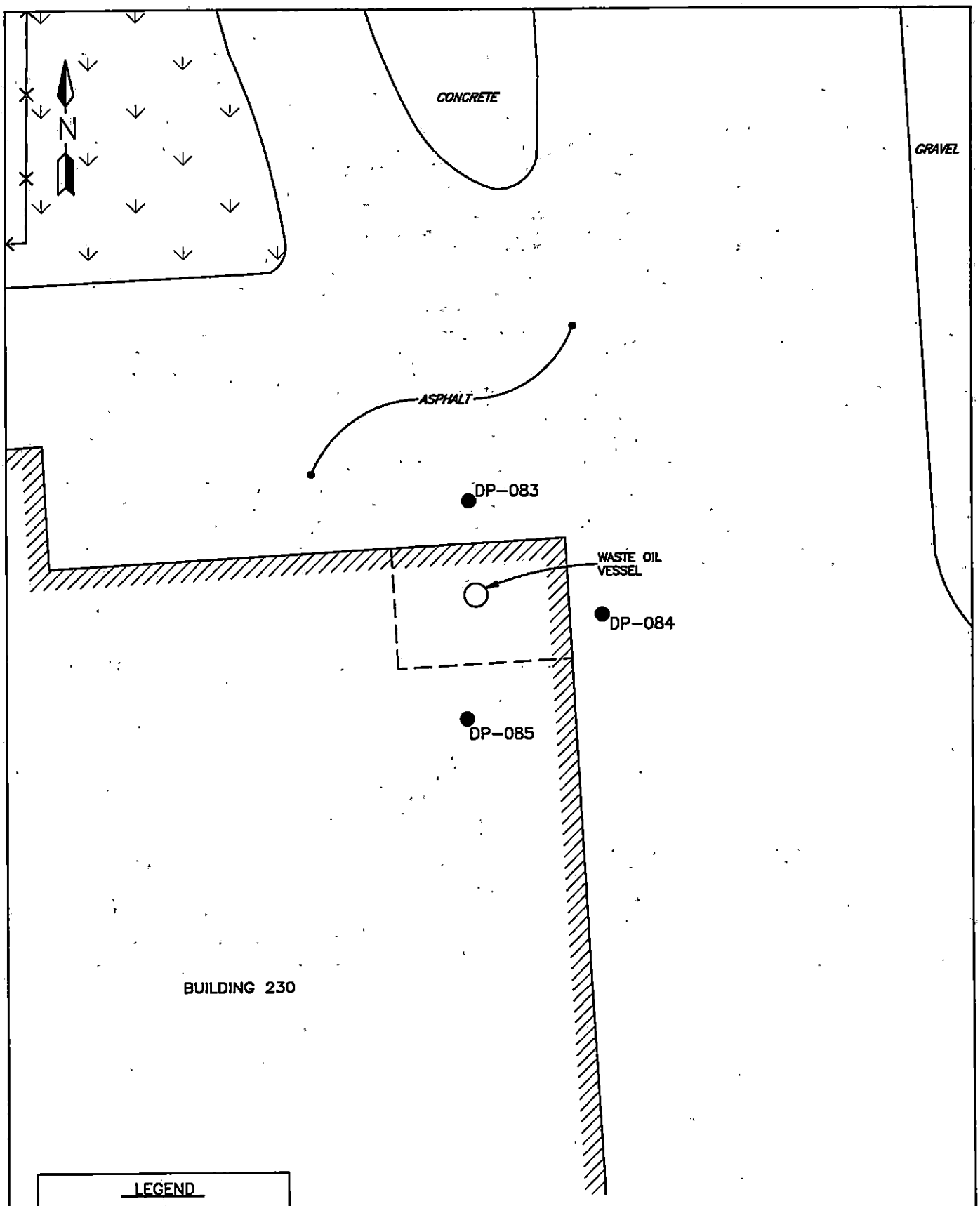


FIGURE 8-45
SITE 11 - WASTE OIL VESSEL, BUILDING 230
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK
ABB Environmental Services, Inc.

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Table 8-48
SUBSURFACE SOIL HITS ABOVE ACTION LEVELS
Site 11 - Waste Oil Vessel, Building 230

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (mg/kg)	Action Level (mg/kg)
Arsenic	11SB003	DP-083	0.28	0.20
	11SB006	DP-084	0.22	0.20
	11SB007	DP-084	0.24	0.20
Chromium	11SB001	DP-083	1.3	0.84
	11SB005	DP-084	1.7	0.84
	11SB006	DP-084	0.97	0.84
	11SB009	DP-085	0.85	0.84
Lead	11SB001	DP-083	0.78	0.65
	11SB003	DP-083	0.65	0.65
	11SB005	DP-084	1.3	0.65
	11SB006	DP-084	0.75	0.65
	11SB009	DP-085	0.84	0.65

mg/kg milligrams per kilogram

Groundwater Chromium was the only constituent detected above reporting limits in the groundwater sample obtained from this site. The metal exceeds action levels (see Table 8-49).

Table 8-49
GROUNDWATER HITS ABOVE ACTION LEVELS
Site 11 - Waste Oil Vessel, Building 230

106th Rescue Group, NYANG
Westhampton Beach, New York

Analyte	Sample ID	Sample Location	Concentration (µg/L)	Action Level (µg/L)
Chromium	11GW001	DP-085	53	50

µg/L micrograms per liters

8.2.10.5 Site 11 Summary

The conceptual model for Site 11 assumed that oil was stored in the vessel and that this oil contained solvents, fuel, and metal constituents. If a release occurred, these materials would have migrated downward through the subsurface below the vessel and into groundwater.

Although metals were detected in soil samples, none of the volatile or semi-volatile organic compounds typically associated with solvents or fuels were detected in samples collected at this site. None of the metals exceed the range of average concentrations in eastern US or NYS background soils or NYS soil cleanup objectives, and chromium, the only analyte detected in groundwater is considered a sampling artifact (see Section 9.2.1).

9.0 SUMMARY AND CONCLUSIONS

9.1 SITE 1 - AVIATION GASOLINE SPILL SITE

9.1.1 Site 1 - Summary

The release of aviation gasoline at this site does not appear to have adversely impacted groundwater quality above applicable guidance. None of the typical components of aviation gasoline were found with the exception of lead in soil. Although lead concentrations exceed action levels developed for this SI, none exceed the average range of concentrations in eastern US background soils, nor has lead been detected in groundwater.

9.1.2 Site 1 - Conclusions

Lead was the only analyte detected above action levels in the soil samples obtained from this site. Concentrations which exceed action levels were detected in three samples, but the extent of such elevated concentrations appears to be limited to surface soils in the south-central portion of the swale. Lead concentrations in surface soils at the north end of the swale and in subsurface soils do not exceed action levels, and infiltration of gasoline elsewhere is unlikely because the remainder of the site is paved. None of these concentrations exceed typical lead values found in eastern U.S. soils (Table 7-2): the highest concentration detected at this site was 14 mg/kg while the average concentration of lead in soils from rural areas in the eastern US ranges from 4 to 61 mg/kg.

Chromium was the only analyte detected above reporting limits in groundwater samples collected from Site 1. The metal was detected above action levels in samples collected from two direct push borings. However, elevated concentrations of chromium in samples obtained from the direct push borings are not considered representative of groundwater quality at the facility.

Figure 9-1 shows chromium concentrations in groundwater samples collected from the direct push borings and wells. None of the samples collected from the wells contain chromium in excess of action levels. In contrast, many samples obtained from the borings exhibit concentrations greater than action levels and nearly all concentrations are significantly higher than those detected in the well samples. Groundwater from the direct push borings was collected by driving or pushing rods to the desired depth and retrieving a sample through a screen attached to the end of the leading rod. The samples were typically more turbid than those collected from the wells and it appears that chromium leached into solution upon preservation with nitric acid, thereby artificially increasing the dissolved phase material. The metal is naturally present in soils at this site (see Section 8.2.1 for background soil concentrations) and would be expected to dissolve during preservation when the pH of the sample is reduced to 2 (it is unlikely that chromium is mobilizing naturally because the pH of groundwater at the facility is approximately neutral). Conversely, the well samples did not contain visible particulate matter because the wells had been developed and purged prior to sample collection. Based on this, and lack of a known source of chromium at this site, the elevated concentrations detected in groundwater collected from the direct push borings are attributed to dissolution of naturally-occurring chromium from suspended solids during sample preservation and are not considered representative of actual groundwater quality.

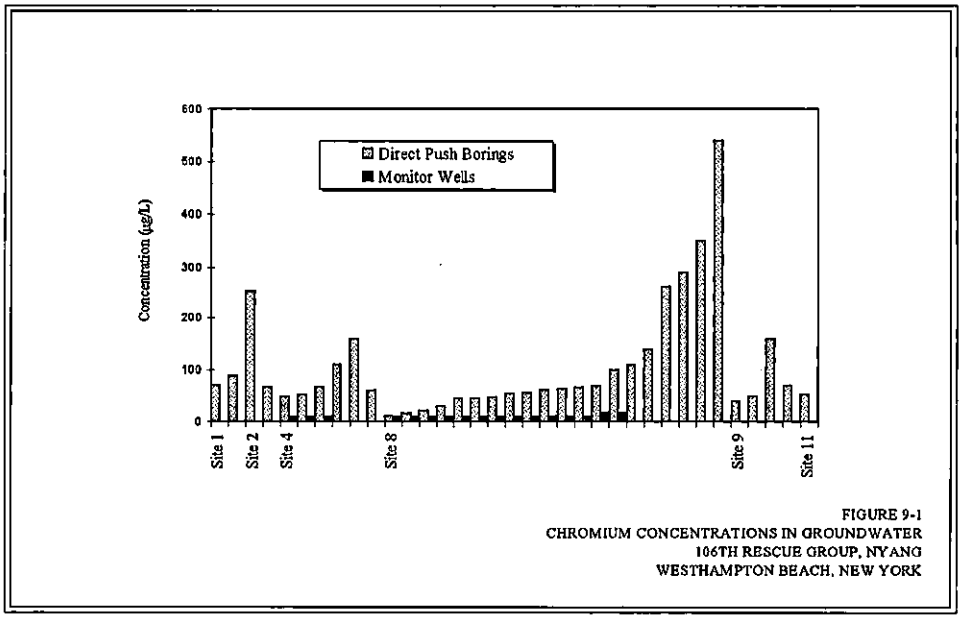


FIGURE 9-1
CHROMIUM CONCENTRATIONS IN GROUNDWATER
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

9.2 SITE 2 - FORMER HAZARDOUS WASTE STORAGE AREA

9.2.1 Site 2 - Summary

Arsenic was detected above action levels in soil samples obtained from this site, but because its concentration is well below the average range of arsenic concentrations in NYS background soils, it is considered to be a naturally occurring constituent. Arsenic has not impacted groundwater above applicable guidance.

The only analyte detected in Site 2 groundwater samples was chromium. These samples were collected from direct push borings. Such elevated concentrations are attributed to dissolution of chromium from solid phase material as a result of acidification (pH $\leq$ 2) during sample collection and are considered sampling artifacts. Chromium concentrations in samples obtained from the wells are much lower because well development and purging removed much of the solid phase prior to sample preservation. As such, the water samples collected from the wells are considered to be more representative of actual groundwater quality. Chromium concentrations in groundwater samples obtained from wells nearest Site 2 (SDW-007, SDW-008, SDW-009, and SDW-010) do not exceed action levels (dissolution of chromium naturally is unlikely because the pH of groundwater at the facility is approximately neutral).

9.2.2 Site 2 - Conclusions

Arsenic was the only analyte detected above action levels in the soil samples obtained from this site. The metal was found slightly above the RL and well below the average concentration of arsenic in NYS background soils. Because there is no other evidence to suggest that metal-bearing solutions such as solvents or fuels were released at this site, this metal is considered to be a naturally-occurring constituent of the soils.

Chromium was the only analyte detected above action levels or reporting limits in groundwater. Because the sample was collected from a direct push boring, the presence of this metal at an elevated concentration

is attributed to the dissolution of naturally-occurring chromium from suspended solids during sample preservation as noted in Section 9.1.

9.3 SITE 3 - FORMER HAZARDOUS WASTE STORAGE AREA (1984-1989)

9.3.1 Site 3 - Summary

Silver was the only analyte detected above action levels in the soil samples obtained from this site. The metal was detected at very low concentration, is isolated at depth, and has not impacted groundwater above applicable guidance.

The only analyte detected in Site 3 groundwater was chromium. Because the groundwater sample was collected from a direct push boring, the presence of this metal at an elevated concentration is considered a sampling artifact (see Section 9.1). Chromium concentrations in groundwater samples obtained from nearby wells (SDW-003, SDW-004, and SDW-011) do not exceed action levels.

9.3.2 Site 3 -Conclusions

Silver was the only analyte detected above action levels in the soil samples obtained from this site. Silver was detected at the RL in one soil sample obtained 17 ft bgs and appears to be an isolated occurrence.

Chromium was the only analyte detected above action levels or reporting limits in groundwater. Because the sample was collected from a direct push boring, and there is no evidence to suggest that metal-bearing solutions were released at this site, the presence of this metal at an elevated concentration is attributed to dissolution of naturally-occurring chromium from suspended solids during sample preservation (Section 9.1).

9.4 SITE 4 - AIRCRAFT REFUELING APRON SPILL SITE

9.4.1 Site 4 - Summary

Soil and groundwater samples collected from Site 4 contain fuel-related compounds at concentrations which exceed action levels. Suspected sources include spills at the fuel distribution pumps, release(s) at the sump tank, and leakage along the fuel line; however, the northern (upgradient) extent of contamination is not known. Concentrations are higher farther downgradient at DP-028, but the maximum probable concentrations in this plume have not been established because the southeastern (downgradient) limit and vertical extent of contamination has not been defined. It is apparent, however, that this plume is moving beyond the defined Site 4 area.

9.4.2 Site 4 - Conclusions

Fuel-related compounds were detected in the unsaturated soils at the south fuel pump, the sump tank, and at the storm drainage line. The same or similar compounds were also detected in the saturated soils at both fuels pumps and along the fuel line. Several compounds exceed action levels at one or more locations. Solvents were found in the saturated soils at DP-021 and DP-024 but at concentrations which do not exceed action levels.

Ethylbenzene, xylenes, toluene, and naphthalene isocons were similar and suggested a common source(s), so all fuel-related compounds were contoured together. Benzene, 2-methylnaphthalene, and chlorobenzene are not as widespread but probably originated similarly, having degraded or dispersed to levels below reporting limits in some areas. The data suggest that fuel has been released at each distribution pump, the sump tank, and possibly the fuel line and that total concentrations in excess of 10,000 µg/L may be moving beyond the defined Site 4 area toward the southeast.

9.5 SITE 5 - SOUTHWEST STORM DRAINAGE DITCH

9.5.1 Site 5 - Summary

Sediments in the upper two sections of the drainage ditch contain VOCs, SVOCs, and metals, some of which exceed action levels. Subsurface soils do not contain organic compounds or metals in excess of the average range of concentrations in eastern US or NYS background soils. The only analyte detected in Site 5 groundwater was chromium. Because the sample was collected from a direct-push boring, the presence of this element at elevated concentration is considered a sampling artifact (Section 9.1). Chromium concentrations in groundwater samples obtained from nearby wells at SDW-014 and SDW-017 do not exceed action levels. Therefore, it appears that drainage entering the ditch has adversely impacted only surface sediments or soils, and the lateral extent of contamination is generally limited to the first two sections of the ditch.

9.5.2 Site 5 - Conclusions

Benzene, toluene, and bis(2ethylhexyl)phthalate were detected in sediment samples collected from the first open section of the ditch. Dibenzofuran was detected in the first two sections, and PAH compounds were detected in the first two sections and at the end of the ditch. Metals were found in all sections; however, the only samples which contain these elements in excess of eastern US or NYS background soils were collected from the first two sections. Concentrations generally decrease with increasing distance from the head of the ditch.

None of the VOC or SVOC compounds detected in sediment samples were found in the subsurface soils. Although arsenic, chromium, and lead are present at depth, none exceed the range of average concentrations detected in eastern US or NYS background soils. This suggests that drainage entering the ditch has adversely impacted only the shallow subsurface materials within about 7 ft of ground surface (e.g. the depth at which the first subsurface soil sample was collected).

Lead was the only constituent detected in the surface water sample. This sample was obtained from stagnant water at the top of the ditch and would be expected to contain one or more analytes in excess of action levels due to the nature of the underlying sediments.

Chromium was the only analyte detected above action levels in groundwater. Because the sample was collected from a direct push boring, the presence of this element at an elevated concentration is attributed to dissolution of naturally-occurring chromium from suspended solids during sample preservation (Section 9.1).

9.6 SITE 8 - OLD BASE SEPTIC SYSTEMS

9.6.1 Site 8 - Summary

Six areas of potential concern have been identified at Site 8 based on the presence of VOCs, SVOCs, and/or metals above action levels in soil or groundwater[1]. These areas are:

- Fuel-related compounds in saturated soils and groundwater at the NYANG facility property line (Cell 2)

- Tetrachloroethene and fuel-related compounds in groundwater at Building 230 (Cell 2)

- Silver in subsurface soils between Buildings 220 and 230 (Cell 2)

- Tetrachloroethene in groundwater at Building 358 (Cell 3)

[1] Chromium concentrations which exceed action levels in groundwater were detected only in samples obtained from the direct push borings and are not considered representative of groundwater quality at this site (see Section 12.2). Since chromium did not exceed action levels in 17 well samples during two sampling rounds, the presence of this metal at elevated concentrations in the direct push samples was not considered a potential concern at this site.

- Fuel-related compounds in subsurface soils between Buildings 276 and 280 (Cell 4), and

- Trichloroethene in groundwater southeast of Building 276 (Cells 4 and 5).

Petroleum fuels migrating southeastward from the county-operated portion of the airport appear to have contaminated soil and groundwater above action levels in the northern portion of Cell 2. The plume extends at least as far south as DP-050, but the leading edge is not well defined.

Tetrachloroethene and fuel-related compounds exceed action levels in groundwater north and south of Building 230. The source of this contamination is not known. Although the lateral extent and the impact to deeper groundwater, if any, has not been defined, it appears that this contamination has not migrated off NYANG-leased property because organic compounds were not detected in downgradient wells at SDW-007, SDW-008, and SDW-009.

Silver was detected in subsurface soils between Buildings 220 and 230 and appears to be a result of wastewater discharges to cesspools at 8C and 8P.

Tetrachloroethene is present slightly above action levels in groundwater east of Building 358. The compound was not detected further north (upgradient) at Site 2 and therefore could be a result of wastewater discharges to a cesspool at 8G. The downgradient and vertical extent of contamination, if any, is not known; however, it appears that this contamination has not migrated off NYANG-leased property because tetreachloroethene has not been detected in Site 4 groundwater.

Fuel-related compounds in the unsaturated subsurface soils at DP-060 appear to have been released from wastewater discharges to cesspools located between Buildings 276 and 280.

Trichloroethene detected southeast of Building 276 probably forms a small plume which sinks as it migrates toward SDW-015. The overall vertical and horizontal extent of concentrations above action levels

Drainage has not been established but may be quite limited since the detected concentrations are relatively low.

9.6.1.1 Cell 1 Conclusions

Toluene, trans-1,2-dichloroethene, and three metals were detected above reporting limits in subsurface soils obtained from this cell. Only the metals exceed action levels, and none of these exceed the lowest value in the range of average concentrations detected in eastern US or NYS background soils.

Three solvent constituents, bis(2ethylhexyl)phthalate, and chromium were detected in groundwater. Each of the halogenated hydrocarbons was detected below the RL in one round of groundwater sampling, and bis(2ethylhexyl)phthalate is a common sampling artifact. Only chromium exceeds action levels. Because chromium was detected above action levels only in samples collected from the direct push borings, and concentrations in soils do not exceed the NYS recommended soil cleanup objective, the presence of this metal at elevated concentrations is attributed to dissolution of naturally-occurring chromium from suspended solids during sample preservation (see Section 9.1).

9.6.1.2 Cell 2 Conclusions

Fuel-related compounds were detected in the unsaturated soils at DP-048 and DP-050 which may suggest some surface spillage of fuel south of Building 218. None of these compounds exceeds action levels.

Fuel-related compounds, two of which exceed action levels, were also detected in the saturated soils northeast of Building 230 at DP-049. Since fuel-related compounds were not detected in the unsaturated soils at this boring, it appears that a plume migrating southward in groundwater from the County-controlled portion of the airport has most likely impacted these soils. This plume apparently consists of a mixture fuels and originates north of Cook Street (Figure 9-10). In 1988, the plume was approximately

100-ft wide by 500-ft long and extended southeast across Cook Street as far as Building 218 on the NYANG facility (UNC Geotech, 1988).

Chromium, lead, and silver also exceed action levels at this cell. Neither chromium nor lead exceeds the range of average concentrations detected in eastern US or NYS background soils. Silver was detected above action levels in six unsaturated and saturated samples between Buildings 220 and 230 and may be related to waste discharges from Buildings 218, 222, and/or 329.

Fuel-related compounds were detected in groundwater samples collected from DP-048 and DP-050. Several compounds exceed action levels. The source of these compounds and those detected in background samples obtained from MW-002 and MW-003 is assumed to be the plume migrating southward from the county-controlled portion of the airport. The plume extends at least as far south as DP-050 and appears to be limited to shallow groundwater.

Tetrachloroethene was detected above action levels in groundwater north and south of Building 230 at DP-046 and SDW-005. Fuel-related compounds were also detected at the same location and arsenic was found at SDW-005. Solvents and fuels were not detected farther downgradient at DP-054 or DP-056.

Chromium was detected only in the groundwater samples collected from the direct push borings. Therefore, the presence of this metal at elevated concentrations is attributed to dissolution of naturally-occurring chromium from suspended solids during sample preservation (see Section 9.1).

9.6.1.3 Cell 3 Conclusions

Chromium and lead were the only analytes detected in the subsurface soil samples obtained from this cell. Although both metals exceed action levels, neither was detected above the lowest value in the range of average concentrations detected in eastern US or NYS background soils, nor has either impacted groundwater quality at this cell above applicable NYS guidance.

Tetrachloroethene was the only analyte detected above action levels in the groundwater samples collected from this cell. The compound was found in groundwater sampled from one well and one boring east of Building 358 and may be a source for trans-1,2-dichloroethene (a degradation product of tetrachloroethene) in saturated soils at Site 4.

9.6.1.4 Cell 4 Conclusions

Fuel-related compounds, solvent constituents (tetrachloroethene, 1,1,1-trichloroethane, and trichloroethene), and metals were detected in the subsurface soils obtained from DP-060 at Buildings 276 and 280. Only the fuels and metals exceed action levels, and none of the metals exceeds the range of average concentrations found in eastern US or NYS background soils. Arsenic and silver were also detected at DP-064; arsenic occurs well below average NYS background soil concentrations (background concentrations for silver are not available) and neither element has impacted groundwater quality at this cell above applicable NYS guidance.

Fuel-related compounds were detected in the groundwater sample collected from DP-060, but none exceed action levels. 1,1,1-Trichloroethane, cis-1,2-dichloroethene and 1,1-dichloroethane were detected in groundwater sampled from SDW-011 at the southwest corner of Building 276. This area does not appear to be downgradient of DP-060. None of these solvent constituents exceeds action levels.

Trichloroethene and 1,1,1-trichloroethane were detected downgradient of DP-060 and SDW-011 in groundwater samples collected from SDW-013 and/or DP-075. Trichloroethene exceeds action levels in groundwater collected from SDW-013 and was detected in deeper groundwater farther downgradient at SDW-015 in Cell 5. Chromium in groundwater at elevated concentrations in direct push samples is attributed to dissolution of naturally-occurring chromium from suspended solids during sample preservation (see Section 9.1).

9.6.1.5 Cell 5 Conclusions

Arsenic, chromium, lead, and silver were detected above action levels in the subsurface soils obtained from this cell. Silver was found in one sample and appears to be an isolated occurrence. The remaining metals were detected well below the range of average concentrations in eastern US or NYS background soils. None of these elements appears to have impacted groundwater at this cell above applicable NYS guidance.

Benzene and trichloroethene were the only analytes found above action levels in the groundwater sampled at this cell. Benzene was detected at the RL in only one round of groundwater sampling, and there is no supporting evidence to suggest that this compound is a widespread phenomenon at this cell.

Trichloroethene was detected approximately 25 ft below the water table in SDW-015 during both rounds of groundwater sampling. Based upon the absence of detectable concentrations in the shallow water sample obtained from SDW-014, it appears that the source of trichloroethene in groundwater originates northwest of this cell

9.7 SITE 9 - RAMP OUTFALL

9.7.1 Site 9 - Summary

Sediments and surface soils in the upper portion of the ramp drainage ditch contain PAH compounds and metals, some of which exceed action levels and/or the average range of concentrations in eastern US or NYS background soils, respectively. Subsurface soils do not contain metal concentrations which exceed the range of U.S. or NY background concentrations or PAH compounds in excess of action levels. This suggests that constituents released at the outfall have impacted only surface materials near the outfall but the overall areal extent or the level of risk associated with this release has not been established.

Fuel-related compounds were also detected in the groundwater and saturated soils located below the outfall at DP-070. The contaminants do not appear to be related to a release at the ditch and may originate from

the plume migrating southward from Site 4. The plume does not appear to extend southwest as far as DP-071; however, the lateral (east) and vertical extent of contamination has not been defined.

9.7.2 Site 9 - Conclusions

Bis(2ethylhexyl)phthalate, naphthalene, and four metals were detected in the sediment samples obtained from this site. Only the metals exceed action levels, and none of these exceed the range of average concentrations detected in eastern US or NYS background soils. The highest concentrations of arsenic, chromium, and lead were detected in the mid-portion of the ditch, approximately 150 ft downgradient of the outfall. Cadmium concentrations decrease down the ditch, and the only analyte present above action levels in the sample collected farthest from the outfall is lead.

The highest concentrations and variety of constituents in surface soils were detected approximately 220 ft downgradient of the outfall at GB-009. PAH compounds, several of which exceed action levels, are present only in the upper reaches of the ditch. All of the metals exceed action levels in one or more samples, but none exceed the range of average concentrations detected in eastern US or NYS background soils.

With the exception of naphthalene, none of the PAH compounds detected at the ditch were found in the subsurface soils. Although arsenic, chromium, and lead are present at depth, none exceed the range of average concentrations detected in eastern US or NYS background soils. This suggests that materials released from the outfall have adversely impacted only surface material in and around the ditch.

Fuel-related compounds were detected in the groundwater sample and the saturated soils at the outfall. None of the volatile organics were detected in sediments from the ditch, which suggests that these compounds originate off site. None of these constituents was detected farther south at DP-071 or DP-072.

9.8 SITE 10 - WASTE STRIPPER TANK #61, BUILDING 370

9.8.1 Site 10 - Summary

Tetrachloroethene was detected in three unsaturated soil samples and groundwater at this site. None of the soil concentrations exceed NYS guidance for the protection of groundwater quality, and groundwater has not been impacted above applicable guidance. Chromium concentrations which exceed action levels in one subsurface soil sample do not exceed NYS recommended soil cleanup objectives and occur below average concentrations in NYS background soils. Elevated concentrations of chromium in direct push groundwater samples are considered sampling artifacts (see Section 9.1). Chromium concentrations in groundwater samples from nearby wells (SDW-012 and SDW-013) do not exceed action levels.

9.8.2 Site 10 - Conclusions

Chromium was the only analyte detected above action levels in subsurface soils obtained from this site. The highest concentration (1.4 mg/kg) occurs below the average range of concentrations (1.5 to 40 mg/kg) detected in NYS background soils, and the metal may be a naturally occurring constituent of the soils.

Tetrachloroethene was found in three unsaturated soil samples at 7, 14, and 16 ft bgs and in groundwater. The compound was not detected in soils at 30 ft bgs, which suggests that the overlying soils may not be the source of tetrachlorethene in groundwater at this site (Section 9.6.4).

Chromium was the only analyte detected above action levels in groundwater. Because the sample was collected from a direct push boring, the presence of this metal at an elevated concentration is attributed to dissolution of naturally-occurring chromium from suspended solids during sample preservation (see Section 9.1).

9.9 SITE 11 - WASTE OIL VESSEL, BUILDING 230

9.9.1 Site 11 - Summary

The conceptual model for Site 11 assumed that oil was stored in the vessel and that this oil contained solvents, fuel, and metal constituents. If a release occurred, these materials would have migrated downward through the subsurface below the vessel and into groundwater.

Although metals were detected in soil samples, none of the volatile or semi-volatile organic compounds typically associated with solvents or fuels were detected in samples collected at this site.

9.9.2 Site 11 - Conclusions

Arsenic, chromium, and lead were detected in the subsurface soils collected from this site. Since none of these metals exceed the range of average concentrations in eastern US or NYS background soils (arsenic and lead concentrations are actually less than the lowest value of these ranges), these elements are considered to be naturally occurring constituents of the soil.

Chromium was detected slightly above the RL in the groundwater sample obtained from this site. Because the sample was collected from a direct push boring, and there is no evidence to suggest that metal-bearing solutions were released at this site, the presence of this element at an elevated concentration is attributed to dissolution of naturally-occurring chromium from suspended solids during sample preservation (see Section 9.1).

10.0 REOMMENDATIONS

10.1 SITE 1 - AVIATION GASOLINE SPILL SITE

The release of aviation gasoline at this site does not appear to have adversely impacted groundwater or soil quality above applicable guidance with the exception of lead in soil. Although lead concentrations exceed action levels developed for this SI, none exceed the average range of concentrations in eastern US background soils. Therefore, no further action is recommended at this site (Figure 10-1).

10.2 SITE 2 - FORMER HAZARDOUS WASTE STORAGE AREA

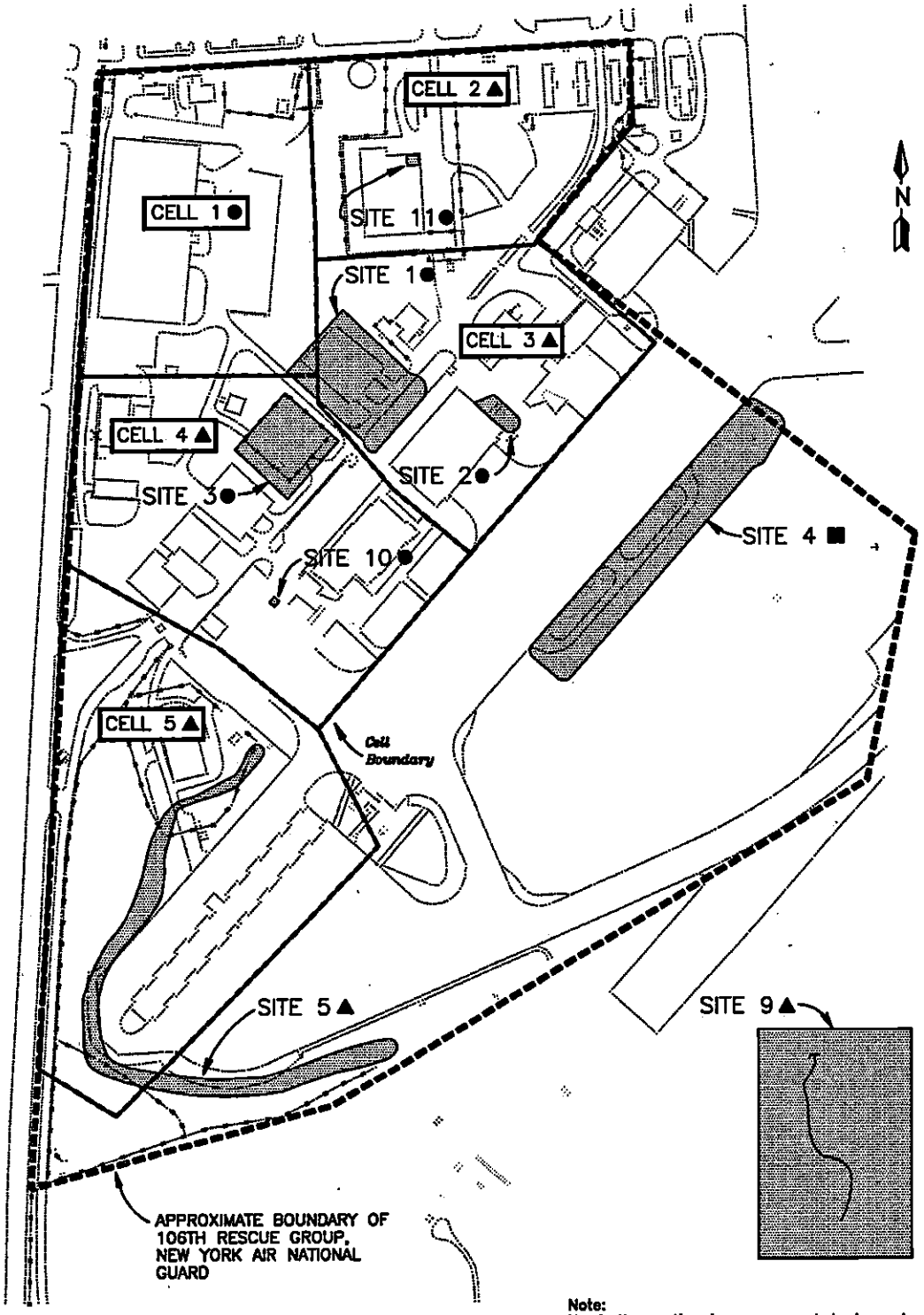
Although chromium was detected in groundwater samples collected from Site 2, it is considered to be a sampling artifact, as described in Section 10. Therefore, no further action is recommended at this site.

10.3 SITE 3 - FORMER HAZARDOUS WASTE STORAGE AREA (1984-1989)

Although chromium was detected in groundwater samples collected from Site 2, it is considered to be a sampling artifact, as described in Section 10. Therefore, no further action is recommended at this site.

10.4 SITE 4 - AIRCRAFT REFUELING APRON SPILL SITE

Soil and groundwater samples collected from Site 4 contain fuel-related compounds at concentrations which exceed action levels. As described in Section 9, it appears that this plume is moving beyond the defined Site 4 area. Therefore, continued investigation is recommended at this site in order to ascertain the extent of contamination and provide maximum concentration data to conduct a risk assessment.



Note:
No further action is recommended at most subsites in Cells 2 through 4 (Site 8). Refer to Subsection 12.6 of this report for a summary of those areas within cells for which a risk assessment is recommended.

Legend
- ● No further action recommended
- ▲ Risk assessment recommended
- ■ Continued investigation recommended

SCALE
200 0 200 400 600 FT

FIGURE 10–1
RECOMMENDED ACTIONS
106TH RESCUE GROUP, NYANG
WESTHAMPTON BEACH, NEW YORK

ABB Environmental Services, Inc.

10.5 SITE 5 - SOUTHWEST STORM DRAINAGE DITCH

Based on the results of this SI, a risk assessment is recommended to determine if the type and concentrations of constituents detected in the sediment samples warrant interim remedial measures. Additional work may be required to further define the precise vertical extent of contamination which is currently estimated at less than 7 ft below ground surface.

10.6 SITE 8 - OLD BASE SEPTIC SYSTEMS

The following are recommendations for the six areas of potential concern identified at Site 8.

- Tetrachloroethene and fuel-related compounds in groundwater at Building 230 (Cell 2)
- Silver in subsurface soils between Buildings 220 and 230 (Cell 2)
- Tetrachloroethene in groundwater at Building 358 (Cell 3)
- Fuel-related compounds in subsurface soils between Buildings 276 and 280 (Cell 4), and
- Trichloroethene in groundwater southeast of Building 276 (Cells 4 and 5).

Petroleum fuels migrating southeastward from the county-operated portion of the airport appear to have contaminated soil and groundwater above action levels in the northern portion of Cell 2. The plume extends at least as far south as DP-050, but the leading edge is not well defined. The county has initiated a recovery system, and it is recommended that NYANG monitor the progress of remedial operations and allow county personnel access to this cell to monitor groundwater quality at the leading edge of the plume.

Although tetrachloroethene and fuel-related compounds exceed action levels in groundwater north and south of Building 230 (Cell 2), the source of this contamination is not known. Although the lateral extent and the impact to deeper groundwater, if any, has not been defined, it appears that this contamination has not migrated off NYANG-leased property because organic compounds were not detected in downgradient wells at SDW-007, SDW-008, and SDW-009. Therefore, it is recommended that a risk assessment be conducted to establish the necessity for additional investigation in this area.

Although silver was detected in subsurface soils between Buildings 220 and 230 (Cell 2), it is unlikely that accessible (surface) soils have been impacted and the metal has not affected groundwater quality above applicable NYS guidance. Based on these data, no further action is recommended at this location. However, disposal of wastewater containing silver to these cesspools should be discontinued.

Because tetrachloroethene is present slightly above action levels in groundwater east of Building 358 (Cell 3). It is recommended that a risk assessment to establish the necessity for continued investigation in this area be conducted.

Although fuel-related compounds were detected in subsurface soils at DP-060 (Cell 4), it is unlikely that accessible (surface) soils have been impacted, and the fuels have not impacted groundwater quality above applicable NYS guidance. Based on these data, no further action is recommended at this location. However, disposal of fuel-contaminated wastes to these cesspools should be discontinued.

Based on the results of this SI, additional groundwater sampling may be required in Cells 4 and 5 to quantify the extent of trichloroethene for the risk assessment.

10.7 SITE 9 - RAMP OUTFALL

Based on the results of this SI, a risk assessment is recommended to determine if the type and concentrations of constituents detected in samples collected at the ditch warrant additional investigation. Although PAH and metal concentrations exceed action levels, the ditch is located in a remote, enclosed area with limited access. Further investigation of Site 9 groundwater can be conducted in conjunction with any additional evaluation of Site 4, as necessary.

10.8 SITE 10 - WASTE STRIPPER TANK #61, BUILDING 370

Based on the results of this SI, no further action is recommended at this site.

10.9 SITE 11 - WASTE OIL VESSEL, BUILDING 230

Although metals were detected in soil samples, none of the volatile or semi-volatile organic compounds typically associated with solvents or fuels were detected in samples collected at this site. Since none of the metals exceed the range of average concentrations in eastern US or NYS background soils or NYS soil cleanup objectives, and chromium, the only analyte detected in groundwater is considered a sampling artifact (see Section 10.2), no further action is recommended at this site.

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