REMEDIAL INVESTIGATION REPORT

ORANGE & ROCKLAND UTILITIES, INC.

INACTIVE HAZARDOUS WASTE DISPOSAL SITE (I.D.#: 3-44-014)

WEST NYACK, NY

Volume 1 of 3

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EXECUTIVE SUMMARY

Orange and Rockland Utilities, Inc.(ORU) retained Rust Environment and Infrastructure (Rust), to conduct a Remedial Investigation (RI)for the ORU property located in a developed commercial and residential area of West Nyack, Rockland County, New York. The RI/FS was performed in accordance with Order on Consent Index # W3-0508-93-12 dated August 2, 1994 between ORU and the New York State Department of Environmental Conservation (NYSDEC). The intent of this RI Report is to summarize the methods used and results obtained to date for the ongoing investigation.

The overall objective of the RI was to determine the nature and extent of hazardous waste contamination which exists on and may be emanating from the Site to surrounding areas. Once the nature and extent of contamination is determined, the data presented in this report will be used to prepare a feasibility study (FS). The FS will identify, evaluate and ultimately recommend the most cost-effective, environmentally sound, long-term remedial action(s).

The Site is approximately three acres in size and is situated north of Route 59 and immediately north of the Old Nyack Turnpike, and seven-tenths of a mile west of the intersection of Routes 59 and 303. The Site is bordered on the west by Consolidated Rail Corporation (Conrail) rail tracks and a small property occupied by Yaboo Fence Company, Inc. for storage purposes. The Hackensack River borders the Site to the north and east.

The Site is currently used as a satellite station for ORU's line crews with garage facilities for utility service repair trucks, parking space for ORU vehicles, and as office space for two outside tenants and for several other ORU Departments. From the late 1920's to approximately 1981 the Site was used to store and repair electrical transformers, capacitors and other utility equipment. Two underground storage tanks located in the center of the Site were used to store gasoline for fueling ORU's utility service repair trucks. In April 1980, it was discovered that one tank was leaking. As a result, this tank was repaired and relined in 1980 and removed in 1989 after failing tightness testing. The second tank was found to be sound and remains in service for diesel fuel storage.

Dating back to 1980 and 1981, ORU has been conducting investigations into the possible nature and extent of soil and groundwater contamination on the Site. The most recent investigation undertaken by ORU was a Phase II performed pursuant to a Consent Order with the NYSDEC. Based on the findings of the Phase II investigation, it was determined that elevated concentrations of certain contaminants were found primarily in surface soil and groundwater. PCBs were detected in several areas in the northern and southeastern portions of the Site. However, only three samples in the northern portion of the Site and one in the southeastern area exhibited PCB concentrations which exceeded the NYSDEC Recommended Soil Cleanup Objective (RSCO) of 10 parts per million (ppm) for subsurface contamination. Low level PCBs were detected in one sediment sample downstream of the Nyack Water Company intake which is immediately adjacent to the northeast corner of the Site on the opposite side of the Hackensack River.

Chlorinated solvents were detected in the shallow and bedrock interface groundwater wells at concentrations exceeding the NYSDEC groundwater standards. The highest concentration of these

solvents were detected in the bedrock interface aquifer. Results from a soil gas survey indicated that chlorinated solvents were also detected in many areas of the Site using a soil gas survey. However, essentially no chlorinated solvents were found in the surface or deep soil samples. Therefore, the source of the solvent contamination could not be identified.

Petroleum-related contaminants were detected in the area of the existing and former underground storage tanks. These contaminants were not detected in the Hackensack River surface water or sediment samples.

The overall approach used during this RI was to gather sufficient information to determine the nature and extent of hazardous waste contamination at and emanating from the Site in order to determine the most cost-effective, environmentally sound, long-term remedial action(s). The gathering of information includes both the utilization of existing information collected for the Phase II Investigation as well as the collection of new data to supplement and complement the existing information.

The following items are considered the primary components of the RI activities:

- Review of existing data and inspection of the existing monitoring network;
- Site mapping and topographic survey;
- Collection of water-level measurements on a monthly basis for three months to assess current conditions of groundwater flow in and between the various hydrogeologic units;
- Collect shallow soil samples from selected locations;
- Collect subsurface soil samples near the former or removed UST area and in the vicinity of the Dry Well Area;
- Install two additional bedrock interface monitoring wells and one shallow overburden monitoring well and the collection of subsurface soil and rock samples to assess groundwater conditions within the bedrock interface and shallow overburden hydrogeologic units;
- Develop the newly-installed monitoring wells;
- Obtain surface water and sediment samples from selected locations to confirm prior analytical results, acquire information for other analytes, and assess background conditions;
- Obtain one round of groundwater samples from all newly-installed wells and existing wells for subsequent analysis for various Target Compound List (TCL) volatile

organic compounds (VOCs) and PCBs to assess current groundwater conditions and confirm results from previous investigations;

- Perform additional in-situ hydraulic conductivity testing; and,

- Perform a fish and wildlife impact analysis.

In addition to the above, the following field activities were also performed during this investigation to obtain information regarding the chemical nature of subsurface soil in the immediate vicinity of a Suspected Disposal Area (located northeast of existing monitoring well MW-3 and east of existing monitoring well (MW-6) and soil boring UST-SB-24:

- Drilling of 2 soil borings and collection of 32 subsurface soil/refuse samples in the immediate vicinity of a Suspected Disposal Area (SDA);

- Analysis of 4 soil/debris samples from a SDA borings for VOCs by EPA Method SW-846 8240 with library search and PCBs by EPA Method SW-846 8080;

- Completion of 3 test pits to the north, east and south of UST soil boring UST-SB-24; and

- Analysis of 4 soil/debris samples from the test pits for PCBs by NYSDEC, CLP Method 91-3.

Conclusions

Based on the findings of the Remedial Investigation, the following conclusions have been reached:

- Subsurface soil in the vicinity of the UST area exhibit BTEX concentrations that are elevated with respect to the NYSDEC RSCO's. There is an estimated 6,000 cubic yards of impacted soils located above and below the groundwater table;

- Subsurface soil in the area of the suspected dry well does not represent a significant source of chlorinated VOCs;

- PCB impacted soil in the vicinity of UST SB-24 is limited to the immediate vicinity of the boring;

- No evidence of subsurface soil contamination exists in the debris disposal area located in the northeast section of the Site;

- Hackensack River surface water analytical data indicates that the Site has not had an impact on surface water quality with respect to PCBs;

- Hackensack River sediment data indicate that the Site has not had an impact on sediment quality with respect to PCBs. Sediments exhibiting concentrations significantly elevated with respect to upgradient background is limited in extent;

- The October 1991 Hackensack River surface water and sediment data indicated that VOCs were not detected. However, groundwater flow data indicate that BTEX compounds may not have reached the River by October 1991.

- Groundwater flow in both the overburden and bedrock interface regimes is to the northeast;

- It is expected that an upward gradient from the bedrock to the overburden exists across the entire northern half of the Site, due to influences posed by the Hackensack River.

- Upgradient background groundwater data indicate that the TCE and to a significant extent the 1,2-DCE is related to an off-site source;

- Overburden groundwater monitoring wells, except MW-1 and MW-5, exhibit elevated concentrations of chlorinated VOCs. Chlorinated volatile concentrations in groundwater from MW-3 have increased;

- Overburden groundwater impacted by petroleum constituents is limited to the three wells, MW-2, MW-3 and MW-4, located immediately downgradient of the UST area. MW-3 and MW-4 concentrations have decreased. Groundwater from monitoring wells EXW-4 and EXW-5 at the downgradient Site boundary has not been impacted by BTEX. However, groundwater flow rates indicate that BTEX compounds may not have reached these locations;

- Bedrock interface groundwater monitoring wells at the upgradient Site boundary and the eastern and central section of the Site exhibit elevated concentrations of chlorinated VOCs. The 1,1,1-TCA and associated degradation products appear Site related; and

- The fish and wildlife criteria specific analysis indicates that Hackensack River sediment concentrations, at a limited number of locations, exhibit concentrations that exceed the sediment criteria screening value of 0.042 mg/kg. However, the available data indicate that the areal extent of impacted sediments is limited and therefore excavation/remediation of the sediments is not warranted.

Recommendations

It is recommended that a complete round of groundwater elevations should be collected from both the overburden and bedrock monitoring wells during low water level conditions. This data is needed to evaluate the weathered bedrock groundwater flow directions to provide more definitive data on the possible source of TCE in the Site overburden monitoring wells and weathered bedrock wells

MW-6 and MW-8. It is also recommended that surface water and sediment samples from the

Hackensack River be collected and analyzed for volatile organics to confirm that VOCs are not a concern.

1.0 INTRODUCTION

1.1 PURPOSE

Orange and Rockland Utilities, Inc.(ORU) retained Rust Environment and Infrastructure (Rust), to conduct a Remedial Investigation (RI) and Feasibility Study (FS) for the ORU property (Site) located in a developed commercial and residential area of West Nyack, Rockland County, New York (Figure 1). The RI/FS was performed in accordance with Order on Consent Index # W3-0508-93-12 dated August 2, 1994 between ORU and the New York State Department of Environmental Conservation (NYSDEC). The intent of this RI Report is to summarize the methods used and results obtained to date for the ongoing investigation.

An RI/FS Work Plan was developed by Rust to serve as a scope and procedural outline for the field activities performed during the RI and the evaluation of remedial technologies and alternatives during the FS. The workplan was reviewed and approved by the NYSDEC.

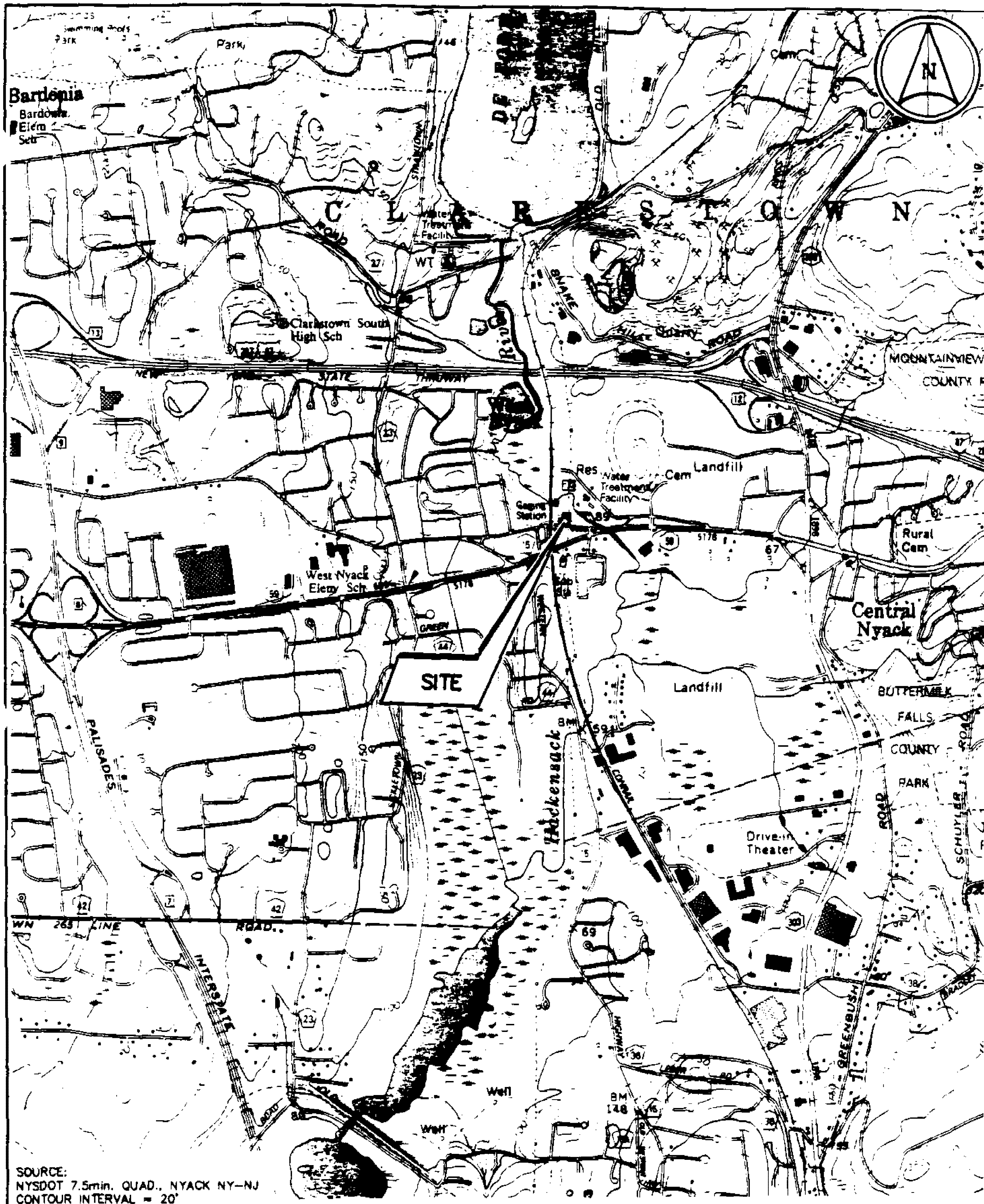
As part of the RI/FS Work Plan, an RI Field Health and Safety Plan (FHSP), Sampling and Analysis Plan (SAP) and Citizen's Participation Plan (CPP) were developed for use with this Work Plan and are presented under separate cover. Although bound separately, these documents were also reviewed and, as appropriate, approved by the NYSDEC prior to the initiation of field activities. The site-specific FHSP was prepared to ensure the health and safety of workers and the immediate community during performance of the RI. The SAP contained both a Field Sampling Plan (FSP) and a Quality Assurance Project Plan (QAPP). The SAP outlined data quality objectives (DQOs) and detailed specific sampling procedures and analytical protocols to ensure the data collected during the RI are of sufficient quality to support remedial decisions. The CPP outlined some of the activities to ensure adequate involvement of the community in the remedial process.

The overall objective of the RI was to determine the nature and extent of hazardous waste contamination which exists on and may be emanating from the Site to surrounding areas. Once the nature and extent of contamination was determined, the data presented in this report will be used to prepare a feasibility study (FS). The FS will identify, evaluate and ultimately recommend the most cost-effective, environmentally sound, long-term remedial action(s).

1.2 SITE DESCRIPTION

The Site is approximately three acres in size and is situated north of Route 59 and immediately north of the Old Nyack Turnpike, and seven-tenths of a mile west of the intersection of Routes 59 and 303. The Site is bordered on the west by Consolidated Rail Corporation (Conrail) rail tracks and a small property occupied by Yaboo Fence Company, Inc. for storage purposes. The Hackensack River borders the Site to the north and east (Figure 1). A Site topographic base map is presented on Figure 2 and Drawing 1.

The Hackensack River flows from north to south, occupying a broad valley bottom of low relief (Figure 1). This valley bottom exists generally at elevations of 50 to 70 feet, but has rolling hills that rise from 100 to 150 feet. It is approximately 6,000 feet wide where it is crossed by NYS Route 59, and maintains that width for about 2,000 feet north of the Site and about 6,000 feet south of the Site (Lawler, Matusky and Skelly, 1992 [L,M&S, 1992]).



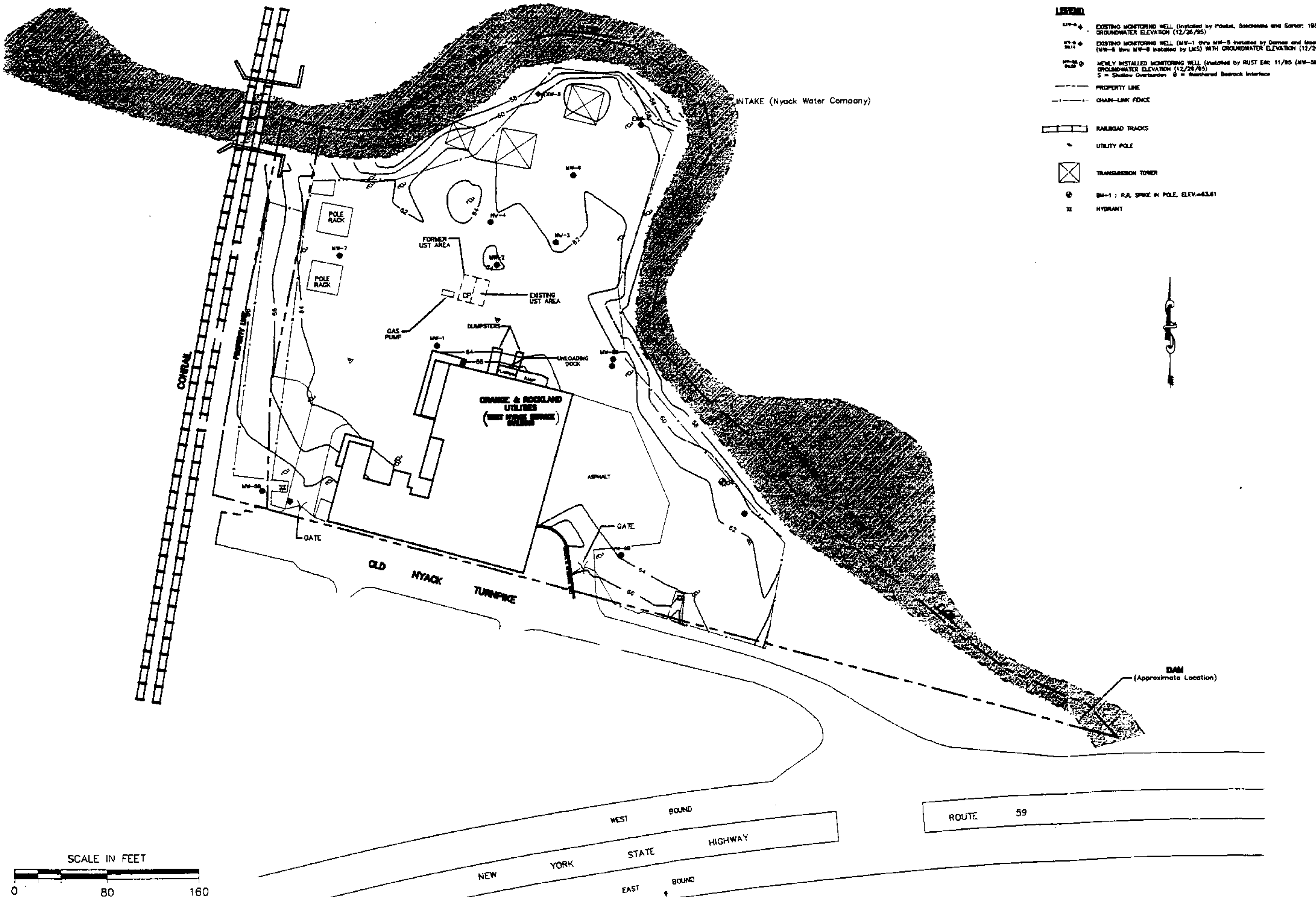
RUST ENVIRONMENT & INFRASTRUCTURE

SITE LOCATION MAP

ORANGE AND ROCKLAND UTILITIES, INC.

VILLAGE OF WEST NYACK — ROCKLAND COUNTY, NEW YORK

PROJECT NO. 38301.200	DATE 9/94	DWG. NO. 38301-03	SCALE 1"=2000'	FIGURE NO. 1



NAMES	DATE
DRAWN: GRM	3/18/96
DESIGN:	
CHECKED: MAW	3/18/96
PE:	
APP'D:	
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APP'D:	

SITE TOPOGRAPHIC BASE MAP

ORANGE AND ROCKLAND UTILITIES, INC.
WEST NYACK, NEW YORK

RUST

PROJECT NUMBER

RUST DWG NUMBER 38301

CLIENT DWG NUMBER FIG No

REVISIONS | MADE | CHK | DATE | NO. | REVISIONS | MADE | CHK | DATE | NO. | REVISIONS | MADE | CHK | DATE

The land surface rises steeply to a long north-south trending ridge at the eastern edge of the Hackensack River floodplain where elevations reach 300 to 500 feet. This long north-south trending ridge forms a topographic divide between the Hudson River and Hackensack River drainage basins. The land rises abruptly to elevations of about 250 feet on the western edge of the Hackensack River floodplain, though not as steeply as on the eastern edge.

One of the rolling hills in the Hackensack River valley mentioned above exists immediately to the west and south of the subject Site. The ground surface rises to 80 feet on the west and 100 feet on the south side of NYS Route 59. This landform creates a small local divide that separates shallow groundwater and surface water that flows northeast toward and across the Site from waters that flow south and west into a large wetland area downstream from the Site.

The Site is mostly flat, sloping gently from southwest to northeast, with the southwest corner rising slightly to approximately 69 feet, which is about 6 to 7 feet higher than most of the Site. The range of elevations encountered at the Site ranges from 50 to 70 feet.

1.3 DEMOGRAPHY AND LAND USE

The Site is located at 180 West Nyack Road (Old Nyack Turnpike) in the hamlet of West Nyack, Town of Clarkstown, Rockland County, New York. The Town of Clarkstown had a 1990 Census population of 79,346. The Site occupies approximately 3 acres just north of NYS Route 59 between (east of) the Conrail train tracks and south and west of the Hackensack River. The geographic coordinates are 41°05' 43" latitude and 73°57' 52" longitude.

The region is an extensively developed commercial and residential area. The Site is an active satellite crew location for ORU, which has owned and operated the Site since the late 1920's. The facility is used to garage utility vehicles and is improved with a service building and also contains empty unpaved lots, storage areas and parking areas for ORU vehicles. In addition, three large electrical transmission towers are located on the northern portion of the Site. The on-Site service building also provides office space for ORU employees and rental office space for three small independent businesses. An ORU-owned parking lot and three one family homes are located to the south of West Nyack Road and north of NYS Route 59.

1.4 SITE HISTORY / PREVIOUS INVESTIGATIONS

The Site is currently used as a satellite station for ORU's line crews with garage facilities for utility service repair trucks, parking space for ORU vehicles, and as office space for two outside tenants and for several other ORU Departments. From the late 1920's to approximately 1981 the Site was used to store and repair electrical transformers, capacitors and other utility equipment. Two underground storage tanks located in the center of the Site were used to store gasoline for fueling ORU's utility service repair trucks. In April 1980, it was discovered that one tank was leaking. As a result, this tank was repaired and relined in 1980 and removed in 1989 after failing tightness testing. The second tank was found to be sound and remains in service for diesel fuel storage.

Dating back to 1980 and 1981, ORU has been conducting investigations into the possible nature and extent of soil and groundwater contamination on the Site. The most recent investigation undertaken by ORU was a Phase II performed pursuant to a Consent Order with the NYSDEC. Based on the findings of the Phase II investigation, it was determined that elevated concentrations of certain contaminants were found primarily in surface soil and groundwater. PCBs were detected in several areas in the northern and southeastern portions of the Site. However, only three samples in the northern portion of the Site and one in the southeastern area exhibited PCB concentrations which exceeded the NYSDEC Recommended Soil Cleanup Objective (RSCO) of 10 parts per million (ppm) for subsurface contamination. Low level PCBs were detected in one sediment sample downstream of the Nyack Water Company intake which is immediately adjacent to the northeast corner of the Site on the opposite side of the Hackensack River.

Chlorinated solvents were detected in the shallow and bedrock interface groundwater wells at concentrations exceeding the NYSDEC groundwater standards. The highest concentration of these solvents were detected in the bedrock interface aquifer. Results from a soil gas survey indicated that chlorinated solvents were also detected in many areas of the Site using a soil gas survey. However, essentially no chlorinated solvents were found in the surface or deep soil samples. Therefore, the source of the solvent contamination could not be identified.

Petroleum-related contaminants were detected in the area of the existing and former underground storage tanks. These contaminants were not detected in the Hackensack River surface water or sediment samples.

Presented below is a chronological list of previous investigations performed at the Site. In addition, a brief summary of activities performed and recommendations provided, based upon review of results and conclusions, from each investigation is also included:

<u>1980</u>: In response to concerns over the possibility of soil contamination and migration of PCBs into the Hackensack River due to the historical operation of the facility, Paulus, Sokolowski and Sartor (PSS) performed a soil, surface water, sediment and groundwater investigation. PSS concluded that PCBs were not migrating from the Site but recommended that monitoring wells be installed and a short-term monitoring program be established.

<u>June-August, 1981</u>: ORU examined on-site air, soil and groundwater and Hackensack River surface water and sediment for PCB content. PCBs were detected in low concentrations in the following media: soil (on-site), groundwater (on-site), surface water and sediment from the nearby Hackensack River.

<u>May, 1987</u>: Wehran Engineering of Middletown, New York performed a Phase I investigation for the NYSDEC. Wehran recommended that a Phase II investigation be performed.

May, 1988: NUS Corporation (NUS) completed a Preliminary Assessment of the Site for the USEPA. The report recommended that surface water sampling be conducted at the intake point of the Nyack Water Company.

August, 1988: NUS completed a Final Draft Site Inspection Report of the Site for the USEPA in which recommendations for further action at the Site were identified as being a high priority.

July, 1989: Dames and Moore (D&M) of Pearl River, New York performed a groundwater investigation due to a failed integrity test on an on-site underground storage tank (UST) and the identification of "petroleum" contaminated soil during its subsequent excavation. D&M installed five monitoring wells and sampled the newly installed wells and three existing wells. Based on the analytical results, D&M confirmed the presence of petroleum-related constituents and the probability of chlorinated solvents in on-site groundwater.

February, 1990: ORU sampled on-site groundwater and surface water and sediment from the Hackensack River. All samples were analyzed for PCBs with PCBs being detected in only one sediment sample from the Hackensack River.

July, 1991: ORU signed a Consent Order with the NYSDEC to conduct a Phase II investigation to verify that no PCBs or chlorinated solvents were present in on-site soil and/or groundwater.

March, 1992: Lawler, Matusky and Skelly Engineers (LMS) performed a Phase II investigation. LMS conducted sampling of on-site soil (shallow surface and subsurface), surface water and sediment from the Hackensack River and on-site groundwater. Each sample was analyzed for the Target Compound List (TCL) organic parameters. PCBs were only identified in on-site soil and Hackensack River sediment samples while chlorinated solvents were identified in on-site soil and groundwater.

Additional information relating to the previous investigations is contained in the Phase II Investigation Report.

1.5 APPROACH

The overall approach to conducting this RI is to gather sufficient information to determine the nature and extent of hazardous waste contamination at and emanating from the Site in order to determine the most cost-effective, environmentally sound, long-term remedial action(s). The gathering of information includes both the utilization of existing information collected for the Phase II Investigation as well as the collection of new data to supplement and complement the existing information. Several existing monitoring wells were sampled. The installation of additional groundwater monitoring wells was minimal with new monitoring wells installed only in those areas where insufficient information existed on the quality of the groundwater in the various hydrogeologic units. Additional soil samples were proposed only in areas not covered by the Phase II Investigation. Since the most likely route for the transport of contaminants from the Site is via the Hackensack River, several additional surface water and sediment samples were collected in the river.

2.0 REMEDIAL INVESTIGATION

Activities associated with the RI were initiated in November 1995. Techniques and methods specified in the approved work plan were used as the basis for performing all field investigations and laboratory testing.

Previous investigative results were reviewed to aid in scoping this RI. The RI tasks presented below provide the additional data necessary for the development and evaluation of remedial alternatives during the FS. The following items are considered the primary components of the RI activities:

- Review of existing data and inspection of the existing monitoring network;
- Site mapping and topographic survey;
- Collection of water-level measurements on a monthly basis for three months to assess current conditions of groundwater flow in and between the various hydrogeologic units;
- Collect shallow soil samples from selected locations;
- Collect subsurface soil samples near the former or removed UST area and in the vicinity of the Dry Well Area;
- Install two additional bedrock interface monitoring wells and one shallow overburden monitoring well and the collection of subsurface soil and rock samples to assess groundwater conditions within the bedrock interface and shallow overburden hydrogeologic units;
- Develop the newly-installed monitoring wells;
- Obtain surface water and sediment samples from selected locations to confirm prior analytical results, acquire information for other analytes, and assess background conditions;
- Obtain one round of groundwater samples from all newly-installed wells and existing wells for subsequent analysis for various Target Compound List (TCL) volatile organic compounds (VOCs) and PCBs to assess current groundwater conditions and confirm results from previous investigations;
- Perform additional in-situ hydraulic conductivity testing; and,
- Perform a fish and wildlife impact analysis.

In addition to the above, the following field activities were also performed during this investigation to obtain information regarding the chemical nature of subsurface soil in the immediate vicinity of a Suspected Disposal Area (located northeast of existing monitoring well MW-3 and east of existing monitoring well (MW-6) and soil boring UST-SB-24:

- Drilling of 2 soil borings and collection of 32 subsurface soil/refuse samples in the immediate vicinity of a Suspected Disposal Area (SDA);
- Analysis of 4 soil/debris samples from a SDA borings for VOCs by EPA Method SW-846 8240 with library search and PCBs by EPA Method SW-846 8080;
- Completion of 3 test pits to the north, east and south of UST soil boring UST-SB-24; and
- Analysis of 4 soil/debris samples from the test pits for PCBs by NYSDEC, CLP Method 91-3.

These and other activities performed to date during the RI are described in more detail below. The results of environmental samples collected and analyzed during the RI are presented in Table 2.1.

2.1 EXISTING DATA REVIEW

In order to gain a more complete understanding of the Site geology, hydrology and physical characteristics, Rust performed a review of correspondence and data generated during the Phase I and II investigations. This included a review of boring logs, well construction details, analytical data forms, field notes, and historical aerial photographs.

2.2 SITE MAPPING AND TOPOGRAPHIC SURVEY

The Site maps included in the Phase II investigation appear to be approximated and therefore inadequate for the data quality objectives of the RI/FS. For this reason, Rust prepared an accurate base map of the Site by performing a topographic survey on January 15, 16 and 17, 1996 (Drawing 1). The Site was mapped at a scale of approximately one inch equals 30 feet with a two foot contour interval. The map adequately represents topography and identifies property lines, fence lines, roadways, buildings, monitoring wells and other significant on-site features. Monitoring wells were surveyed to the nearest 0.01 foot at the top of well casing and top of protective steel casing. Ground surface at each location was surveyed to the nearest 0.1 foot.

2.3 WATER LEVEL MEASUREMENTS

A sufficient water-level database was developed during previous phases of investigation at the Site. However, the most recent round of water levels is from December 1991. Therefore, several rounds of water-level measurements were obtained during the RI from all accessible wells to assess current conditions and also to acquire hydrologic information from the additional wells installed during the RI. Water levels were collected December 6, 1995, January 12, 1996 and March 13, 1996. All water-level data were converted to water-level elevations with respect to mean sea level (msl) using the surveyed elevations of the measuring points. Groundwater elevation data is summarized in Table 3.2, Section 3.0. Water-level measurement rounds were not performed during or immediately after (i.e., within two days) a significant precipitation event (i.e., greater than 0.25 to 0.5 inches).

Table 2.1

Sample and Analysis Summary
Orange and Rockland Utilities, Inc.
West Nyack, New York

Well I.D.	Date Collected	Media Sampled	Analytical Method
Shallow Soil			
HA-1 (1-2')	11/14/95	Shallow Soil	TCL VOCs CLP 91-1
HA-1 (3-4')	11/14/95	Shallow Soil	TCL VOCs CLP 91-1
HA-1 (3-4') MS/MSD	11/14/95	Shallow Soil	TCL VOCs CLP 91-1
HA-2 (1-2')	11/14/95	Shallow Soil	TCL VOCs CLP 91-1
HA-2 (3-4')	11/14/95	Shallow Soil	TCL VOCs CLP 91-1
HA-3 (1-2')	11/14/95	Shallow Soil	TCL VOCs CLP 91-1
HA-3 (3-4')	11/14/95	Shallow Soil	TCL VOCs CLP 91-1
HA-4 (1-2')	11/14/95	Shallow Soil	TCL VOCs CLP 91-1
HA-4 (3-4')	11/14/95	Shallow Soil	TCL VOCs CLP 91-1
HA-5 (1-2')	11/14/95	Shallow Soil	TCL VOCs CLP 91-1
HA-5 (3-4')	11/14/95	Shallow Soil	TCL VOCs CLP 91-1
X-1	11/14/95	Shallow Soil	TCL VOCs CLP 91-1
Former Underground Storage Tank (UST) Area			
UST-SB-06A (10-12')	11/20/95	Soil	EPA Method SW-846 8020 (BTEX)
UST-SB-07A (10-12')	11/21/95	Soil	EPA Method SW-846 8020 (BTEX)
UST-SB-07 (8-10')	11/20/95	Soil	EPA Method SW-846 8020 (BTEX)
UST-SB-07 (8-10') MS	11/21/95	Soil	EPA Method SW-846 8020 (BTEX)
UST-SB-07 (8-10') MSD	11/21/95	Soil	EPA Method SW-846 8020 (BTEX)
UST-SB-09 (8-10')	11/27/95	Soil	EPA Method SW-846 8020 (BTEX)
UST-SB-09A (8-10')	11/28/95	Soil	EPA Method SW-846 8020 (BTEX)
UST-SB-14A (10-12')	11/30/95	Soil	EPA Method SW-846 8020 (BTEX)
UST-SB-16 (14-16')	12/4/95	Soil	EPA Method SW-846 8020 (BTEX)
UST-SB-17 (10-12')	12/4/95	Soil	EPA Method SW-846 8020 (BTEX)

Table 2.1
Sample and Analysis Summary
Orange and Rockland Utilities, Inc. (continued)

Well I.D.	Date Collected	Media Sampled	Analytical Method
Former Underground Storage Tank (UST) Area (Cont.)			
UST-SB-19 (8-10')	12/6/95	Soil	EPA Method SW-846 8020 (BTEX)
UST-SB-19 (8-10') MS	12/6/95	Soil	EPA Method SW-846 8020 (BTEX)
UST-SB-19 (8-10') MSD	12/6/95	Soil	EPA Method SW-846 8020 (BTEX)
Former Dry Well Area			
DW-SB-01 (24-26')	12/6/95	Soil	EPA Method 8240
DW-SB-01 (26-26.7')	12/6/95	Soil	EPA Method 8021
DW-SB-02 (26-26.4')	12/8/95	Soil	EPA Method 8021
DW-SB-03 (26-27.1')	12/7/95	Soil	EPA Method 8021
DW-SB-04 (26-26.5')	12/8/95	Soil	EPA Method 8021
DW-SB-04 (26-26.5') MS	12/8/95	Soil	EPA Method 8021
DW-SB-04 (26-26.5') MSD	12/8/95	Soil	EPA Method 8021
DW-SB-05A (4-6')	12/11/95	Soil	EPA Method 8021
DW-SB-05A (24-24.4')	12/11/95	Soil	EPA Method 8021
DW-SB-06 (28-28.4')	12/12/95	Soil	EPA Method 8021
Suspected Disposal Area			
SDA-SB-01 (4-6')	12/13/95	Soil/Electrical Debris	PCBs only - EPA Method SW-846 Method 8080
SDA-SB-01 (12-14')	12/13/95	Soil/Refuse	EPA Method SW-846 8240 with library search
SDA-SB-02 (12-14')	12/12/95	Soil/Refuse	PCBs only - EPA Method SW-846 Method 8080 & EPA Method SW-846 8240 with library search
Other			
UST-SB-24 (2-4')	11/30/95	Soil	PCBs only - EPA Method SW-846 8080
UST-SB-24 (4-4.5')	11/30/95	Soil	PCBs only - EPA Method SW-846 8080

Table 2.1
Sample and Analysis Summary
Orange and Rockland Utilities, Inc. (continued)

Well I.D.	Date Collected	Media Sampled	Analytical Method
UST-SB-24 Area - Test Pits			
TP-96-1 (4-5')	1/11/96	Soil/Electrical Debris	PCBs by NYSDEC, Contract Laboratory Program Method 91-3
TP-96-2 (5')	1/11/96	Soil/Electrical Debris	PCBs by NYSDEC, Contract Laboratory Program Method 91-3
TP-96-3 (5-6')	1/11/96	Soil/Refuse Debris	PCBs by NYSDEC, Contract Laboratory Program Method 91-3
TP-96-4 (4.75')	1/11/96	Soil/Refuse Debris	PCBs by NYSDEC, Contract Laboratory Program Method 91-3
Hackensack River			
SW-1	12/27/95	Surface Water	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SW-1 MS	12/27/95	Surface Water	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SW-1 MSD	12/27/95	Surface Water	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SW-2	12/27/95	Surface Water	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SW-3	12/27/95	Surface Water	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
X-2 (SW-2)	12/27/95	Surface Water	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SED-1	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SED-2	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SED-3	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SED-4	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SED-5	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SED-5 MS	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SED-5 MSD	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SED-6	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SED-7	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SED-8	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SED-9	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SED-10	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SED-11	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)

Table 2.1
Sample and Analysis Summary
Orange and Rockland Utilities, Inc. (continued)

Well I.D.	Date Collected	Media Sampled	Analytical Method
Hackensack River (Cont.)			
SED-12	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SED-13	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SED-14	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SED-15	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SED-16	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SED-17	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
SED-18	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
X-3 (SED-12)	12/28/95	Sediment	TCL PCBs (NYSDEC-ASP CLP Method 91-3)
Monitoring Wells			
EXW-1	1/12/96	Groundwater	TCL Volatiles (NYSDEC ASP CLP Method 91-1)/TCL PCBs (NYSDEC ASP CLP Method 91-3)
EXW-4	12/27/95	Groundwater	TCL Volatiles (NYSDEC ASP CLP Method 91-1)/TCL PCBs (NYSDEC ASP CLP Method 91-3)
EXW-5	12/27/95	Groundwater	TCL Volatiles (NYSDEC ASP CLP Method 91-1)/TCL PCBs (NYSDEC ASP CLP Method 91-3)
MW-1	12/26/95	Groundwater	TCL Volatiles (NYSDEC ASP CLP Method 91-1)/TCL PCBs (NYSDEC ASP CLP Method 91-3)
MW-2	1/12/96	Groundwater	TCL Volatiles (NYSDEC ASP CLP Method 91-1)/TCL PCBs (NYSDEC ASP CLP Method 91-3)
MW-3	1/12/96	Groundwater	TCL Volatiles (NYSDEC ASP CLP Method 91-1)/TCL PCBs (NYSDEC ASP CLP Method 91-3)
MW-4	1/12/96	Groundwater	TCL Volatiles (NYSDEC ASP CLP Method 91-1)/TCL PCBs (NYSDEC ASP CLP Method 91-3)
MW-5	12/26/95	Groundwater	TCL Volatiles (NYSDEC ASP CLP Method 91-1)/TCL PCBs (NYSDEC ASP CLP Method 91-3)
MW-5MS	12/26/95	Groundwater	TCL Volatiles (NYSDEC ASP CLP Method 91-1)/TCL PCBs (NYSDEC ASP CLP Method 91-3)
MW-5MSD	12/26/95	Groundwater	TCL Volatiles (NYSDEC ASP CLP Method 91-1)/TCL PCBs (NYSDEC ASP CLP Method 91-3)
MW-5B	12/27/95	Groundwater	TCL Volatiles (NYSDEC ASP CLP Method 91-1)/TCL PCBs (NYSDEC ASP CLP Method 91-3)

Table 2.1
Sample and Analysis Summary
Orange and Rockland Utilities, Inc. (continued)

Well I.D.	Date Collected	Media Sampled	Analytical Method
<u>Monitoring Wells (Cont.)</u>			
MW-6	12/27/95	Groundwater	TCL Volatiles (NYSDEC ASP CLP Method 91-1)/TCL PCBs (NYSDEC ASP CLP Method 91-3)
MW-7	12/26/95	Groundwater	TCL Volatiles (NYSDEC ASP CLP Method 91-1)/TCL PCBs (NYSDEC ASP CLP Method 91-3)
MW-8S	12/26/95	Groundwater	TCL Volatiles (NYSDEC ASP CLP Method 91-1)/TCL PCBs (NYSDEC ASP CLP Method 91-3)
MW-8	12/26/95	Groundwater	TCL Volatiles (NYSDEC ASP CLP Method 91-1)/TCL PCBs (NYSDEC ASP CLP Method 91-3)
MW-9B	12/26/95*	Groundwater	TCL Volatiles (NYSDEC ASP CLP Method 91-1)/TCL PCBs (NYSDEC ASP CLP Method 91-3)
X-1 (MW-8S)	12/26/95*	Groundwater	TCL Volatiles (NYSDEC ASP CLP Method 91-1)/TCL PCBs (NYSDEC ASP CLP Method 91-3)

<u>**Notes:**</u>

* = Groundwater samples from X-1 (MW-8S) and MW-9B had to be resampled on 12/27/95 due to breakage during shipping.

Water-level measurements at the Site were obtained in accordance with the procedures detailed in the approved RI/FS Work Plan. A water-level measurement form was completed for each round, and the resultant forms are presented in Appendices A.1 through A.4. The form was modified throughout the RI as new monitoring wells were installed.

2.4 SOIL SAMPLING AND ANALYSIS

2.4.1 Shallow Soil Borings

Additional shallow soil borings were completed and shallow subsurface soil samples collected during this RI to confirm prior analytical results for VOCs and PCBs collected during previous investigative phases, evaluate the vertical and horizontal extent of contamination at the Site and collect information to enable comparison of soil conditions at and downgradient of background conditions. The shallow soil samples were also collected to potentially identify the source of the chlorinated VOCs which have been detected in soil samples, soil gas samples and in groundwater from monitoring wells located on-site. Additionally, shallow soil samples provided data to prove that PCBs are not a concern at depth in the areas where the shallow soil samples were collected. Table 2.1 provides a summary of the shallow soil sample analyses as well as other sample analyses associated with subsequent tasks.

Five shallow soil borings (HA-1, HA-2, HA-3, HA-4 and HA-5) were hand augered and/or drilled to a depth of four feet below grade. Two soil samples were collected from each boring; one from a depth of 1 to 2 feet below grade and a second from a depth of 3 to 4 feet below grade. Three of the shallow soil sample locations were completed in a north-south trending orientation along the west boundary of the Site. Borings were installed at approximately 75 foot intervals beginning approximately 100 feet north of existing shallow overburden monitoring well MW-5. The remaining two borings were installed along an east-west trending line beginning approximately 75 feet east of the center boring of the north/south borings. Actual shallow soil sample locations are depicted in Figure 3 and Drawing 2. Analytical results are summarized in Table 4.1.

Shallow surface soil samples collected at the Site were obtained in accordance with the procedures detailed in the approved RI/FS Work Plan. A total of ten grab samples were collected. A blind duplicate designated X-1 was obtained from sampling location HA-2 (1-2') while a matrix spike/ matrix spike duplicate (MS/MSD) sample was obtained from sampling location HA-1 (3-4').

All VOC analyses of shallow soil samples were performed by NYTEST Environmental, Inc. (NYTEST) of Port Washington, New York. All PCB analyses of shallow soil samples were performed through the use of field test kits operated by an experienced Rust chemist. Results of shallow soil sampling are presented and discussed further in Section 4.1. The volatile organic analytical data were validated by Rust chemists. The validated VOC analytical data packages are presented in Appendix L.

Figure 3 RI Sampling Locations

2.4.2 Underground Storage Tank (UST) Area Subsurface Soil

As part of the RI, 28 soil borings were drilled in order to investigate the source of benzene, toluene, ethylbenzene, and xylene (BTEX) contamination detected in previous samples collected in the vicinity of the former and existing USTs (Figure 3 and Drawing 2). The UST soil boring program was performed between November 13, 1995 and December 6, 1995 to determine the nature and extent of these contaminants. This investigation consisted of the drilling of soil borings radiating outward from the location of the former and existing USTs. One boring was also drilled at the center point of the former UST location. All of the drilling activities were performed by Parratt-Wolff, Inc. (Parratt-Wolff) of East Syracuse, New York, under the supervision of Rust personnel.

Subsurface soil samples collected at the UST Area were obtained in accordance with the procedures detailed in the approved RI/FS Work Plan. A total of 302 subsurface soil samples were collected from 28 soil borings drilled at the UST Area. At each boring, samples were collected every 2 feet of depth to the top of bedrock, or until auger refusal, and geologically logged. The soil samples were collected and described by Rust personnel using the Modified Burmister and Unified Soil Classification Systems described in Appendix B.3.1. Boring logs describing the subsurface materials encountered in each boring were prepared and are presented in Appendix B.3.2.

An HNU Model 311 D portable GC was used to analyze soil samples for VOCs. The GC was equipped with a PID and an onboard computer programmed to analyze samples for benzene, toluene ethylbenzene, xylenes, cis-1,2-dichloroethene (c-1,2-DCE), 1,1-dichloroethene (1,1-DCE), 1,1,1-trichloroethane (1,1,1-TCA), vinyl chloride (VC) and trichloroethene (TCE). In the UST area the instrument was only calibrated for BTEX, due to interferences caused by petroleum related volatile organics in the identification of chlorinated compounds.

The GC generates quantitative data specific to each compound by analyzing gaseous samples. After injection into the instrument, the sample flows through a chromatographic column prior to reaching the PID. The various VOCs pass through this column at different rates and thus reach the detector at different times relative to the injection time. A chromatographic record of detector response versus time is obtained during each analysis and the presence of VOCs in the sample is manifested by peaks on the chromatogram.

The GC measures two parameters for each peak observed during the analysis. First, the length of time (known as the retention time) is measured between the initial injection of the sample and the detection of the peak; each VOC has a characteristic retention time by which it is tentatively identified. Second, the system integrates the detector response to measure the area under the peak. The area measured in millivolt seconds (mV-S) is proportional to the concentration of the compound in the sample. The concentration of the analyte in the sample is then calculated by direct comparison with the detector response to a standard of known concentration.

Prior to the start of field activities, the instrument was calibrated to recognize the characteristic retention times for compounds of interest, and to convert peak areas into concentrations for these compounds. Calibration standards were then analyzed at a minimum frequency of once daily throughout the field program. Stock and working standards were prepared as follows. A known quantity of pure product of each analyte was added using a 10 microliter (μl) syringe to a previously tared 10 milliliter (ml) volumetric flask half-filled with reagent grade methanol. The exact weight of the analyte added was recorded to the nearest 0.0001 grams (g). Each analyte was added to the same tared flask in a similar fashion at the appropriate ratios and diluted to the 10 ml mark with reagent grade methanol to yield a stock standard mix. A 10 μl aliquot of the stock standard mix was then withdrawn using a 10 μl syringe, introduced into a second 10 ml volumetric flask half-filled with methanol, and diluted to the mark with methanol to yield a working calibration standard mix..

Calibration standards were prepared by injecting an aliquot of the working calibration standard mix into a 40-ml glass vial containing 10 grams (g) of clean sand and 20 ml of deionized water. The sand had been previously demonstrated to be free of VOC's. The VOA vial was shaken vigorously for one minute and allowed to stand for five minutes in a heated (50° Celsius) sand bath. Using a gas-tight syringe, 250 μl of headspace were then drawn off and injected into the GC for analysis.

Sample preparation and analyses were conducted in the same manner as the calibration standards. Approximately 10 g of soil was added to a previously-tared 40ml- vial and the weight recorded. Twenty mls of distilled water were added and the VOA vial was then capped and shaken vigorously for one minute before being placed in a heated (50° Celsius) sand bath for five minutes. A 250 μl aliquot of headspace vapor was withdrawn with a gas-tight syringe and injected into the GC for analysis. When sample results were above the linear range of the detector, a smaller aliquot of soil sample was prepared as described above and the sample concentrations were then multiplied by the dilution factor.

Concentration of VOCs in a sample were calculated using the following equation:

Sample Concentration = MI x SA x 1000/STA xSW

Where:		
	MI	= mass of standard injected (μg)
	SA	= sample area response
	1000	= conversion factor from g to kg
	STA	= standard analyte peak area
	SW	= sample wet weight (g)

Instrument/syringe blanks were analyzed at least daily to demonstrate that the instrument and injection syringe were free of contaminants. Method blanks were prepared and analyzed to verify that the distilled water, methanol, associated glassware and syringes were also free of VOCs. Instrument calibration was confirmed daily. Duplicate analyses were performed at a frequency of twenty percent.

The deepest and outermost sample(s) which demonstrated non-detectable concentrations of BTEX was submitted for laboratory confirmation analysis using EPA Method SW-846 8020. Based on the rationale discussed in the approved RI/FS Work Plan, 12 subsurface samples (UST-SB-06A [10-12'], UST-SB-07[8-10'], UST-SB-07A [10-12'], UST-SB-09 [8-10'], UST-SB-09A[8-10'], UST-SB-12 [12-14'], UST-SB-14A [10-12'], UST-SB-16[14-16'], UST-SB-17 [10-12'], UST-SB-18 [6-8'], UST-SB-19[8-10'] and UST-SB-22 [8-10']), were submitted to NYTEST for VOC analyses. A MS/MSD sample was obtained from split-spoon sample UST-SB-07 (8-10') and another MS/MSD sample was collected from split-spoon sample UST-SB-19 (8-10'). Table 2.1 provides a summary of the UST Area subsurface soil sample analyses as well as other sample analyses associated with subsequent tasks.

Results of subsurface soil samples selected for analyses are presented and discussed further in Section 4.2. A summary of the field GC BTEX results and laboratory VOC analytical results are presented in Section 4 on Table 4.2 and Table 4.3 , respectively.

2.4.3 Former Dry Well Area Subsurface Soil

As part of the RI, 6 soil borings were drilled in order to determine if the suspected location of the former dry well represents a source of VOC contamination detected in previous samples collected in the vicinity of the former dry well. The Dry Well soil boring program was performed between December 6, 1995 and December 12, 1995 to determine the nature and extent of these contaminants. The six soil borings were installed in a radial pattern radiating outward from the location of the former Dry Well. All of the drilling activities were also performed by Parratt-Wolff under the supervision of Rust personnel.

Subsurface soil samples collected at the Dry Well Area were obtained in accordance with the procedures detailed in the approved RI/FS Work Plan. At each boring, samples were collected every 2 feet of depth to the top of bedrock, or until auger refusal, and geologically logged. Boring logs describing the subsurface materials encountered in each boring were prepared and are presented in Appendix B.3.3.

A total of 85 subsurface soil samples were collected from 6 soil borings drilled at the former Dry Well Area. Each subsurface soil sample was collected and analyzed for BTEX and select VOCs using the on-site field GC. The deepest and outermost sample(s) from each spoke which demonstrated non-detectable (i.e., below action criteria) concentrations of BTEX / VOCs underwent laboratory confirmation analysis using EPA Method SW-846 8021. Based on the rationale discussed in the approved RI/FS Work Plan, 8 subsurface samples (DW-SB-01 [24-26'], DW-SB-01[26.0-26.7'], DW-SB-02 [26.0-26.4'], DW-SB-03 [26.0-27.1'], DW-SB-04[26.0-26.5'], DW-SB-05/5A [4.0-6.0'],DW-SB-05/5A [24.0-24.4'] and DW-SB-06[28.0-28.4']) were submitted to NYTEST for BTEX/VOC analyses. A MS/MSD sample was obtained from split-spoon sample DW-SB-04(26.0-26.5').

Results of subsurface soil samples selected for analyses are presented and discussed further in Section 4.3. A summary of the field GC BTEX / select VOC results and the laboratory BTEX / VOC analytical results are presented in Table 4.4 and Table 4.5, respectively. Analytical data were validated by Rust chemists. The validated BTEX / VOC laboratory analytical data package are presented in Appendix L.

2.4.4 Other Subsurface Investigations

In addition to the above, the following field activities were also performed during this investigation to obtain information regarding the chemical nature of subsurface soil in the immediate vicinity of a SDA (located northeast of existing monitoring well MW-3 and east of existing monitoring well (MW-6) and soil boring UST-SB-24:

- Drilling of 2 soil borings and collection of 32 subsurface soil/refuse samples in the immediate vicinity of a SDA;
- Analysis of 3 soil/debris samples from the SDA borings for VOCs by EPA Method SW-846 8240 with library search and PCBs by EPA Method SW-846 8080;
- Completion of 3 test pits to the north, east and south of UST soil boring UST-SB-24; and
- Analysis of 4 soil/debris samples from the test pits for PCBs by NYSDEC, CLP Method 91-3.

2.4.4.1 Boring UST-SB-24 Area Test Pit Soil/Debris

As an additional activity which was beyond the scope of the RI work plan, three test pits were advanced to determine the extent of PCB impacted soil in the vicinity of the UST Area SB-24. The location of the test pits is provided in Figure 3 and Drawing 2. Each test pit was advanced to a depth of six to eight feet around UST SB-24. The intent of these test pits was to determine if the area is a potential source of PCBs. The test pitting was performed on January 11, 1996 to determine the nature and extent of these contaminants. All of the test pitting activities were performed by Miller Environmental Group, Inc. of Newburgh, New York, under the supervision of Rust personnel.

Samples collected along the walls of the pit were obtained in a matter consistent with soil sampling procedures detailed in the approved RI/FS Work Plan. At each pit, samples were collected every 2 vertical feet and geologically logged. Test Pit logs describing the subsurface materials encountered in each pit were prepared and are presented in Appendix C.

A total of 18 subsurface soil / debris samples were collected from 3 test pits advanced at the Site. Based on visual inspection, 4 soil/debris samples (TP-96-01 [4-5'], TP-96-02[5'], TP-96-03[5-6'] and TP-96-04[4.75']) were submitted to NYTEST for PCBs by NYSDEC, CLP Method 91-3.

Results of subsurface soil / debris samples selected for analyses are presented and discussed further in Section 4.4. A summary of the PCB analytical results are presented in Table 4.6.

2.4.4.2 Suspected Disposal Area Soil/Debris

As an additional activity which was beyond the scope of the RI work plan, 2 soil borings were drilled in order to investigate an area where it has been reported that transformer/electrical refuse debris was potentially buried. This area is located northeast of existing monitoring well MW-3 and east of existing monitoring well MW-6. The location of the soil borings is shown in Figure 3 and Drawing 2. The intent of these borings was to determine if the suspected disposal area is a potential source of PCBs or VOCs. The SDA soil boring program was performed between December 12 and 13, 1995 to characterize the chemical nature of the subsurface soils. All of the drilling activities were performed by Parratt-Wolff under the supervision of Rust personnel.

The selection of each boring location was based on the information gathered from interviews of ORU employees and the review of existing data. Subsurface soil / electrical refuse debris samples collected at the SDA were obtained in a matter consistent with the procedures detailed in the approved RI/FS Work Plan. At each boring, samples were collected every 2 feet to the top of bedrock, or until auger refusal, and geologically logged. Boring logs describing the subsurface materials encountered in each boring were prepared and are presented in Appendix B.3.4.

A total of 32 subsurface soil samples were collected from 2 soil borings drilled at the SDA. Each subsurface soil sample was collected and analyzed for BTEX and select VOCs using the field GC. Based on the visual inspection and the results of the field GC analyses, 3 soil/debris samples (SDA-SB-01 [4-6'], SDA-SB-01[12-14'] and SDA-SB-02[12-14']) were submitted to NYTEST for analysis of VOCs by EPA Method SW-846 8240 with a library search and PCBs by EPA Method SW-846 8080.

Results of the subsurface soil / debris samples selected for analyses are presented and discussed further in Section 4.5. A summary of the field GC BTEX / select VOC results and the laboratory VOC analytical results and PCB analytical results are presented in Table 4.7, Table 4.8 and Table 4.9, respectively. Analytical results are discussed in Section 4.5.

2.5 EXISTING MONITORING WELL EVALUATION

As the first task of the RI, the existing groundwater monitoring network was inspected to assess the current condition of all overburden and bedrock interface monitoring wells installed during previous investigations. The inspection was performed on November 13, 1995, in conjunction with the monthly water-level measurements as previously discussed in Section 2.3. The integrity of protective casings and surface seals was documented on a field inspection form, as was any other damage. Total depth measurements were also obtained during the inspection and was compared to the well depths recorded at the time of installation to determine the degree of siltation or the presence of obstructions. Field inspection forms documenting the results of the inspection are located in Appendix D.

The purpose of the monitoring network inspection was to determine which wells could continue to be used and to make recommendations for any needed maintenance activity. Wells of questionable integrity were noted, as detailed in Appendix D.

2.6 INSTALLATION OF ADDITIONAL MONITORING WELLS

Rust supervised the drilling and installation of three (3) additional groundwater monitoring wells. The three wells consisted of one shallow overburden (MW-8S) and two bedrock interface wells (MW-5B and MW-9B), locations are shown in Figure 3 and Drawing 2.

2.6.1 Overburden Monitoring Wells

While the contaminant plume in the overburden has been somewhat defined, one additional overburden monitoring well was installed in proximity to existing bedrock interface well MW-8 and was constructed in a fashion similar to the existing overburden wells. A shallow overburden well at this location, designated MW-8S, closed a data gap at the northeastern property boundary which resulted from the loss of two previously existing wells that were damaged or destroyed and never replaced. This well also served as an additional groundwater sampling point downgradient of the tank excavation area and allowed for the evaluation of the vertical relationship between the unconfined overburden system and the semi-confined weathered bedrock zone screened by well MW-8.

A borehole was drilled to construct the new overburden well using a truck-mounted drill rig. A test boring was advanced to 15.5 feet using 4-1/4 inch inside diameter (I.D.) hollow-stem augers. Drill cuttings were managed as described in Section 2.9.

Soil samples were obtained utilizing a split-spoon sampler according to American Society for Testing Materials (ASTM) Method D-1586 in advance of the hollow stem augers. During the drilling of well MW-8S, continuous split-spoon samples were collected, characterized and logged by a Rust hydrogeologist. Boring logs describing the subsurface materials encountered in this boring was prepared and are presented in Appendix E.1. Representative sub-samples were field screened for organic vapors using a portable photo ionization detector, and the results of this screening are also presented on the boring logs.

Each overburden well was constructed immediately following drilling and was installed through the hollow-stem augers. However, prior to construction, turbid water was removed by bailing or pumping up to the equivalent of one borehole volume from within the augers. Monitoring well MW-8S was constructed of 2-inch ID, Schedule-40 PVC well screen flush-threaded into Schedule-40, PVC riser pipe of the same diameter. The size of the screen was No. 10 slot (i.e., 0.010 inch). The length of well screen used in this well was determined by the supervising geologist. The base of each well was equipped with threaded bottom plugs while the top of each well was equipped with a vented, non-threaded cap.

Sand was introduced gradually inside the augers, and will fill the annular space between the screen and borehole adjacent to the screen. The sand pack extended from the bottom of the boring to approximately 1.5 feet above the top of the screen. During placement of the sand pack, augers were withdrawn in increments so that the formation materials did not collapse against the well casing and/or screen. The sand pack consisted of a clean, graded, silica sand with grain size distribution matched to the slot-size of the screen. A Morie Grade 0 or equivalent sand was deemed appropriate. Six-inches of clean Morie Grade 00 sand choke was subsequently placed above the sand pack to preclude migration of sealing material into the sand pack. A bentonite pellet seal was placed above the sand pack to form a seal at least two-feet thick. A thick cement-bentonite grout extended from the top of the bentonite pellet seal to approximately three feet below grade. The grout material consisted of Type I Portland Cement mixed with powdered bentonite to a consistency deemed acceptable by the supervising geologist. The grout was introduced via a tremie pipe which was lowered to just above the top of the bentonite pellet seal. As the grout material was pumped into the borehole, the tremie pipe was removed and the augers withdrawn. A lockable well cover was installed on the casing upon completion of the well to prevent unauthorized access and provide protection for the wells. The well identification number was clearly labeled on the outside of the curb box.

2.6.2 Bedrock Interface Monitoring Wells

Pursuant to the approved RI/FS Work Plan, two new weathered bedrock interface wells were installed in the southern portion of the Site near the Old Nyack Turnpike. One of these wells, MW-5B, was installed on the southwest side of the Site in proximity to existing overburden well MW-5, while the other was installed on the east side of the building near the gate and was designated MW-9B. Both of these wells provided additional information to better characterize the direction of groundwater flow within the weathered bedrock zone and to assist in evaluating whether the chlorinated solvents found in this zone are originating from an off-site source. Additionally, the newly installed MW-5B provided for an evaluation of the vertical relationship between the unconfined overburden system and the semi-confined weathered bedrock zone in the southwestern portion of the Site.

Soil samples were obtained utilizing a split-spoon sampler according to American Society for Testing Materials (ASTM) Method D-1586 in advance of the hollow stem augers. During the drilling of well MW-8S, continuous split-spoon samples were collected, characterized and logged by a Rust hydrogeologist. Boring logs describing the subsurface materials encountered in this boring was prepared and are presented in Appendix E.2, and some of the drilling information is summarized in Table 6. Representative sub-samples were field screened for organic vapors using a portable photo ionization detector, and the results of this screening are also presented on the boring logs.

To construct the well, 4¼-inch ID hollow-stem augers were advanced to the overburden-bedrock interface which was determined by prolonged grinding of the auger, the occurrence of native siltstone chips and tapped or seated into place with a mallet or light weight. To confirm the presence and characteristics of bedrock, bedrock was cored using a five-foot core barrel at each proposed bedrock interface monitoring well location. The lithology of rock core samples were described by a qualified on-site geologist. Core logs describing the weathered bedrock encountered in each of these borings was prepared and are presented in Appendix F. Bedrock drilling was then performed using a 4-inch OD tri-cone roller bit. The drilling penetrated 5 to 10 feet into the bedrock and was subsequently reamed to a 4-inch nominal diameter to accommodate the 2-inch ID PVC well materials. Drill cuttings and fluids were managed as described in Section 2.9.

Well MW-5B and MW-9B were constructed with 2-inch ID, No. 10 slot, Schedule-40, PVC screen and Schedule-40, PVC riser pipe and installed into the bedrock borehole. The base of the well was equipped with a threaded bottom plug while the top of the well had a vented, non-threaded cap. The screen was 7 to 10 feet in length and a sand pack was placed in the borehole extending 1.5 feet above the top of the screen. Six-inches of clean Morie Grade 00 sand choke was placed above the sand pack to preclude migration of sealing material into the sand pack. The well was completed with a minimum 2-foot bentonite pellet seal, hydrated and the remainder of the annulus grouted to the surface. The sandpack, bentonite pellets and grout were all be tremied into place. A lockable curb box was installed over the casing upon completion of the well to prevent unauthorized access and provide protection for the wells. The well identification number was clearly labeled on the outside of each protective casing. Well construction details are presented in Appendix B.3.6 and are summarized in Table 3.1.

2.6.3 Monitoring Well Development

After installation, each new well was developed in order to remove residual formational silts and clays, increase the hydraulic conductivity immediately around the well and reduce the turbidity of groundwater samples. This helped to ensure that the groundwater samples, and other hydraulic information obtained from these wells, are representative of subsurface conditions. Rust personnel also redeveloped existing well EXW-5, which was currently silted in, in order to collect groundwater samples and other hydrologic data.

The monitoring wells were developed as soon as possible, but not less than 24 hours after installation. All groundwater and sediments resulting from well development were managed as described in Section 2.9. The wells were developed using procedures outlined in the approved RI/FS Work Plan.

Well development was continued until a turbidity goal of less than or equal to 50 Nephelometric Turbidity Units (NTUs) was achieved. If this goal could not be reached, well development was continued until an amount of groundwater equivalent to 10 well volumes was removed. Field parameters, such as temperature, pH, specific conductivity, and turbidity were measured incrementally during well development. The procedures used to obtain these measurements were as specified in the approved RI/FS Work Plan.

Monitoring wells EXW-5, MW-5B, MW-8S and MW-9B were developed between December 6 and 7, 1995. Well development information and associated field parameter measurements are presented in Appendix G.1 for the overburden monitoring wells and Appendix G.2 for the bedrock interface monitoring wells.

2.7 SURFACE WATER AND SEDIMENT SAMPLING AND ANALYSIS

2.7.1 Surface Water (Hackensack River)

Hackensack River surface water samples were obtained during this RI to confirm prior analytical results for PCBs, evaluate the impact the Site may have had on the surface water quality of the Hackensack River and collect information to enable comparison of surface water conditions at and downgradient of background conditions. One round of surface water samples (SW-1, SW-2 and SW-3) were obtained on December 27, 1995. These samples consisted of one sample upgradient of the Site (SW-1), one near the intake of the Nyack Water Company (SW-2) and one downgradient of the Site (SW-3) as depicted in Figure 3 and Drawing 2. All samples were obtained during normal flow conditions.

Surface water sampling was conducted in accordance with the procedures outlined in the approved RI/FS Work Plan. The surface water samples obtained at the three locations were analyzed for the TCL PCBs in accordance with the NYSDEC's ASP, CLP Method 91-3. A blind duplicate sample X-2, was collected at the Nyack Water Company intake (SW-2) while a MS/MSD sample was obtained from surface water sampling location SW-1.

All PCB analyses of surface water samples were performed by NYTEST. Analytical data were validated by Rust chemists. The validated PCB analytical data packages are presented in Appendix L. Results of surface water sampling are discussed further in Section 4.6.

2.7.2 Sediment

One round of sediment samples, collected on December 28, 1995, were collected from the river bottom of the Hackensack River and consisted of eighteen grab samples. Samples were collected at the following locations: one upgradient of the Site (SED-1); five adjacent to the northern surface soil sample locations (SED-2 through SED-6); three between former sediment sample locations SD-3 and SD-4 (SED-7, SED-8 and SED-12); three in the vicinity of the 1991 SD-4 sample (SED-9 through SED-11); four adjacent to the southeast surface soil sample locations (SED-13 through SED-16); and one at the locations of the 1991 SD-5 and SD-6 samples (SED-17 and SED-18, respectively). Sediment sample locations are also shown in Figure 3 and Drawing 2. These sample locations were selected to evaluate potential impacts to the Hackensack River from the Site and to confirm analytical results from previous sampling events.

Sediment sampling was conducted in accordance with the procedures outlined in the approved RI/FS Work Plan. The sediment samples obtained were only analyzed for TCL PCB parameters in accordance with the NYSDEC's ASP, CLP Method 91-3. A blind duplicate sample X-3, was collected at sediment sample location SED-12 and the MS/MSD sample was obtained from sediment sampling location SED-5, immediately upstream of the Nyack Water Company intake.

Analytical data were validated by Rust chemists. The validation reports and the laboratory reporting sheets are presented in Appendix L and K, respectively. Results of sediment sampling are discussed further in Section 4.7. A summary of the PCB analytical results are presented in Table 4.11.

2.8 GROUNDWATER SAMPLING AND ANALYSIS

Groundwater samples were obtained from selected wells to confirm results obtained during previous investigative activities, obtain results from the newly-installed wells and provide a "snapshot" of current conditions. Sampling of wells EXW-4, EXW-5, MW-1, MW-5, MW-5B, MW-6, MW-7, MW-8S, MW-8 and MW-9B was performed by Rust on December 26 and 27, 1995 using procedures presented in the approved RI/FS Work Plan. After locating wells EXW-1, MW-2, MW-3 and MW-4 on January 11, 1996, the wells were subsequently sampled by Rust on January 12, 1996. Both the wells to be sampled and the analyses to be performed are discussed below. Analytical results are discussed in Section 4.8. Purge water collected during the sampling activity was managed as discussed in Section 2.9.

2.8.1 Overburden Monitoring Wells

One round of groundwater samples were obtained from existing wells to define and confirm the chemistry within the shallow overburden hydrogeologic unit. The existing wells sampled were EXW-1, EXW-4, EXW-5, MW-1, MW-2, MW-3, MW-4 and MW-5 and the newly-installed well MW-8S. Groundwater samples were obtained concurrently with bedrock interface groundwater samples except wells EXW-1, MW-2, MW-3 and MW-4 which were located at a later date. After locating wells EXW-1, MW-2, MW-3 and MW-4 on January 11, 1996, the wells were subsequently sampled by Rust on January 12, 1996. Well sampling records are presented in Appendix H.1 and H.2.

The groundwater samples from wells EXW-1, EXW-4, EXW-5, MW-1, MW-2, MW-3, MW-4, MW-5 and MW-8S were analyzed for the TCL VOC and PCB parameters following the NYSDEC ASP, CLP Methods 91-1 and 91-3, respectively. All VOC and PCB analyses of groundwater samples were performed by NYTEST. Analytical data were validated by Rust chemists. The VOC and PCB data validation reports and laboratory reporting sheets are presented in Appendix L and K, respectively. Results of groundwater sampling are discussed further in Section 4.8. A summary of the VOC and PCB analytical results are presented in Table 4.12 and 4.13, respectively.

2.8.2 Bedrock Interface Monitoring Wells

One round of groundwater samples were obtained from selected wells to define and confirm the chemistry within the bedrock interface hydrogeologic unit. These samples were obtained contemporaneously with shallow overburden groundwater samples during the main sampling event (December 26 and 27, 1996). The wells which were sampled are from existing bedrock interface wells MW-6, MW-7 and MW-8 and the newly-installed wells MW-5B and MW-9B. Well sampling records are presented in Appendix H.1.

The groundwater samples from wells MW-5B, MW-6, MW-7, MW-8 and MW-9B were analyzed for the TCL VOC and PCB parameters following the NYSDEC ASP, CLP Methods 91-1 and 91-3, respectively. All VOC and PCB analyses of groundwater samples were performed by NYTEST. Analytical data were validated by Rust chemists. The validated VOC and PCB analytical data packages are presented in Appendix L. Results of groundwater sampling are discussed further in Section 4.8 and summarized in Section 4, Table 4.14.

2.9 IN-SITU HYDRAULIC CONDUCTIVITY TESTING

Numerous in-situ hydraulic conductivity tests, also known as slug or bail tests, were performed during previous investigations to assist in the hydraulic characterization of the overburden and bedrock interface hydrogeologic units. These tests were also performed during the RI on select wells and the newly-installed wells. Wells EXW-1, MW-2, MW-3 and MW-4 were not tested. The collection of this data was necessary in calculation of groundwater flow rates and volumes within a hydrogeologic unit as well as providing data for the screening and selection of potential remedial options.

Specifically, slug tests were performed by RUST on December 28 and 29, 1995 in overburden monitoring wells EXW-4, EXW-5, MW-1, MW-5 and MW-8S and bedrock interface monitoring wells MW-5B, MW-6, MW-7, MW-8 and MW-9B. Results of the hydraulic conductivity testing are presented in Appendix I.1 for overburden monitoring wells and Appendix I.2 for bedrock interface monitoring wells. In addition, the results of the hydraulic conductivity testing are discussed in Section 3.2 and summarized in Table 3.1.

All of the test performed during the RI were slug tests. These tests were performed in the 2-inch ID or 3-inch ID wells by introducing 1 gallon of distilled water. Water-level recovery was electronically recorded using an In-Situ, Inc. Hermit Model SE 100°C data logger and an associated transducer. Prior to initiating each test, the transducer was lowered into the well 3 to 5 feet below the static water level and secured by clamping the cable to the protective casing or curb box. The water-level recovery data collected during the RI are presented in Appendix I.

Interpretation of the water-level recovery data from the in-situ hydraulic conductivity test was performed using the Hvorslev (1951) method and, as applicable, the Bouwer and Rice (1976) method. The principle behind Hvorslev's method is that water-level recovery theoretically follows an exponential decline. If normalized to the amount of the initial perturbation, the water-level recovery data will show a straight-line relationship on a semi-log plot. The horizontal hydraulic conductivity (K) can then be calculated as follows:

$$K = [r^2 \ln(L/R)]/2LT^0$$

where:

- r = effective radius of "riser" in which water-level fluctuations occur;
- L = well screen or sand pack length, as appropriate;
- R = radius of well screen or open section; and
- T^0 = Hvorslev's basic time lag.

Hvorslev's basic time lag (T^0) is the time required for complete recovery if the original rate of recovery could be maintained. It can also be considered as the time required to reduce the amount of unrecovered head at any given time after an instantaneous perturbation to 37% of its value at that time.

The computer program used to calculate horizontal hydraulic conductivity by the Hvorslev method utilizes linear regression techniques applied to normalized water-level recovery data after logarithmic transformation as follows:

$$\text{In}\,(H\text{-}h/H\text{-}H^0) = b^0 + b^1 t$$

where:

- H = head at equilibrium (static) conditions;
- h = head at time t;
- H^0 = initially perturbed head;
- b^0 = intercept of y- (time-) axis;
- b^1 = slope of best-fit line; and
- t = time.

This methodology results in a quantitative and objective "forcing" of a straight line to the water-level recovery data. The slope (b^1) and y-intercept (b^0) of this line can be used to find T^0 and then K. The goodness of fit can be assessed using various statistical properties [i.e., the coefficient of determination (R^2) and assessment of residuals].

Hvorslev's method assumes that the aquifer tested is homogeneous. Additionally, application of the above equations to bedrock wells assumes that sufficient joints and bedding planes intersect the intake so as to behave like a porous medium with Darcian flow conditions.

The principle behind the Bouwer and Rice (1976) method is also based on a straight-line relationship between a plot of logarithmically-transformed water-level recovery data versus time. The horizontal hydraulic conductivity (Kh) is calculated as follows:

$$Kh = [rc^2 In(Re/rw)/(2Lt)] \ln[(H-h)/h-H^0)]$$

where:

rc	=	effective radius of the well casing within which the water-level fluctuations occur;
rw	=	radius of the borehole;
L	=	length of the wells screen or sand pack, as appropriate;
t	=	time since initial perturbation of head in well;
h	=	head in well at any given time;
H^0	=	head in well at time 0;
H	=	static elevation of the piezometric surface; and
Re	=	equivalent radial distance over which the instantaneous slug ($H-H^0$), is dissipated.

The computer program used to calculate horizontal hydraulic conductivity by this method also utilizes linear regression techniques applied to the water-level recovery data after logarithmic transformation.

2.10 DATA VALIDATION

Validation of the TCL analytical data was performed in accordance with USEPA data validation guidelines, modified as appropriate for the NYSDEC's ASP. Validation was performed by personnel meeting the NYSDEC data validator qualifications.

The data validation included the review and evaluation of all laboratory deliverables. The basic review covered sample request forms, chains-of-custody, methodology summaries, laboratory chronicles, and items listed below. Data validation reports are presented in Appendix L.

Volatile Organic Compounds

- Deliverable Requirements
- Case Narrative
- Holding Times

- Surrogate Recoveries and Summary
- Method Blank Summary and Data
- GC/MS Tuning and Mass Calibration
- Organic Analysis Data Sheets (Form 1)
- Quantitation Reports
- Mass Spectral Data
- EPA/National Institute of Standards (NIST) Mass Spectral Library Search for Tentatively Identified Compounds (TICs)
- Initial Calibration Data (GC/MS)
- Continuing Calibration Data (GC/MS)
- Internal Standard Areas and Retention Times

PCBs

- Case Narrative
- Deliverable Requirements
- Holding Times and Sample Preparation
- Surrogate Recoveries and Summary (Form 2)
- Method Blank Summary and Data
- Calibration and GC Performance
- Matrix Spike Blank/MS/MSD Recoveries and Summary (Form 3)
- Analyte Resolution Check
- Compound Quantitation and Reported Detection Limits
- Chromatogram Quality

2.11 FISH AND WILDLIFE IMPACT ANALYSIS

The Site is located in a developed area in close proximity to the Hackensack River. To fully assess the potential impacts the Site may have on fish and wildlife resources, Rust completed a Fish and Wildlife Impact Analysis in accordance with the June 18, 1991 guidance from the NYSDEC entitled, " Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites". Rust performed Step I and the Pathway analysis and Criteria-Specific analysis of Step II. The significant activities undertaken were:

- Development of a cover type map for the area within a 0.5 mile radius of the Site;
- Description of fish and wildlife resources present;
- Valuation of fish and wildlife resources;
- Identification of applicable fish and wildlife regulatory criteria;
- Analysis of potential exposure pathways; and
- Comparison of media chemical concentrations with available numerical criteria

The need to perform additional tasks or succeeding steps is discussed in Section 6.0

2.12 DECONTAMINATION PROCEDURES

Decontamination procedures were conducted in accordance with the approved RI/FS Work Plan in order to minimize the potential for compromising data validity by reducing the possibility of cross-contamination. Non-disposable equipment used during the RI was decontaminated prior to and after the on-site RI activities. In addition, disposable sampling equipment was disposed of between samples. More detailed equipment decontamination procedures implemented as part of the RI activities are presented in the work plan.

The drilling program also included decontamination procedures to ensure that possible contaminants are not introduced to or transferred across the Site. A decontamination pad was constructed near the southwest corner of the Site. Prior to drilling the first boring, the equipment used in drilling and well installation was cleaned to remove possible contaminants. The cleaning process involved the use of a high-pressure steam cleaner. Potable water from the Nyack Water Company was used for decontamination of all equipment. All equipment which came in contact with the soil, as well as water tanks, drill tools, iron casings, pumps and hoses, underwent the initial cleaning procedure. All screen, riser pipe, top caps and bottom plugs were decontaminated and sealed in plastic before beginning drilling at the first location. While working at the Site, the drilling equipment was decontaminated between boring locations to prevent cross-contamination. Decontamination of equipment used during the overburden and bedrock drilling was decontaminated at the decontamination pad. The drill rig and all drilling tools were decontaminated before leaving the Site at the completion of the drilling and well installation activities.

2.13 HANDLING OF INVESTIGATION-DERIVED WASTE

Wastes resulting from the above investigative activities were handled in accordance with the approved RI/FS Work Plan. The RI activities produced investigation-derived waste (IDW) which required appropriate management. The IDW included the following:

- Drill cuttings;
- Groundwater resulting from the drilling and development of newly-installed wells (i.e., monitoring, observations and/or pumping wells);
- Groundwater resulting from the sampling of wells;
- Sediments which settle out of groundwater produced during the above;
- Decontamination fluids and sediments which may settle out of such fluids; and
- Personnel protective equipment (PPE) and associated debris resulting from the execution of field activities.

The management of these materials is discussed below.

2.13.1 Drill Cuttings

All drill cuttings were spread on the ground near the respective boring and covered by a minimum of six inches of clean fill at the completion of each drilling task. During each task, drilling was scheduled to progress systematically from locations expected to be relatively free of contamination to locations where elevated concentrations of contaminants were expected.

2.13.2 Groundwater

Groundwater generated during the drilling, development and sampling of overburden wells were containerized in appropriate 55-gallon drums pending receipt of analytical results. All of the containerized aqueous wastes resulting from the investigative activities are stored temporarily stored adjacent to the former decontamination pad or at the specific well location. If analytical results indicate that the VOC concentrations are below New York State groundwater standards, the groundwater was discharged onto the ground surface at a point downgradient of the well and allowed to infiltrate. Groundwater in excess of those standards is temporarily stored at the Site and will be transported off-site for proper treatment and/or disposal at the conclusion of field activities.

Groundwater generated during the drilling, development and sampling of bedrock interface monitoring wells was containerized in appropriate 55-gallon drums pending receipt of analytical results. If analytical results indicated the presence of VOC concentrations below New York State groundwater standards, the groundwater was discharged onto the ground surface at a point downgradient of the well and allowed to infiltrate. Groundwater in excess of those standards is temporarily stored at the Site and will be transported off-site for proper treatment and/or disposal at the conclusion of field activities.

Any settled solids were managed as discussed below.

2.13.3 Sediments, PPE and Associated Debris

Solids which settle out of the groundwater produced during the drilling, development, sampling and pump testing of bedrock wells were containerized in appropriate 55-gallon drums and stored temporarily on-site. At the conclusion of field activities, these materials were appropriately characterized and after receiving the necessary approvals, will be transported off-site for treatment and/or disposal at permitted facility. Used PPE and other associated debris (e.g., disposable sampling equipment) was containerized separately, but managed similarly.

2.13.4 Decontamination Fluids

Decontamination fluids associated with drilling activities was containerized in appropriate 55-gallon drums and temporarily stored on-site. Upon completion of field activities, this material was properly characterized and, after receiving the analytical results and necessary approvals, was discharged onto the ground surface or transported off-site for treatment and/or disposal at a permitted facility.

3.0 GEOLOGY AND HYDROGEOLOGY

3.1 GEOLOGY

3.1.1 Regional Geology

The study area lies within the Triassic Lowland, a physiographic province of New York State which occupies most of Rockland County (Univ. Of New York, 1966). The lowland is bounded on the west by the Triassic border fault (Ramapo Fault system) and on the north and east by the Palisades Sill. The remainder of the lowland extends southward into northern New Jersey. The lowland, which is commonly referred to as the Northern Newark Basin, was created as the Appalachian Mountain Range to the west experienced uplift and rifting during the Mesozoic Era causing near vertical or steeply dipping fracturing and faulting along its margins. A series of extensional rift valleys and basins formed along these margins. Large quantities of sediments were transported into the basins creating thick sedimentary sequences concurrent with occasional volcanic episodes, (i.e., the Palisades Sill and other related igneous bodies throughout the region).

The sediments from which the bedrock underlying the region was formed, were deposited during the Late Triassic and Early Jurassic Periods, approximately 230 to 200 million years ago (Seidemann, 1984). The Brunswick Formation which is believed to be approximately 7,000 feet thick in the region, comprises all of the Triassic/Jurassic (Triassic) outcropping in the study area. According to the Geologic Map of New York (Fisher, 1970), the Brunswick Formation is divided into three individual members or lithofacies. These are as follows, from oldest to youngest:

- Mudstone, sandstone, arkose member;
- Sandstone, siltstone, mudstone member; and,
- Sandstone, conglomerate member.

These members appear with the oldest outcropping in eastern Rockland County and the youngest along the Ramapo fault to the west.

The Brunswick Formation dips at approximately 8° to 10° to the west as a result of faulting along the Ramapo fault. The basin subsided as a graben at a greater rate adjacent to the fault than within its more easterly portions. This was in part due to stratigraphic loading of sediments from the uplands onto the basin along the margins of the border fault. The rocks now strike between north and N15°E (Savage, 1967 and 1968).

The igneous rocks of the lowland outcrop in the eastern portion of Rockland County. These consist of basaltic, diabase or gabbro intrusives associated with the Palisades Sill. The Ladentown basalts in the northwestern portion of the basin probably resulted from a Triassic dike attached to the Palisades Sill (Frimpter, 1967).

The unconsolidated sediments within the study area consist primarily of glacial age sediments deposited during the Wisconsinan stage of the Pleistocene Epoch with secondary fluvial deposition adjacent to the modern-day streams. The glacial materials typically include a thin veneer of lodgement till, overlain by various sediments which include outwash sand and gravels, glacio-lacustrine silts and clays, and ice-contact and ablation till materials of highly variable clast size and textures. The recent fluvial materials vary from channel sands and gravels to silt and clay flood plain deposits and organic swamp and marsh deposits.

3.1.2 Site Geology

Geologic conditions in the vicinity of the Site have been previously characterized by Paulus, Sokolowski and Sartor (1980), Dames and Moore (1990) and Lawler, Matusky and Skelly (1992). Subsurface conditions were further evaluated by Rust during this RI through the performance of forty-one soil borings. Based on data obtained during the RI and on the results of previous investigations, the geology beneath the Site is generally composed of approximately 25 to 40 feet of unconsolidated sediments of glacial and post-glacial origin overlying Triassic age sedimentary bedrock.

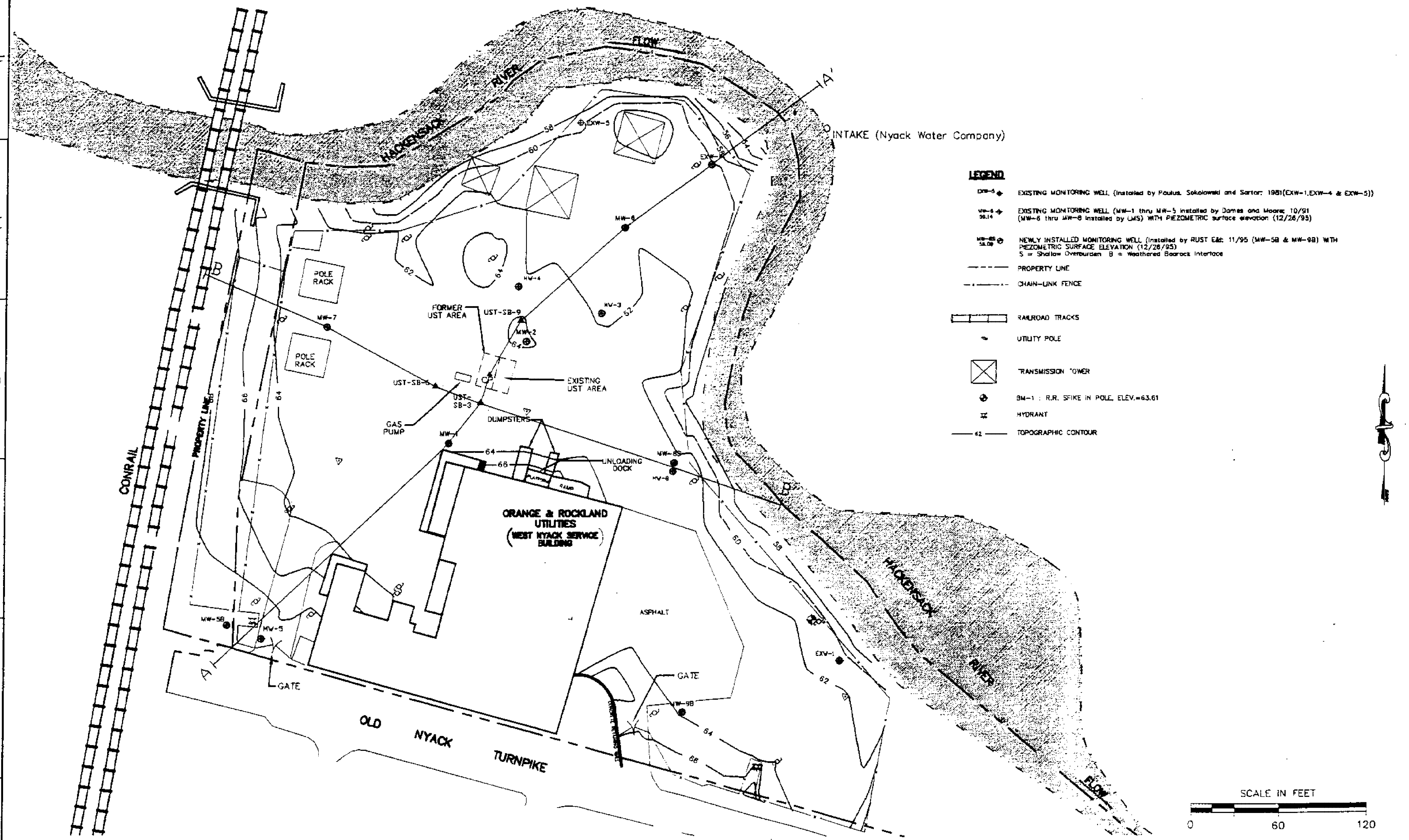
Logs of the soil borings, which describe in detail the subsurface materials encountered, are provided in Appendix B. Soil boring locations are shown on Figure 3. Figure 4 shows the locations of two geologic profiles constructed from the soil boring data. These profiles, as shown on Figure 5, depict the unconsolidated sediments present at the Site and the topographic profile of the bedrock surface.

Unconsolidated Sediments

Unconsolidated deposits present at the Site have been grouped into four units. In order of increasing depth, these include: fill; organic silt and sand; undifferentiated sand and gravel; and glacial till.

A layer of fill ranging in thickness from 1 and 8 feet overlies the native material across a majority of the Site. The fill generally consists of reworked native soils, road stone (ballast), brick, angular gravel and in some areas asphalt. On occasion, electrical refuse debris such as wire, insulators and ceramic were also identified in the area of the test pits and soil borings SDA-SB-1 and SDA-SD-2. The fill is thickest in the central and northern part of the Site, adjacent to the Hackensack River, and is generally between 2 and 4 feet thick over the rest of the Site.

A layer of black to dark brown organic silt with some fine to medium grain sand is present beneath the fill material over a majority of the northern half of the Site. The organic layer contains varying amounts of roots, wood pieces and peat and is generally soft as evidenced by low split spoon sampler blow counts. The organic layer ranges in thickness from not present (i.e., in the southern half of the Site and in areas where it has been replaced by fill) to 6.5 feet (soil boring UST-SB-09A). Where present, it is believed that the organic silt and sand layer depicts the natural surface grade, prior to the Site being developed. The presence and nature of the organic layer suggests that a portion of the Site was previously occupied by a swamp or marsh which would be consistent with local geomorphology (i.e., wetlands are located east, southeast and southwest of the Site).



NAMES		DATE
DRAWN:	GRM	3/21/96
DESIGN:		
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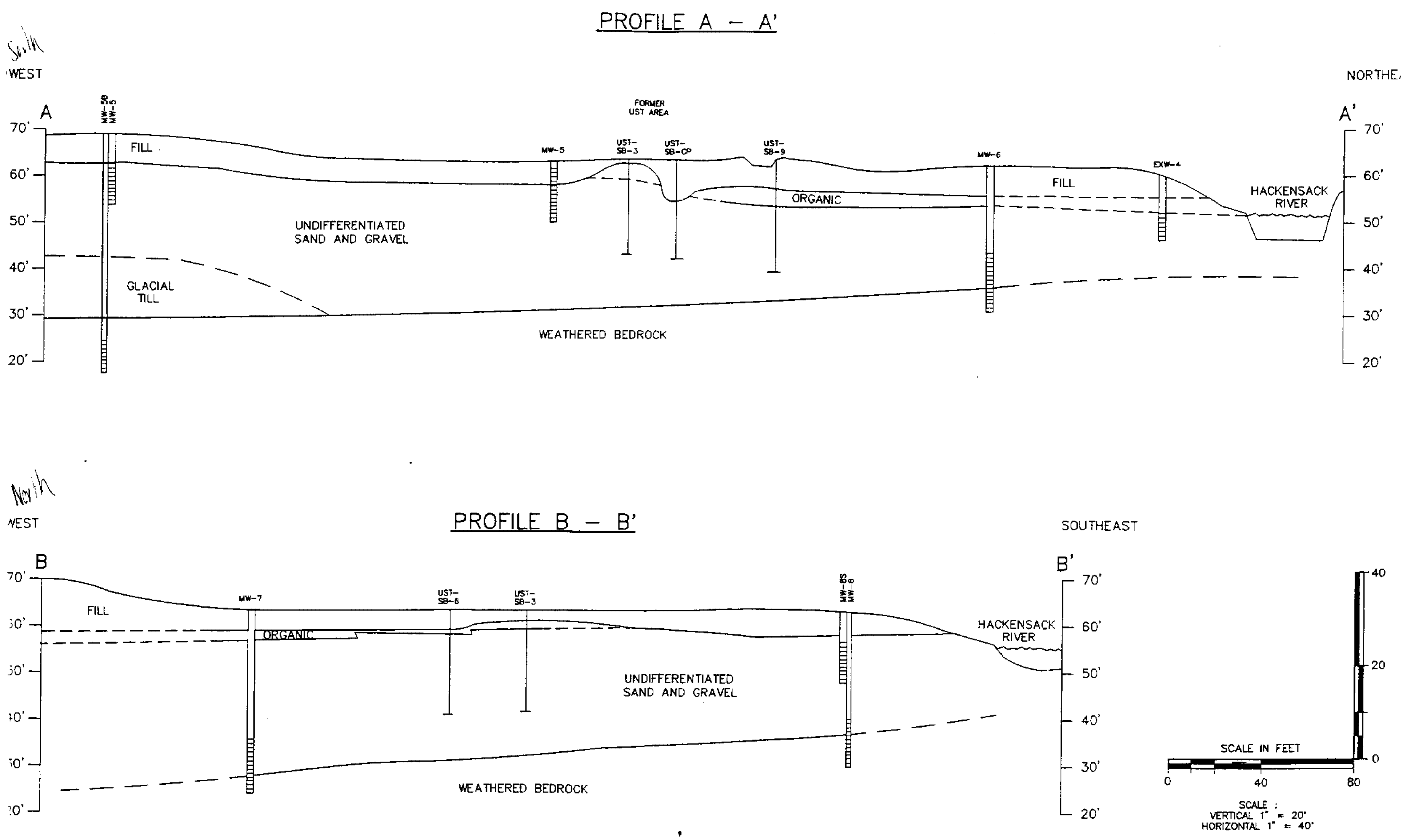
LOCATION OF GEOLOGIC PROFILES

ORANGE AND ROCKLAND UTILITIES, INC.
WEST NYACK, NEW YORK

RUST ENVIRONMENT & INFRASTRUCTURE

PROJECT NUMBER 38301.300 DATE 3/21/96
RUST DWG NUMBER 38301-07 FILE NUMBER
CLIENT DWG NUMBER FIG. No. 4 SHEET NUMBER

NO.	REVISIONS	MADE	CHK	DATE



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GEOLOGIC PROFILES
A-A' AND B-B'

ORANGE AND ROCKLAND UTILITIES, INC.
WEST NYACK, NEW YORK

RUST ENVIRONMENT & INFRASTRUCTURE

PROJECT NUMBER 38301.300
DATE 3/21
RUST DWG NUMBER 38301-08
FILE NUM
CLIENT DWG NUMBER FIG. No. 5
SHEET NU
CAD FILE NAME: 38301-08

A relatively thick sequence of undifferentiated sand and gravel is present beneath the organic silt and sand layer, or below the fill materials where the organic layer is absent. This sequence ranges in thickness from approximately 20 to 30 feet across the Site. Overall, the sand and gravel sequence appears to contain little or no fine grain sediments (i.e., silt or clay) although minor amounts (10-15%) were observed in isolated samples. It appears that the sand and gravel sequence was previously interpreted (L,M & S, 1992) as being glacial till. This apparently was inferred based on the highly compact nature of the unit, as evidenced by moderately high blow counts and sample moisture content which ranged from "moist" to "damp". In soil borings drilled on the north side of the Site during the RI, sand and gravel sediments penetrated below an approximate depth of 20 feet did appear very dense and compact and exhibited a relatively low moisture content. However, due to the relatively low percentage of fine grain sediments in the sequence, the lower portion of the sand and gravel sequence is not considered a glacial till.

Glacial till was identified in soil boring MW-5B from a depth of 26.2 feet to the top of bedrock (40.1 feet). This identification was made because the samples were very dense and compact, exhibited low moisture content and consistently contained 10 to 15% silt, as a matrix to the sand and gravel.

Bedrock

The bedrock underlying the Site is composed of the Brunswick formation, previously described in Section 3.1.1. The upper 5 to 10 feet of the bedrock surface has been penetrated at 5 locations (MW-5B, MW-6, MW-7, MW-8 and MW-9B) during investigations conducted to date. Based on data from these borings, the depth of the bedrock surface ranges from 25 to 40 feet across the Site. The bedrock surface slopes downward to the west/southwest at approximately 2.5°.

Based on the Geologic Map of New York (Fisher, 1970), the contact between the easternmost two of the three Brunswick Formation members discussed in Section 3.1.1 (i.e.; mudstone, sandstone, arkose member and sandstone, siltstone mudstone member) lies just east of the Site and generally coincides with the Hackensack River. The course of the Hackensack River in the region follows this contact closely as evidenced by the fact that the course of the Hackensack River and the contact begin to trend southwest just downstream from the Site (LM&S, 1992).

Based on descriptions of bedrock drill cuttings (MW-6, MW-7 and MW-8) and core descriptions (MW-5B), shallow bedrock beneath the Site consists of red to red-gray sandstone, siltstone, and mudstone which appears to be consistent with the Geologic Map of New York. Based on boreholes drilled during the RI and during previous investigations, the bedrock beneath Site is highly fractured. Weathering along these fractures have produced localized zones of solution cavities. The results of coring performed in borings MW-5B and MW-9B demonstrates the highly fractured nature of the bedrock. In boring MW-5B, an RQD of less than 10% was obtained throughout the 10 foot section of core. Numerous attempts to core boring MW-9B from a depth of 32 to 38 feet yielded only 0.7 feet of recovered core.

3.2 HYDROGEOLOGY

3.2.1 Surface Water

The Site has low relief and is situated within the Hackensack River drainage basin. The Site is relatively flat but slopes radially outward along its northern and eastern perimeter. Precipitation that does not infiltrate to groundwater drains, as surface water runoff, into the Hackensack River. Wetland areas prevail over the area, although the inactive Clarkstown Landfill is located about 1,500 feet southeast of the Site while the inactive Dexter Nyack Landfill is located 0.5 mile east-northeast of the Site. A freshwater wetland is located directly north-northwest of the Site. Additional wetlands are located approximately 0.3 miles to the south along the Hackensack River.

The primary surface water body in the region is the Hackensack River, which flows from north to south. This orientation was directly produced during the most recent period of (Wisconsinan) glaciation when the north to south-oriented ice flow deepened and widened the Hackensack valley. In the immediate vicinity of the Site the Hackensack River flows from the northwest to southeast.

The Hackensack River basin has a drainage area of approximately 29.4 square miles at West Nyack. The flow in the Hackensack River was measured to be 422.7 million gallons per day (mgd) at West Nyack near the Site (Robison, 1965). The Hackensack River acts as the outlet for Lake DeForest, about 0.7 mile north of the Site. Tributaries of the Hackensack River in the Clarkstown/Orangetown area include Nauraushaun Brook, Pascack Brook and Muddy Creek. These creeks drain areas to the west of the Hackensack River. The Hackensack River is dammed at Nauraushaun, New York, about 2.5 miles south of the Site, forming Lake Tappan. The Hackensack River, serving as the outlet for Lake Tappan, continues to flow south into the state of New Jersey ultimately emptying into Newark Bay between the City of Newark and Jersey City. The Hackensack River is not under the County's jurisdiction, but is controlled by an interstate agreement because it flows from New York into New Jersey.

The Hackensack River is the largest river in the County and provides a water supply resource for drinking water, fishing, recreational, industrial, commercial, and agricultural uses. The Nyack Water Company intake is located directly opposite the northeastern corner of the Site along the eastern banks of the Hackensack River. The portion of the Hackensack River which meanders around the northern and eastern portion of the Site has been designated as "Class A" by the NYSDEC.

3.2.2 Regional Hydrogeology

Groundwater in the study area occurs in both the bedrock and unconsolidated sediments. Groundwater in the bedrock is found in the Brunswick Formation. This bedrock aquifer is the dominant source of drinking water used in Rockland County. Water occurs within the Brunswick aquifer in both primary porosity features (intergranular) and in secondary openings in the rock fabric along bedding planes, fractures and joints that developed after deposition of the rock (Leggette, Brashears and Graham, 1982 and Slayback, 1984). Permeability of the aquifer is controlled mainly by the secondary porosity features with the primary porosity supplementing the water bearing capabilities of the rock.

Recharge to the formation has been estimated at between 225,000 and 350,000 gallons per day per square mile (LM&S, 1992). Maximum withdrawals from the Brunswick Formation are estimated at 25 to 30 million gallons per day (mgd) with average withdrawals being on the order of 15 mgd (LM&S, 1992).

Most of the unconsolidated deposits covering the region are glacial sediments of Pleistocene age. Perlmutter (Perlmutter, 1959) has grouped those glacial deposits into: 1) till and 2) stratified drift. The recent deposits have little value as a source of water due primarily to their thinness and, in many places, their low permeability.

The stratified drift sediments are the most productive of the glacial sediments and are capable of yielding, 8 to 1700 gpm. Well yields within large diameter dug wells in glacial till are generally less than 5 gpm.

3.2.3 Site Hydrogeology

Groundwater beneath the Site is present in both the unconsolidated sediments (overburden) and bedrock. Thirteen monitoring wells (EXW-1, EXW-4, EXW-5, MW-1, MW-2, MW-3, MW-5, MW-5B, MW-6, MW-7, MW-8S, MW-8 and MW-9B) are currently located at the Site (Table 3.1). Table 3.2 presents static water level data collected on December 26, 1995. Groundwater levels could not be measured in wells EXW-1, MW-2, MW-3 and MW-4 on this date as the wells were inaccessible.

The geologic units present at the Site (Section 3.1.2) comprise three hydrogeologic units. Two of these include a shallow unconsolidated sediments (overburden) groundwater flow zone and a weathered bedrock interface groundwater flow zone. The third hydrogeologic unit is comprised by the glacial till. This unit likely serves as a confining or semi-confining layer to vertical groundwater flow between the two groundwater flow zones outlined above. Following is a discussion of groundwater flow conditions in the overburden groundwater flow zone and weathered bedrock interface groundwater flow zones.

Overburden Groundwater Flow Zone

The overburden groundwater flow zone is comprised of fill materials (where fill has been placed below the water table), the organic silt unit, and the upper portions of the undifferentiated sand and gravel sequence. The upper portion (i.e., at depths less than approximately 20 feet) of the sand and gravel sequence that is included in the water table groundwater flow zone exhibited relatively lower split spoon sampler blow counts and higher soil moisture content than did lower portions of the undifferentiated sand and gravel sequence. Groundwater in the overburden groundwater flow zone occurs under unconfined water table conditions and rises and falls with changes in recharge and discharge. The water table at the Site exists fairly close to the ground surface (3 to 6.5 feet below grade).

Table 3-1
Existing Well Construction Summary
Orange and Rockland Utilities, Inc.
West Nyack, New York

Well I.D.	T.O.C. Elevation (ft.)	Measuring Point Elevation (ft.)	Ground Elevation (ft.)	Depth of Boring (ft. BGS)	Screened Interval Depth (Elevation)	Sand Pack Interval (Elevation)	Date Installed
EXW-1[1]	---	61.42	61.4	15.0	9.65-14.65 [51.73-46.73]	7.0-15.0 [54.38-46.38]	1981
EXW-4[1]	61.40	61.40	60.2	13.5	8.31-13.31 [51.9-46.9]	6.0-13.5 [54.21-46.71]	1981
EXW-5[1]	62.94	62.94	60.6	8.60*	9.0-14.0 [51.62-46.62]	7.0-14.0 [53.62-55.62]	1981
MW-1[2]	62.68	62.68	62.7	13.0	2.0-12.0 [60.7-50.7]	1.6-13.0 [61.1-49.7]	11/89
MW-2[2]	61.91	61.81	61.9	15.0	2.0-12.0 [59.9-49.9]	1.7-15.0 [60.2-46.9]	11/89
MW-3[2]	61.79	61.63	61.8	13.0	2.0-12.0 [59.8-49.8]	1.7-13.0 [60.1-48.8]	11/89
MW-4[2]	62.09	61.85	62.1	15.0	2.0-12.0 [60.1-50.1]	1.5-15.0 [60.6-47.1]	11/89
MW-5[2]	68.76	68.52	68.8	15.0	5.0-15.0 [63.8-53.8]	4.0-15.0 [64.8-53.8]	1/90
MW-5B[4]	68.78	68.58	68.9	40.1/50.5	43.0-50.0 [25.9-18.9]	41.0-50.5 [27.9-18.4]	11/95
MW-6[3]	61.94	61.72	61.9	31.0	21.0-31.0 [40.9-30.9]	19.5-31.0 [42.4-30.9]	10/91
MW-7[3]	63.13	62.89	63.1	40.0	29.0-39.0 [34.1-24.1]	27.0-40.0 [36.1-23.1]	10/91
MW-8S[4]	62.91	62.49	62.9	15.5	5.0-15.0 [57.9-47.9]	4.0-15.5 [58.9-47.4]	11/95
MW-8[3]	62.85	62.47	62.8	32.5	22.5-32.5 [40.3-30.3]	20.0-33.0 [42.8-29.8]	10/91
MW-9B[4]	63.78	63.43	63.8	40.1	30.0-40.0 [33.8-23.8]	28.0-40.5 [35.8-23.3]	11/95

Notes:

ft = Feet
BGS = Below Ground Surface
T.O.C. = Top of Casing
Measuring Point = Top of PVC Riser
[1] = Monitoring well installed by Paulus, Sokolowski and Sartor
[2] = Monitoring well installed by Dames and Moore
[3] = MWS installed by Lawler, Matusky & Skelly Engineers
[4] = Monitoring well installed by Rust Environment and Infrastructure
* = Monitoring well EXW-5 appears to have obstruction at 8.60 feet BMP.

TABLE 3.2
WATER LEVEL MEASUREMENT SUMMARY
ORANGE & ROCKLAND UTILITIES, INC.
WEST NYACK, NEW YORK
DECEMBER 26, 1995

WELL NUMBER	MEASURING PT. ELEVATION (FT.)	DEPTH TO WATER (FT. BELOW MEASURING POINT)	TOTAL DEPTH (FT. BELOW MEASURING POINT)	GROUNDWATER ELEVATION (FT.)	STRATIGRAPHIC UNIT SCREENED
EXW-4	61.40	4.80	13.40	56.60	Shallow Overburden
EXW-5	62.94	5.93	8.65	57.01	Shallow Overburden
MW-1	62.68	3.54	10.15	59.14	Shallow Overburden
MW-5	68.52	6.37	15.07	62.15	Shallow Overburden
MW-5B	68.58	8.93	49.25	59.65	Weathered Bedrock Interface
MW-6	61.72	2.95	30.75	58.77	Weathered Bedrock Interface
MW-7	62.89	4.00	37.60	58.89	Weathered Bedrock Interface
MW-8S	62.49	3.50	14.25	58.99	Shallow Overburden
MW-8	62.47	3.33	30.68	59.14	Weathered Bedrock Interface
MW-9B	63.43	4.34	37.85	59.09	Weathered Bedrock Interface

FT. = Feet (All Measurements were taken from Top of PVC)
Measuring Point = Top of PVC Riser

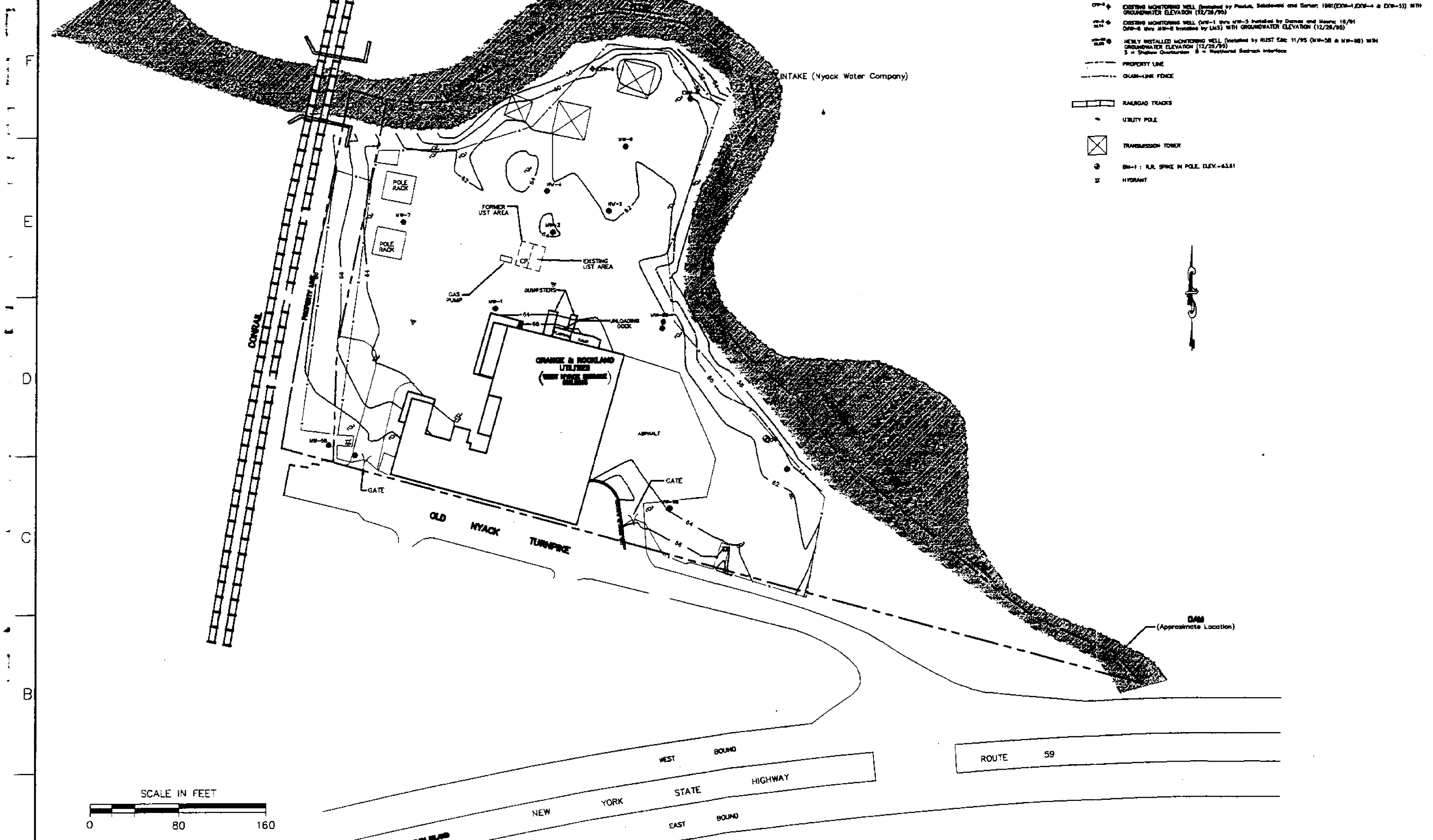
Monitoring wells installed in the overburden groundwater flow zone include EXW-1, EXW-4, EXW-5, MW-1, MW-2, MW-3, MW-4 and MW-5 (installed prior to the RI) and MW-8S (installed during the RI). Figure 6 is a groundwater contour map of water table elevations measured on December 26, 1995. As shown on the map, groundwater in this hydrogeologic unit flows in a northeasterly direction beneath the Site, and ultimately discharges to the Hackensack River. The hydraulic gradient of the water table along a groundwater flow path extending from monitoring well MW-5 to EXW-4 (flowpath length of approximately 460 feet) was calculated at 0.012 ft/ft. The water table gradient appears to be steeper (0.1 ft/ft) along the bank of the Hackensack River, at the eastern end of the Site.

Based on K-tests performed on wells EXW-4, EXW-5, MW-1 and MW-8S, the geometric mean horizontal hydraulic conductivity for the overburden groundwater flow zone (Table 3.3 - overburden values) was calculated to be 5.49 x 10^{-4} cm/sec (1.56 feet/day) by the Bouwer and Rice method and 9.16 x 10^{-4} cm/sec (2.60 feet/day) by the Hvorslev method. The range of measured hydraulic conductivities in these wells was from 1.48 x 10^{-4} cm/sec (0.42 feet/day) in well EXW-5 to 3.61 x 10^{-3} cm/sec (10.23 feet/day) in well MW-1. As shown on Table 3.3, K values estimated by Rust differed somewhat from those calculated by Dames and Moore. This may reflect differences in testing procedures or possibly changes in physical conditions of well screens and sandpacks. The K-test result from monitoring well MW-5 was not used in the geometric mean hydraulic conductivity estimate for the overburden groundwater flow zone primarily because the test result was approximately one order of magnitude slower than the other wells. Considering its location in the extreme southwest corner of the Site, the test result for well MW-5 may not be representative of aquifer conditions in the downgradient portions of the Site. Further, utilizing a geometric mean hydraulic conductivity value without the test result from MW-5 will provide a conservative value when assessing groundwater flow velocities and travel times in this hydrogeologic unit.

Weathered Bedrock Interface Groundwater Flow Zone

Groundwater is present in the upper weathered portion of bedrock beneath the Site where there is an abundance of secondary porosity features (joints, fractures and solution cavities). This unit comprises a weathered bedrock interface groundwater flow zone. Five monitoring wells (MW-5, MW-6, MW-7, MW-8B and MW-9B) screen the upper weathered and fractured portion of the bedrock. Monitoring wells MW-6, MW-7 and MW-8 are constructed such that the screened interval straddles the bedrock interface. Monitoring wells MW-5B and MW-9B were constructed with all of the screened section placed immediately below the bedrock surface. Based on similarities in groundwater elevations measured and hydraulic conductivities calculated for each of the 5 bedrock monitoring wells, it is concluded that the 5 wells effectively monitor the same hydrogeologic unit and that hydrogeologic data generated from the wells can be compared. This is further discussed in the following sections.

Figure 7 is a contour map of groundwater elevations measured in the weathered bedrock wells on December 26, 1995. The groundwater contours indicate that groundwater in the bedrock flows to the northeast, similar to that in the overburden. The potentiometric surface elevation decreases by 0.88 feet over a distance of approximately 380 feet between wells MW-5B and MW-6 resulting in a very flat hydraulic gradient (0.002) across the Site. This relative flat hydraulic gradient indicates that there is good hydraulic communication throughout the weathered bedrock interface groundwater flow zone across the Site.



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SITE TOPOGRAPHIC BASE MAP

ORANGE AND ROCKLAND UTILITIES, INC.
WEST NYACK, NEW YORK

RUST ENVIRONMENT & INFRASTRUCTURE

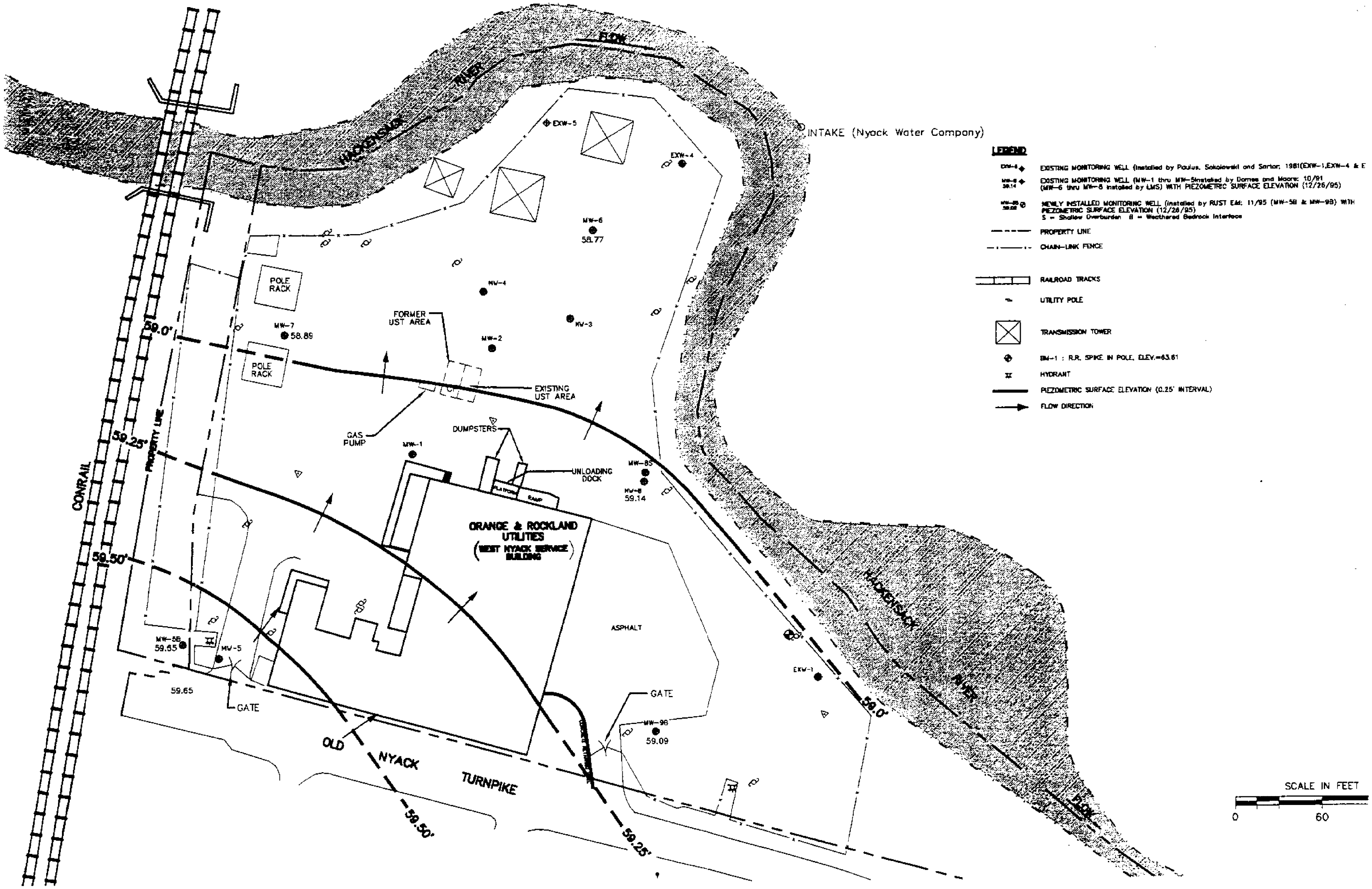
PROJECT NUMBER 38301.300 — DATE 3/18/96
RUST DWG NUMBER 38301H02 — FILE NUMBER
CLIENT DWG NUMBER FIG No.6 — SHEET NUMBER

TABLE 3.3
SUMMARY OF HYDRAULIC CONDUCTIVITY INFORMATION
ORANGE & ROCKLAND UTILITIES, INC.
WEST NYACK, NEW YORK

WELL I.D.	HYDRAULIC CONDUCTIVITIES (cm/sec.) LAWLER, MATUSKY & SKELLY[1]	RUST E&I[2] Hvorslev Method	RUST E&I[2] Bouwer and Rice Method
Overburden			
EXW-1	9.33×10^{-4}	Not Tested[C]	Not Tested[C]
EXW-4	2.03×10^{-3}	6.23×10^{-4}	4.09×10^{-4}
EXW-5	Not Tested[A]	2.63×10^{-4} [A]	1.48×10^{-4} [A]
MW-1	5.51×10^{-4}	3.61×10^{-3}	2.17×10^{-3}
MW-2	4.57×10^{-3}	Not Tested[C]	Not Tested[C]
MW-3	1.60×10^{-3}	Not Tested[C]	Not Tested[C]
MW-4	1.06×10^{-2}	Not Tested[C]	Not Tested[C]
MW-5	5.35×10^{-3}	6.73×10^{-5}	3.98×10^{-5}
MW-8S	Not Tested[B]	1.19×10^{-3}	6.94×10^{-4}
Geometric Mean		**9.16×10^{-4} [D]**	**5.49×10^{-4} [D]**
Bedrock Interface			
MW-5B	Not Tested[B]	1.84×10^{-3}	1.86×10^{-3}
MW-6	6.10×10^{-2}	3.86×10^{-3}	3.56×10^{-3}
MW-7	5.18×10^{-3}	1.73×10^{-3}	1.61×10^{-3}
MW-8	2.82×10^{-2}	1.04×10^{-2}	7.87×10^{-3}
MW-9B	Not Tested[B]	2.21×10^{-4}	2.13×10^{-4}
Geometric Mean		**1.95×10^{-3}**	**1.78×10^{-3}**

NOTES:

1) November, 1989 Data Reduction
2) December, 1995 Data Reduction
A) EXW-5 was silted when slug testing was performed
B) Well MW-8S, MW-5B and MW-9B were installed in November, 1995; therefore, they were not tested by Dames & Moore.
C) EXW-1, MW-2, MW-3 and MW-4 were not "located" prior to K-testing activities.
Hydraulic conductivity values for bedrock interface wells were determined under confined conditions.
D) Value based on test results from EXW-4, EXW-5, MW-1 and MW-8S only.



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WEATHERED BEDROCK INTERFACE GROUND WATER CONTOUR MAP (DECEMBER 26, 1995)

ORANGE AND ROCKLAND UTILITIES, INC.
WEST NYACK, NEW YORK

RUST ENVIRON INFRAST

PROJECT NUMBER 38301.300
RUST DWG NUMBER 38301-05
CLIENT DWG NUMBER FIG. No. 7

The geometric mean horizontal hydraulic conductivity (Table 3.3) for wells screening the weathered bedrock interface was calculated to be 1.78 x 10^{-3}cm/sec (5.05 feet/day) by the Bouwer and Rice method and 1.95 x 10^{-3} cm/sec (5.53 feet/day) using the Hvorslev method. The range of measured hydraulic conductivities in the bedrock was from 2.13 x 10^{-4} cm/sec (0.60 feet/day) in well MW-9B to 1.04 x 10^{-2} cm/sec (29.48 feet/day) in well MW-8. These values are approximately 1 order of magnitude greater than estimated values for the overburden groundwater flow zone.

Glacial Till

The glacial till deposit identified in soil boring MW-5B appears to serve as a confining or semi-confining layer to the weathered bedrock interface flow zone in the southwest corner of the Site. This conclusion is based on the water table elevation in well MW-5 on December 26, 1995 (62.15') which was 2.5 feet higher than that in MW-5B (59.65'). Although these wells are not immediately adjacent to one another, they are close enough to show that the hydraulic head in the overburden groundwater flow zone is appreciably higher than that in the weathered bedrock interface groundwater flow zone. This demonstrates that the two groundwater flow zones are hydraulically isolated from one another in this area at the Site.

In the northern half of the Site, the deeper portion (i.e., between a depth of approximately 20 feet and the bedrock surface) of the undifferentiated sand and gravel sequence was observed to be highly compact and dense. Based on this it is believed that this unit exhibits at least some confining properties between the two groundwater flow zones. This appears to be substantiated by the groundwater elevation in well MW-8S on December 26, 1995 (58.99') which was 0.15 feet lower than that in MW-8 (59.14').

Vertical Groundwater Flow Components

The vertical hydraulic gradient between the potentiometric surface in the weathered bedrock interface flow zone and the water table was calculated for the two locations at the Site where well couplets exist (MW-5 and MW-8). The hydraulic head in MW-5 is 2.5 feet higher than in MW-5B, as previously discussed. The vertical distance between the midpoints of these two well screens is 36.4 feet. From these values, it is apparent that a moderate downward vertical gradient of 0.069 ft/ft from the overburden to the bedrock was present at this location on the date the water levels were recorded. The head measured in bedrock well MW-8 (59.14') was 0.15 feet higher than that in shallow well MW-8S (58.99'). The difference in the midpoint screen elevations in these wells is 17.6 feet resulting in a slight upward groundwater flow gradient (0.009 ft/ft) from the bedrock to the overburden. Considering the close proximity of well couplet MW-8S/MW-8 to the Hackensack River, it appears that the Hackensack River induces the upward vertical groundwater flow component. Based on this data, it is expected that an upward gradient from the bedrock to the overburden exists across the entire northern half of the Site, due to influences posed by the River.

Further evaluation of vertical groundwater flow gradients was performed by comparing the groundwater contour map for the water table (Figure 6) to that of the weathered bedrock interface groundwater flow zone (Figure 7). The two groundwater contour maps reveal a coincident "59 foot" groundwater contour extending in a northwesterly direction from just southwest of location MW-

8S/MW-8B through the location of the former UST area. The coincidence of these contours indicates that the hydraulic head in the two groundwater flow zones are equivalent along this line and there would be no vertical component of flow. Also evident from reviewing the maps is that the horizontal hydraulic gradient to the northeast is moderately steeper in the water table (0.012) than it is in the weathered bedrock interface groundwater flow zone (0.002). Because of this condition, it appears that the 59 foot contour line constitutes the median between a downward vertical flow gradient to the south and southeast and an upward vertical flow gradient to the north and northeast. A good example of the potential upward groundwater flow component is evident at monitoring well MW-6. Based on the water table contour map (Figure 6), the water table elevation at this location is inferred to be approximately 57.25', which is approximately 1.5' lower than the hydraulic head measured in the weathered bedrock zone (58.77 feet in well MW-6).

Based on the apparent vertical gradients as discussed above, it is concluded that an upward groundwater flow component from the weathered bedrock groundwater flow zone to the overburden groundwater flow zone exists in portions of the Site north and northeast of the former UST area.

Groundwater Flow Velocity and Travel Time

The horizontal groundwater flow velocity within the overburden groundwater flow zone was calculated to determine the travel time downgradient of the former UST area. Groundwater velocity in this area was calculated using a modification of the Darcy Equation, where groundwater flow velocity is a function of the aquifer's hydraulic conductivity, effective porosity, and hydraulic gradient as follows:

$V = ((K(h/L))/n$ where: V = groundwater flow velocity
K = hydraulic conductivity
n = effective porosity
h/L = hydraulic gradient

The groundwater flow velocity calculations were performed utilizing a hydraulic gradient (0.012) derived from groundwater elevations recorded at the site, the two geometric mean hydraulic conductivity values obtained from wells EXW-4, EXW-5, MW-1 and MW-8S (1.56 ft/day and 2.60 ft/day), and an effective porosity value of 35%. Utilizing these values, the resultant groundwater flow velocities are summarized as follows:

HYDRAULIC CONDUCTIVITY (FT/DAY)	GROUNDWATER FLOW VELOCITY (FT/DAY)
1.56	**0.053**
2.60	**0.089**

Two groundwater flow paths along which groundwater travel time was calculated are shown on Figure 6. The longer of the two flow paths extends from the former UST area to monitoring well EXW-4. The shorter of the two flow paths extends from monitoring well MW-3 to the Hackensack River. The travel time along each flow path is calculated as the length of the flow path (L) divided by the groundwater flow velocity (V). Based on available data, it appears that hydrogeologic conditions and groundwater gradients are similar enough in the vicinity of these two flow paths to use the set of groundwater flow velocities shown above for estimating travel time along both flow paths.

Utilizing the two groundwater flow velocities summarized above, the travel time along the groundwater flow path from the former UST area to monitoring well EXW-4 (L=200 feet) is estimated to range between 6.2 years and 10.3 years. Similarly, the travel time from monitoring well MW-3 to the Hackensack River (L=90 feet) is estimated to range between 2.8 years and 4.7 years.

4.0 NATURE AND EXTENT OF CONTAMINATION

This section evaluates the analytical data from the environmental samples collected and analyzed as part of the RI field investigation performed at the Site. The data are evaluated and interpreted to provide an understanding of the extent to which environmental media have been affected by site related chemicals. The environmental samples collected and the analyses performed have been summarized in Table 2.1. The media sampled included sub-surface soils, groundwater, surface water and sediments. A listing of the media/areas investigated are listed below:

- Shallow boring (HA series) subsurface soil;
- Underground storage tank subsurface soil;
- Dry well area subsurface soil;
- Suspected disposal area subsurface soil;
- Test pit soil;
- Hackensack River surface water;
- Hackensack River sediment; and
- Groundwater.

The analytical results from the environmental media listed above and available historical site data are discussed in the following sections. The data gathered during the RI, in conjunction with previously existing data collected at the Site, provide a comprehensive understanding of the environmental quality on and adjacent to the Site.

4.1 SHALLOW SOIL BORING INVESTIGATION

Five shallow soil borings (HA-1 through HA-5) were completed to a depth of four feet. Two samples were collected from each boring, one from 1'-2' and a second from 3'-4'. Samples were submitted to NYTEST for volatile organic analysis by NYSDEC ASP, CLP Method 91-1. Samples were analyzed in the field for PCBs using the Omichron immunoassay test kit.

The shallow soil boring sample VOC results are summarized in Table 4.1. Analytical results indicated that the 3'-4' samples from the HA-4 and HA-5 borings exhibited elevated concentrations of petroleum related BTEX. The HA-4 and HA-5, BTEX concentrations exceeded the NYSDEC RSCOs (benzene 60 µg/kg; toluene 1,500 µg/kg; ethylbenzene 5,500 µg/kg; xylene 1,200 µg/kg). The HA-4 and HA-5 boring samples were collected in the vicinity of the former and existing UST area. The high BTEX concentrations reported in the HA-4 and HA-5, 3'-4' boring samples is not unexpected. Field analytical data from additional subsurface boring soil samples analyzed as part of the UST investigation confirmed the high BTEX concentrations in subsurface soil in the HA-4 and HA-5 boring areas. The HA-4 1'-2' sample exhibited very low, estimated concentrations of benzene (4 µg/kg), toluene (8 µg/kg) and xylene (3 µg/kg); the results were well below the NYSDEC RSCO for these compounds (benzene 60 µg/kg; toluene 1,500 µg/kg; xylene 1,200 µg/kg). This data indicates that shallow subsurface soil are not impacted with respect to VOCs. Soil in the vicinity of HA-4 and HA-5 are impacted at depths greater than two feet.

Table'4.1
Volatile Organic Analytical Data - Shallow Soil

Orange & Rockland Utilities
West Nyack, New York

Sampling Date: November 14, 1995

Compound / Sample ID	HA-1 (1-2')	HA-1 (3-4')	HA-2 (1-2')	HA-2 (3-4')	HA-3 (1-2')	HA-3 (3-4')	HA-4 (1-2')	HA-4 (3-4')	X-1	HA-5 (1-2')	HA-5 (3-4')	*NYSDEC RSCO
Chloromethane	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 UV	62 U	11 U	12 U	
Bromomethane	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 UV	62 U	11 U	12 U	
Vinyl Chloride	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 UV	62 U	11 U	12 U	
Chloroethane	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 UV	62 U	11 U	12 U	
Methylene Chloride	13 U	13 U	12 U	15 U	12 U	13 U	12 U	12 UV	62 U	11 U	12 U	
Acetone	**16**	**39**	**22**	**30**	**11 J**	**26**	**22**	12 UV	62 U	**18**	12 U	200
Carbon Disulfide	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 UV	62 U	11 U	12 U	
1,1-Dichloroethene	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 UV	62 U	11 U	12 U	
1,1-Dichloroethane	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 UV	62 U	11 U	12 U	
1,2-Dichloroethene (total)	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 UV	62 U	11 U	12 U	
Chloroform	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 UV	62 U	11 U	12 U	
1,2-Dichloroethane	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 UV	62 U	11 U	12 U	
2-Butanone	11 U	**16**	**7 J**	**13**	**7 J**	**9 J**	12 U	12 UV	62 U	11 U	12 U	300
1,1,1-Trichloroethane	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 U	62 U	11 U	12 U	
Carbon Tetrachloride	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 U	62 U	11 U	12 U	
Bromodichloromethane	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 U	62 U	11 U	12 U	
1,2-Dichloropropane	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 U	62 U	11 U	12 U	
cis-1,3-Dichloropropene	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 U	62 U	11 U	12 U	
Trichloroethene	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 U	62 U	11 U	12 U	
Dibromochloromethane	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 U	62 U	11 U	12 U	
1,1,2-Trichloroethane	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 U	62 U	11 U	12 U	
Benzene	11 U	11 U	11 U	12 U	12 U	12 U	**4 J**	**20,000 D**	**17,000 D**	**6 J**	**1,900 JD**	60
trans-1,3-Dichloropropene	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 U	62 U	11 U	12 U	
Bromoform	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 U	62 U	11 U	12 U	
4-Methyl-2-Pentanone	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 U	62 U	11 U	12 U	
2-Hexanone	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 U	62 U	11 U	12 U	
Tetrachloroethene	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 U	62 U	11 U	12 U	
1,1,2,2-Tetrachloroethane	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 U	62 U	11 U	12 U	
Toluene	11 U	11 U	11 U	**3 J**	12 U	12 U	**8 J**	**120,000 D**	**160,000 D**	**5 J**	**13,000 JD**	1,500
Chlorobenzene	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 U	62 U	11 U	12 U	
Ethylbenzene	11 U	11 U	11 U	12 U	12 U	12 U	12 U	**76,000 D**	**95,000 D**	**8 J**	**6,800 JD**	5,500
Styrene	11 U	11 U	11 U	12 U	12 U	12 U	12 U	12 U	62 U	11 U	12 U	
Xylene (total)	11 U	11 U	11 U	**2 J**	12 U	12 U	**3 J**	**390,000 D**	**490,000 D**	**32**	**39,000 D**	1,200

All results expressed in ug/Kg.
Standard Organic Data Qualifiers have been used.
Sample X-1 is a blind field duplicate of sample HA-4 (3-4').
*NYSDEC TAGM HWR-94-4046, January 1994: Recommended Soil Cleanup Objectives

Shallow subsurface soil samples from borings HA-1, HA-2 and HA-3 did not exhibit high concentrations of petroleum related VOCs. With the exception of very low, estimated concentrations of xylene and toluene in the HA-2 3'-4' sample, no BTEX was detected in any of the HA-1, HA-2 or HA-3 samples. The HA-2 3'-4' sample toluene and xylene concentrations were low estimated values (toluene 3 µg/kg; xylene 2 µg/kg) well below the NYSDEC RSCO concentrations. Data indicate that shallow subsurface soil in the western section of the Site have not been impacted with respect to VOCs.

The field PCB test kit analytical data indicated shallow subsurface soil (1'-4') in the vicinity of borings HA-1, HA-2, HA-3, HA-4 and HA-5 have not been impacted with respect to PCBs. The Omichron field data indicated that PCBs were not detected in any of the boring soil samples at a reporting limit of 2 ppm (wet weight) as Aroclor 1254.

Review of the data discussed above indicates that the subsurface soil at depths greater than two feet in the vicinity of borings HA-4 and HA-5 are impacted with respect to BTEX. Shallow subsurface soil (1' to 4') in the western section of the Site have not been impacted by BTEX contaminants. Omichron field test kit data indicate that soil in the immediate vicinity of borings HA-1, HA-2, HA-3, HA-4 and HA-5 have not been impacted with respect to PCBs.

4.2 UNDERGROUND STORAGE TANK AREA INVESTIGATION

The objective of the UST area investigation was to evaluate the horizontal and vertical extent of petroleum impacted soil in the vicinity of the refueling area. The tasks implemented to meet this objective included the installation of soil borings in a radial pattern outward from the refueling area. Samples collected from the borings were analyzed in the field using a portable field HNU Model 311D gas chromatograph (GC). A 1 ppm total volatile concentration was used to demark the extent of impacted soils. Field analytical results for samples exhibiting less than 1 ppm total volatile organic compounds were submitted to NYTEST analytical for confirmation. The vertical and horizontal extent of impacted soil was considered defined when the deepest (vertical) and outermost radial sample (horizontal) total volatile concentration was less than 1ppm. The methodology for collection and analysis of the soil boring samples and the investigation design has been presented in Section 2.

A total of 303 subsurface soil samples from 28 borings were analyzed in the field for BTEX using the field GC. A summary of the field GC soil boring sample analytical results is presented in Table 4.2. The NYTEST laboratory soil boring BTEX analytical data are summarized in Table 4.3.

The soil boring analytical data indicate that subsurface soil in the UST area are impacted to a maximum depth of fourteen feet and that impacted soil are generally no deeper than 12 feet in and many cases no deeper than 8 feet. Depth to groundwater in the UST area during the investigation was approximately 5 feet below grade. Samples exhibiting elevated BTEX levels collected below this depth represent a mixture of impacted groundwater and soil. Soil were impacted by sorbtion of aqueous phase contaminants from the groundwater. The soil boring blow counts as depicted in the soil boring logs (Appendix B), indicate that the subsurface soil became more competent with depth and that groundwater movement became preferentially lateral rather than vertical. The depth at which groundwater movement became primarily horizontal and/or aqueous phase concentrations where to low to significantly sorb to soil organic matter, represents the maximum depth of impacted subsurface soils.

Table 4.2
BTEX Data - UST Soil Boring Program
Orange & Rockland Utilities, Inc.
West Nyack, New York
November 13 through December 6, 1995

B = 19
T = 13
E = 1
X = 15
max Bz =
46

Location:	UST-SB-CP	UST-SB-CP	UST-SB-CP	UST-SB-CP	UST-SB-CP	UST-SB-CP	UST-SB-CP	UST-SB-CP	UST-SB-CP
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	12-14'	16-18'	18-20'	20-22'
Compound									
Benzene	< 5	151	5.8	< 5	223	13	< 5	< 5	< 5
Toluene	< 5	104	< 5	< 5	172	10	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	< 5	320	11	< 5	504	< 5	< 5	< 5	< 5
o-Xylene	< 5	29	< 5	< 5	111	< 5	< 5	< 5	< 5
Total BTEX	0	604	16.8	0	1,010	23	0	0	0

Location:	UST-SB-01	UST-SB-01	UST-SB-01	UST-SB-01	UST-SB-01	UST-SB-01	UST-SB-01	UST-SB-01	UST-SB-01	UST-SB-01	UST-SB-01	UST-SB-01	UST-SB-01
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'	22-24'	24-26'
Compound													
Benzene	44.7	233	12,130	1,448	172	> 26,000	34	6.3	< 5	< 5	< 5	< 5	< 5
Toluene	8.7	771	24,870	955	32.6	> 26,000	75.4	9	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 50	< 100	993	62.5	> 26,000	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	202	2,761	> 260,000	1,278	88	> 26,000	150	14	< 5	< 5	5.7	< 5	< 5
o-Xylene	37.7	1,040	26,000	1,136	< 25	> 26,000	24	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	293.1	4,805	63,000	5,810	355.1	> 130,000	283.4	29.3	0	0	5.7	0	0

Location:	UST-SB-02	UST-SB-02	UST-SB-02	UST-SB-02	UST-SB-02	UST-SB-02	UST-SB-02	UST-SB-02	UST-SB-02	UST-SB-02	UST-SB-02	UST-SB-02
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'	22-24'
Compound												
Benzene	> 150,000	> 100,000	76,000	31,400	1,560	82	3,850	17	< 5	< 5	< 5	< 5
Toluene	72,650	> 100,000	525,000	145,000	8,690	147	11,200	46	< 5	< 5	< 5	< 5
Ethylbenzene	< 1,500	< 5,000	< 5000	< 5,000	< 1,000	< 20	< 500	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	> 150,000	> 100,000	726,000	313,000	7,920	150	17,500	70	6.4	< 5	< 5	< 5
o-Xylene	118,000	109,000	215,000	77,700	2,650	49	4,430	24	< 5	< 5	< 5	< 5
Total BTEX	190,650	> 409,000	1,542,000	567,100	20,820	428	36,980	157	6.4	0	0	0

Location:	UST-SB-03	UST-SB-03	UST-SB-03	UST-SB-03	UST-SB-03	UST-SB-03	UST-SB-03	UST-SB-03	UST-SB-03	UST-SB-03	UST-SB-03	UST-SB-03
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'	22-24'
Compound												
Benzene	43	215,000	189,000	1,800 J	1,280 J	1,120	12	17	23	< 5	< 5	< 5
Toluene	< 5	> 720,000	1,430,000	32,000	2,950	5,610	89	149	126	9.4	< 5	< 5
Ethylbenzene	< 5	< 2,500	< 5,000	< 5,000	< 2,500	< 50	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	< 5	1,077,500	1,870,000	49,000	5,200	5,430	67	129	100	< 5	< 5	< 5
o-Xylene	< 5	351,000	495,000	< 5000	1,150 J	1,900	11	51	36	< 5	< 5	< 5
Total BTEX	43	1,643,500	3,984,000	82,800	10,580	14,060	179	346	285	9.4	0	0

All results expressed in ug/Kg wet weight (ppb, uncorrected for percent solids).

B = 18
T = 12
E = 0
X = 13

Table 4.2
BTEX Data - UST Soil Boring Program
Orange & Rockland Utilities, Inc.
West Nyack, New York
November 13 through December 6, 1995

Location:	UST-SB-04	UST-SB-04	UST-SB-04	UST-SB-04	UST-SB-04	UST-SB-04	UST-SB-04	UST-SB-04	UST-SB-04	UST-SB-04	UST-SB-04	UST-SB-04
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'	22-24'
Compound												
Benzene	187	39,800	22,000	31,200	16,200	244	52	5.6	< 5	< 5	< 5	12
Toluene	52	325,000	22,700	86,300	55,000	881	95.4	9.7	< 5	14	9.1	24
Ethylbenzene	<	< 5,000	< 5,000	< 250	< 250	< 5	< 10	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	357	345,000	92,000	> 100,000	98,500	1,440	165	26	< 5	12.9	12	25
o-Xylene	143	117,000	12,800	92,750	39,150	423	24	21	< 5	7	6.2	8.7
Total BTEX	739	826,800	149,500	> 310,250	208,850	2,988	336.4	62.3	0	33.9	27.3	69.7

Location:	UST-SB-05	UST-SB-05	UST-SB-05	UST-SB-05	UST-SB-05	UST-SB-05	UST-SB-05	UST-SB-05	UST-SB-05	UST-SB-05
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'
Compound										
Benzene	5,350	37,600	2,190	1,470	86	40	18	< 5	6.6	< 5
Toluene	35,700	383,000	15,500	12,600	355	213	38	19	25	< 5
Ethylbenzene	< 250	< 5,000	< 5,000	< 250	< 50	< 10	33	< 5	< 5	< 5
m&p-Xylene	63,250	479,000	75,900	72,700	589	359	35	28	32	< 5
o-Xylene	1,920	156,000	13,700	22,200	123	77.6	< 5	6.3	11	< 5
Total BTEX	106,220	1,055,600	107,290	108,970	1,153	689.6	124	53.3	74.6	0

Location:	UST-SB-06	UST-SB-06	UST-SB-06	UST-SB-06	UST-SB-06	UST-SB-06	UST-SB-06	UST-SB-06	UST-SB-06	UST-SB-06	UST-SB-06	UST-SB-06
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'	22-22.5'
Compound												
Benzene	< 5	130	13.3	32.7	29	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	445	14.2	46.2	53.4	5.6	< 5	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 50	< 5	< 5	33.8	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	< 5	270	23	25.9	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
o-Xylene	< 5	111	3.4	8.5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	0	956	53.9	113.3	116.2	5.6	0	0	0	0	0	0

Location:	UST-SB-06A	UST-SB-06A	UST-SB-06A	UST-SB-06A	UST-SB-06A	UST-SB-06A	UST-SB-06A	UST-SB-06A	UST-SB-06A	UST-SB-06A	UST-SB-06A
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'
Compound											
Benzene	2,060	104,000	3,230	30,300	49.6	120	77.8	35.4	6.1	55.1	< 5
Toluene	3,580	808,000	9,000	157,000	61.1	189	144	98.3	34	148	10.8
Ethylbenzene	< 25	< 25,000	< 500	< 2,500	44.6	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	8,050	830,000	14,500	168,000	< 5	247	187	107	19.3	175	< 5
o-Xylene	4,320	351,000	5,150	64,000	< 5	81.3	77.4	45	12.6	84.1	< 5
Total BTEX	18,010	2,093,000	31,880	419,300	155.3	637.3	486.2	285.7	72	462.2	10.8

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All results expressed in ug/Kg wet weight (ppb, uncorrected for percent solids).

B = 13
T = 6
E = 1
X = 7

Table 4.2
BTEX Data - UST Soil Boring Program
Orange & Rockland Utilities, Inc.
West Nyack, New York
November 13 through December 6, 1995

Location:	UST-SB-09A	UST-SB-09A	UST-SB-09A	UST-SB-09A	UST-SB-09A	UST-SB-09A	UST-SB-09A	UST-SB-09A	UST-SB-09A	UST-SB-09A	UST-SB-09A	UST-SB-09A
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'	22-24'
Compound												
Benzene	167	48	N/A	N/A	94.2	24	< 5	9.7	< 5	< 5	< 5	< 5
Toluene	26.7	24	N/A	N/A	56.7	20	< 5	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	N/A	N/A	< 5	< 5	< 5	< 5	< 5	< 5	< 5	6.4
m&p-Xylene	56.3	96.3	N/A	N/A	66.1	31.1	< 5	< 5	< 5	< 5	< 5	< 5
o-Xylene	20.2	20.5	N/A	N/A	16.6	9	< 5	< 5	< 5	< 5	< 5	11
Total BTEX	270.2	188.8	N/A	N/A	233.6	84.1	0	9.7	0	0	0	17.4

Location:	UST-SB-10	UST-SB-10	UST-SB-10	UST-SB-10	UST-SB-10	UST-SB-10	UST-SB-10	UST-SB-10	UST-SB-10	UST-SB-10	UST-SB-10
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'
Compound											
Benzene	831	O/C	16,900	131	178	26.7	< 5	< 5	< 5	6.1	< 5
Toluene	2,320	O/C	58,700	233	321	63.6	9.4	< 5	< 5	28.6	< 5
Ethylbenzene	O/C	O/C	< 500	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	O/C	O/C	62,200	239	159	52.5	< 5	< 5	< 5	21	< 5
o-Xylene	2,510	199,000	25,200	84.5	56.8	21	< 5	< 5	< 5	8.5	< 5
Total BTEX	> 10,000	> 800,000	163,000	688	715	163.8	9.4	0	0	64.2	0

Location:	UST-SB-11	UST-SB-11	UST-SB-11	UST-SB-11	UST-SB-11	UST-SB-11	UST-SB-11	UST-SB-11	UST-SB-11	UST-SB-11
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'
Compound										
Benzene	138,000	2,690	52,900	101,000	74	18	22.9	5.3	98.1	< 5
Toluene	1,170,000	28,300	303,000	589,000	295	36.8	88.8	18.8	366	10
Ethylbenzene	224,000	< 500	< 5,000	< 5,000	< 50	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	941,000	20,900	171,000	330,000	157	22.6	62.6	19.9	368	< 5
o-Xylene	395,000	9,180	72,400	139,000	< 50	< 5	23.1	13.2	148	< 5
Total BTEX	2,868,000	61,070	599,300	1,159,000	526	77.4	197.4	57.2	980.1	10

Location:	UST-SB-12	UST-SB-12	UST-SB-12	UST-SB-12	UST-SB-12	UST-SB-12	UST-SB-12	UST-SB-12	UST-SB-12	UST-SB-12	UST-SB-12
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'
Compound											
Total BTEX	52	> 20,000	1,751	1,260	566	> 5,000	85	137	< 5	< 5	< 5

All results expressed in ug/Kg wet weight (ppb, uncorrected for percent solids).
O/C indicates Over Calibration; N/A indicates Not Analyzed.

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B = 12
T = 2
E = 0
X = 3

Table 4.2
BTEX Data - UST Soil Boring Program
Orange & Rockland Utilities, Inc.
West Nyack, New York
November 13 through December 6, 1995

Location:	UST-SB-07	UST-SB-07	UST-SB-07	UST-SB-07	UST-SB-07	UST-SB-07	UST-SB-07	UST-SB-07	UST-SB-07	UST-SB-07
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'
Compound										
Benzene	< 5	< 5	< 5	< 5	38.4	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
o-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	0	0	0	0	38.4	0	0	0	0	0

Location:	UST-SB-07A	UST-SB-07A	UST-SB-07A	UST-SB-07A	UST-SB-07A	UST-SB-07A	UST-SB-07A	UST-SB-07A	UST-SB-07A	UST-SB-07A	UST-SB-07A
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'
Compound											
Benzene	61	29,300	232	321	129	5.4	< 5	< 5	< 5	< 5	< 5
Toluene	23.5	133,000	515	306	349	23.2	6.2	< 5	< 5	7	< 5
Ethylbenzene	< 5	< 5,000	< 5	< 10	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	11.6	182,000	525	360	403	16.1	< 5	< 5	< 5	< 5	< 5
o-Xylene	< 5	72,600	198	126	176	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	96.1	416,900	1,470	1,113	1,057	44.7	6.2	0	0	7	0

Location:	UST-SB-08	UST-SB-08	UST-SB-08	UST-SB-08	UST-SB-08	UST-SB-08	UST-SB-08	UST-SB-08	UST-SB-08	UST-SB-08	UST-SB-08
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'
Compound											
Benzene	399	175	2,900	< 5	168	82	77.6	11	12.5	< 10	< 30
Toluene	439	68.4	8,000	< 5	125	< 5	44.5	11.7	13.7	< 10	< 30
Ethylbenzene	< 5	< 5	< 5,000	< 5	266	< 5	< 5	< 5	< 5	< 10	< 30
m&p-Xylene	2,810	248	17,700	< 5	274	99.1	122	31.1	36.9	< 10	< 30
o-Xylene	297	43.8	3,590	< 5	< 25	< 5	32	< 5	11.8	< 10	< 30
Total BTEX	3,945	535	32,190	0	833	181.1	276.1	53.8	74.9	0	0

Location:	UST-SB-09	UST-SB-09	UST-SB-09	UST-SB-09	UST-SB-09	UST-SB-09	UST-SB-09	UST-SB-09	UST-SB-09	UST-SB-09	UST-SB-09
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'
Compound											
Benzene	< 5	< 5	11.6	50.3	85.9	< 5	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	12.1	< 5	< 10	< 5	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	< 5	< 5	21.8	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
o-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	0	0	45.5	50.3	85.9	0	0	0	0	0	0

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All results expressed in ug/Kg wet weight (ppb, uncorrected for percent solids).

B = 12
T = 2
E = 0
X = 3

Table 4.2
BTEX Data - UST Soil Boring Program
Orange & Rockland Utilities, Inc.
West Nyack, New York
November 13 through December 6, 1995

Location:	UST-SB-07	UST-SB-07	UST-SB-07	UST-SB-07	UST-SB-07	UST-SB-07	UST-SB-07	UST-SB-07	UST-SB-07	UST-SB-07
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'
Compound										
Benzene	< 5	< 5	< 5	< 5	38.4	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
o-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	0	0	0	0	38.4	0	0	0	0	0

Location:	UST-SB-07A	UST-SB-07A	UST-SB-07A	UST-SB-07A	UST-SB-07A	UST-SB-07A	UST-SB-07A	UST-SB-07A	UST-SB-07A	UST-SB-07A	UST-SB-07A
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'
Compound											
Benzene	61	29,300	232	321	129	5.4	< 5	< 5	< 5	< 5	< 5
Toluene	23.5	133,000	515	306	349	23.2	6.2	< 5	< 5	7	< 5
Ethylbenzene	< 5	< 5,000	< 5	< 10	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	11.6	182,000	525	360	403	16.1	< 5	< 5	< 5	< 5	< 5
o-Xylene	< 5	72,600	198	126	176	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	96.1	416,900	1,470	1,113	1,057	44.7	6.2	0	0	7	0

Location:	UST-SB-08	UST-SB-08	UST-SB-08	UST-SB-08	UST-SB-08	UST-SB-08	UST-SB-08	UST-SB-08	UST-SB-08	UST-SB-08	UST-SB-08
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'
Compound											
Benzene	399	175	2,900	< 5	168	82	77.6	11	12.5	< 10	< 30
Toluene	439	68.4	8,000	< 5	125	< 5	44.5	11.7	13.7	< 10	< 30
Ethylbenzene	< 5	< 5	< 5,000	< 5	266	< 5	< 5	< 5	< 5	< 10	< 30
m&p-Xylene	2,810	248	17,700	< 5	274	99.1	122	31.1	36.9	< 10	< 30
o-Xylene	297	43.8	3,590	< 5	< 25	< 5	32	< 5	11.8	< 10	< 30
Total BTEX	3,945	535	32,190	0	833	181.1	276.1	53.8	74.9	0	0

Location:	UST-SB-09	UST-SB-09	UST-SB-09	UST-SB-09	UST-SB-09	UST-SB-09	UST-SB-09	UST-SB-09	UST-SB-09	UST-SB-09	UST-SB-09
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'
Compound											
Benzene	< 5	< 5	11.6	50.3	85.9	< 5	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	12.1	< 5	< 10	< 5	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	< 5	< 5	21.8	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
o-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	0	0	45.5	50.3	85.9	0	0	0	0	0	0

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All results expressed in ug/Kg wet weight (ppb, uncorrected for percent solids).

B = 0
T = 0
E = 0
X = 0

Table 4.2
BTEX Data - UST Soil Boring Program
Orange & Rockland Utilities, Inc.
West Nyack, New York
November 13 through December 6, 1995

Location:	UST-SB-13	UST-SB-13	UST-SB-13	UST-SB-13	UST-SB-13	UST-SB-13	UST-SB-13	UST-SB-13	UST-SB-13	UST-SB-13	UST-SB-13
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-20.4'
Compound											
Benzene	< 5	< 5	< 5	15.4	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	10.4
Ethylbenzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	5	< 5
m&p-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	7.2	14.1
o-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	9.5	19.7
Total BTEX	0	0	0	15.4	0	0	0	0	0	21.7	44.2

Location:	UST-SB-13A	UST-SB-13A	UST-SB-13A	UST-SB-13A	UST-SB-13A	UST-SB-13A	UST-SB-13A	UST-SB-13A	UST-SB-13A	UST-SB-13A
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'
Compound										
Benzene	< 5	< 5	< 5	< 5	18.1	13.2	< 5	31.2	28.2	< 5
Toluene	< 5	< 5	6.2	230	< 5	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
o-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	0	0	6.2	230	18.1	13.2	0	31.2	28.2	0

Location:	UST-SB-14	UST-SB-14	UST-SB-14	UST-SB-14	UST-SB-14	UST-SB-14	UST-SB-14	UST-SB-14	UST-SB-14	UST-SB-14
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-18.1'
Compound										
Benzene	< 5	< 5	< 5	7.3	42.1	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	6.2
Ethylbenzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	5.5
o-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	0	0	0	7.3	42.1	0	0	0	0	11.7

Location:	UST-SB-14A	UST-SB-14A	UST-SB-14A	UST-SB-14A	UST-SB-14A	UST-SB-14A	UST-SB-14A	UST-SB-14A	UST-SB-14A	UST-SB-14A
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'
Compound										
Benzene	< 5	< 5	< 5	N/A	12.8	< 5	19.6	< 5	< 5	< 5
Toluene	< 5	< 5	< 5	N/A	< 5	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	N/A	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	< 5	< 5	< 5	N/A	< 5	< 5	< 5	< 5	< 5	< 5
o-Xylene	< 5	< 5	< 5	N/A	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	0	0	0	0	12.8	0	19.6	0	0	0

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All results expressed in ug/Kg wet weight (ppb, uncorrected for percent solids).

B = 19
T = 12
E = 0
X = 12

Table 4.2
BTEX Data - UST Soil Boring Program
Orange & Rockland Utilities, Inc.
West Nyack, New York
November 13 through December 6, 1995

Location:	UST-SB-15	UST-SB-15	UST-SB-15	UST-SB-15	UST-SB-15	UST-SB-15	UST-SB-15	UST-SB-15	UST-SB-15	UST-SB-15
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'
Compound										
Benzene	2,840	141,000	4,500	498	28	27	105	7.7	< 5	5
Toluene	14,100	887,000	9,610	117	41.5	< 5	189	20.3	14	20.4
Ethylbenzene	< 500	< 5,000	< 500	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	10,900	572,000	194,000	122	40.7	< 5	156	19	9	17
o-Xylene	4,810	255,000	10,100	25.7	11.3	< 5	77	< 5	< 5	< 5
Total BTEX	32,650	1,855,000	218,210	762.7	121.5	27	527	47	23	42.4

Location:	UST-SB-16	UST-SB-16	UST-SB-16	UST-SB-16	UST-SB-16	UST-SB-16	UST-SB-16	UST-SB-16	UST-SB-16	UST-SB-16	UST-SB-16	UST-SB-16
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'	22-22.9'
Compound												
Benzene	145	74,300	9,940	4,820	216	128	378	13.7	< 5	< 5	< 5	< 5
Toluene	67	540,000	8,660	9,700	718	485	1,590	42.2	6.5	9.3	< 5	10.8
Ethylbenzene	< 5	< 5,000	< 500	< 500	< 25	< 5	< 5	22.4	< 5	< 5	< 5	< 5
m&p-Xylene	107	357,000	18,900	16,200	935	468	1,400	35.9	< 5	< 5	< 5	6.8
o-Xylene	40	155,000	4,620	5,740	383	183	549	14.6	< 5	< 5	< 5	< 5
Total BTEX	359	1,126,300	42,120	36,460	2,252	1,264	3,917	129	7	9	0	17.6

Location:	UST-SB-17	UST-SB-17	UST-SB-17	UST-SB-17	UST-SB-17	UST-SB-17	UST-SB-17	UST-SB-17	UST-SB-17	UST-SB-17	UST-SB-17
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'
Compound											
Benzene	1,340	16,200	29,600	28	107	7.7	9.6	< 5	19.6		
Toluene	2,910	131,000	228,000	128	513	21.9	56	< 5	83.2		
Ethylbenzene	< 500	< 5,000	< 5,000	< 25	< 5	< 5	< 5	< 5	< 5		
m&p-Xylene	160	112,000	211,000	271	621	13.8	42	< 5	68.3		
o-Xylene	73.2	42,900	96,800	129	266	< 5	19.5	< 5	36		
Total BTEX	4,483	302,100	565,400	556	1,507	43	128	0	207	0	0

Location:	UST-SB-18	UST-SB-18	UST-SB-18	UST-SB-18	UST-SB-18	UST-SB-18	UST-SB-18	UST-SB-18	UST-SB-18	UST-SB-18	UST-SB-18
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'
Compound											
Benzene	O/C	1,530	232	22	11.9	< 5	< 5	< 5	< 5	< 5	< 5
Toluene	O/C	1,970	620	54	28.2	9.9	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	O/C	< 50	< 5	28	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	O/C	3,130	290	37	16	< 5	< 5	< 5	< 5	10.5	< 5
o-Xylene	2,300	1,310	197	25	9	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	> 10,000	7,940	1,339	166	65	10	0	0	0	11	0

All results expressed in ug/Kg wet weight (ppb, uncorrected for percent solids). O/C indicates Over Calibration.

B = 14
T = 4
E = 0
X = 7

Table 4.2
BTEX Data - UST Soil Boring Program
Orange & Rockland Utilities, Inc.
West Nyack, New York
November 13 through December 6, 1995

Location:	UST-SB-19	UST-SB-19	UST-SB-19	UST-SB-19	UST-SB-19	UST-SB-19	UST-SB-19	UST-SB-19	UST-SB-19	UST-SB-19
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'
Compound										
Benzene	13	9.4	106	320	20	22	12.8	< 5	< 5	< 5
Toluene	6	19	247	782	43.6	49.2	17	< 5	< 5	17.7
Ethylbenzene	< 5	< 5	< 5	< 5	12.7	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	< 5	30	114	294	16	26	6	< 5	< 5	12
o-Xylene	< 5	< 5	97	289	13.1	19.7	5	< 5	< 5	< 5
Total BTEX	19	58	564	1,685	105	117	41	0	0	30

Location:	UST-SB-22	UST-SB-22	UST-SB-22	UST-SB-22	UST-SB-22	UST-SB-22	UST-SB-22	UST-SB-22	UST-SB-22	UST-SB-22
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'
Compound										
Benzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
o-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	0	0	0	0	0	0	0	0	0	0

Location:	UST-SB-23	UST-SB-23	UST-SB-23	UST-SB-23	UST-SB-23	UST-SB-23	UST-SB-23	UST-SB-23	UST-SB-23	UST-SB-23
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'
Compound										
Benzene	274	15,000	34,700	113	31.1	50.4	121	39.8	10	26.3
Toluene	387	77,100	131,000	148	66.4	13.5	400	100	15.9	70.6
Ethylbenzene	< 5	< 500	< 5,000	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	712	57,100	91,500	83.6	44.7	15	273	79	13.4	44.2
o-Xylene	240	23,700	23,900	23.4	13.1	5.8	126	38.7	< 5	20.7
Total BTEX	1,613	172,900	281,100	368	155.3	84.7	920	257.5	39.3	161.8

Location:	UST-SB-25	UST-SB-25	UST-SB-25	UST-SB-25	UST-SB-25	UST-SB-25	UST-SB-25	UST-SB-25	UST-SB-25	UST-SB-25
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'
Compound										
Benzene	12.6	72,400	17,900	69,400	595	11.9	150 E	399	245	5.7
Toluene	< 5	180,000	45,400	213,000	676	67.7	370	984	357	< 5
Ethylbenzene	< 5	< 5,000	< 500	< 500	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	23.1	546,000	136,000	765,000	2,990	538	753	3,590	891	24
o-Xylene	15	189,000	45,000	222,000	930	218	208	1,090	267	< 5
Total BTEX	51	987,400	244,300	1,269,400	5,191	835.6	1,481	6,063	1,760	29.7

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All results expressed in ug/Kg wet weight (ppb, uncorrected for percent solids).

Table 4.3
Laboratory BTEX Analytical Data - Soil (Former UST Area)
Orange & Rockland Utilities
West Nyack, New York

Sampling Dates: November 20, 21, 27, 28 and 30 and December 4 and 6, 1995

Sample ID Depth Compound	SB-06A (10-12')	SB-07 (8-10')	SB-07A (10-12')	SB-09 (8-10')	SB09A (8-10')	SB-14A (10-12')	SB-16 (14-16')	SB-17 (10-12')	SB-19 (8-10')	NYSDEC Recommened Soil Cleanup Objective
Benzene	**5.6**	1 U	1.1 U	**13**	**0.8 J**	1 U	1 U	1 U	1 U	60
Toluene	**4.4**	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U	1 U	1,500
Ethylbenzene	**6.4**	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U	1 U	5,500
Xylene (total)	**20**	1 U	1.1 U	1 U	**0.8 J**	1 U	1 U	**1.2**	1 U	1,200

All results expressed in ug/Kg.
Standard Organic Data Qualifiers have been used.
The NYSDEC Recommended Soil Cleanup Objectives are from TAGM 4046 (HWR-94-4046, January 24, 1994 REVISED).

Table 4.3
Laboratory BTEX Analytical Data - Soil (Former UST Area)

Orange & Rockland Utilities
West Nyack, New York

Sampling Dates: November 20, 21, 27, 28 and 30 and December 4 and 6, 1995

Sample ID Depth Compound	SB-06A (10-12')	SB-07 (8-10')	SB-07A (10-12')	SB-09 (8-10')	SB09A (8-10')	SB-14A (10-12')	SB-16 (14-16')	SB-17 (10-12')	SB-19 (8-10')	NYSDEC Recommened Soil Cleanup Objective
Benzene	**5.6**	1 U	1.1 U	**13**	**0.8 J**	1 U	1 U	1 U	1 U	60
Toluene	**4.4**	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U	1 U	1,500
Ethylbenzene	**6.4**	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U	1 U	5,500
Xylene (total)	**20**	1 U	1.1 U	1 U	**0.8 J**	1 U	1 U	**1.2**	1 U	1,200

All results expressed in ug/Kg.
Standard Organic Data Qualifiers have been used.
The NYSDEC Recommended Soil Cleanup Objectives are from TAGM 4046 (HWR-94-4046, January 24, 1994 REVISED).

The vertical and horizontal extent of impacted soil north, west and south of the UST area have been determined. Laboratory and field analytical data from samples collected north of the UST area indicates that impacted soil do not extend beyond SB-9A, SB-13A or SB-14A, which represents a horizontal maximum limit of impacted soil of approximately 50 feet from boring CP with a maximum depth of impacted soil of 12 feet. On the western portion of the Site, data indicate that impacted soil do not extend beyond SB-6 and SB-7, which represents a horizontal maximum limit of approximately 40 feet and a maximum depth of 12 feet. South of the Site field and laboratory data indicate that impacted soil do not extend beyond SB-19 and not significantly past SB-18, which represents a horizontal maximum limit of 50 to 60 feet and a maximum depth of 12 feet.

The horizontal extent of impacted soil to the northeast, east and southeast of the UST area has not been completely defined. Field data indicated that to the northeast, impacted soil extend at least up to SB-25, to the east to SB-16 and to the southeast to SB-17. To the northeast soil are generally impacted to a depth of six feet except at SB-25 where data indicate that subsurface soil are potentially impacted to a depth of 18 feet. To the east (SB-16) and southeast (SB-17) soil are impacted to a depth of 14 feet and 10 feet, respectively.

Data from SB-5 and SB-5A, collected and analyzed as part of the dry well investigation, indicated that petroleum impacted soil do not extend as far as these two borings; BTEX compounds were not detected at elevated concentrations in the subsurface soil samples collected from these two borings. Field analytical results from samples collected from boring SDA-SB-01 and SDA-SB-02, completed as part of a potential disposal area evaluation and located approximately 110 feet northeast of SB-25, revealed that BTEX concentrations in the samples from these borings were low. Generally, BTEX was not detected in any of the samples collected from these two borings. The SDA-SB-01 and -02 boring data indicate that subsurface soil contamination associated with the UST area does not extend to the northeast as far as the SDA-SB-01 and SDA-SB-02 borings.

In review, the extent of impacted subsurface soils, north, west and south of the UST area have been delineated. North of the USTs subsurface impacted soil do not extend beyond SB-9A, SB-13A or SB-14A, to the west soil at SB-6 and SB-7 are not impacted and to the south soil at SB-22 and SB-19 are not impacted. SB-18 marks the approximate limit of impacted soil south southeast of the UST area. To the east and southeast the extent of impacted soil lies between SB-16/SB-17 and borings the Dry well SB-5/SB-5A. Northeast of the UST area the horizontal extent of impacted soil lies between SB-25 and the suspected disposal area boring SDA-SB-02. The depth of impacted soil ranges from 1 foot to 14 feet. Using 12 feet as an average depth of impacted soil and a horizontal area of impact as described above, there is potentially 6,000 cubic yards of soil impacted by petroleum related VOCs.

4.3 FORMER DRY WELL AREA INVESTIGATION

Six soil borings were completed in the suspected location of the former dry well to determine if the dry well represents a potential source of VOCs detected in groundwater and subsurface soil at the Site. Continuous split spoon samples were collected from each boring and analyzed using the field GC for selected chlorinated VOCs and BTEX. The deepest sample from each boring was submitted