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Shaw Environmental & Infrastructure Engineering of New York, P.C.

FINAL FEASIBILITY STUDY REPORT
JIMMY'S DRY CLEANERS – OPERABLE UNIT 1
61 NASSAU ROAD,
ROOSEVELT, NEW YORK

SITE NUMBER
1-30-080

revised FS (OU1) combines soil/soil gas/indoor air remedy (Rev Rept complete & separate from original)

January 2004

Prepared for:
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LIST OF ACRONYMS AND ABBREVIATIONS:

ARARs	Applicable or Relevant and Appropriate Requirements
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COPCs	Chemicals of Potential Concern
DCE	Dichloroethene (All Isomers)
1,1-DCE	1,1-Dichloroethene
DNAPL	Dense Non-Aqueous Phase Liquid
EA	Exposure Assessment
ECL	Environmental Conservation Law
ERAGs	Ecological Risk Assessment Guidance
FS	Feasibility Study
FWIA	Fish and Wildlife Impact Assessment
GAC	Granular Activated Carbon
GRA	General Response Action
HEAST	Health Effects Assessment Summary Tables
IPC	Inclined Plate Clarifier
IRIS	Integrated Risk Information System
IRM	Interim Remedial Measure
$\mu g/L$	Micrograms per Liter
$\mu g/m^3$	Micrograms per Cubic Meter
MCL	Maximum Contaminant Level
mg/kg	Milligrams per Kilogram
mg/m^3	Milligrams per Cubic Meter
NCDOH	Nassau County Department of Health
NCP	National Contingency Plan
NSZVI	Nano-Scale Zero-Valent Iron
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&M	Operations and Maintenance
OU	Operable Unit
OSHA	Occupational Safety and Health Administration
PCE	Tetrachloroethene
PVC	Polyvinyl Chloride
RAGs	Risk Assessment Guidance
RAOs	Remedial Action Objectives
RBCs	Risk Based Concentrations
RCRA	Resource Conservation and Recovery Act
RfDs	Reference Doses
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
SCGs	Standards, Criteria and Guidelines
SDG	Sample Delivery Group
Shaw	Shaw Environmental and Infrastructure Engineering of New York, P.C.
SNARLs	Suggested No Adverse Response Levels
SVE	Soil Vapor Extraction
TAGM	Technical and Administrative Guidance Memorandum

TCE	Trichloroethene
TFs	Toxicity Factors
TOGS 1.1.1	NYSDEC Division of Water Technical and Operation Guidance Series
1,1,1-TCE	1,1,1-Trichloroethene
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

This Feasibility Study (FS) has been prepared by Shaw Environmental and Infrastructure Engineering of NY, P.C (Shaw) on behalf of the New York State Department of Environmental Conservation (NYSDEC) for the Jimmy's Dry Cleaners, New York State Superfund Site, Operable Unit 1 (Site #1-30-080), located at 61 Nassau Road in Roosevelt, New York.

The submittal of this FS represents the completion of activities set forth in the Remedial Investigation Feasibility Study (RI/FS) Work Plan for the Jimmy's Dry Cleaners Site (IT Corporation, July 20, 2001). The conclusions and recommendations presented within this FS are based on the characterization of the Site as presented in the Remedial Investigation Report (Shaw, May 2003).

1.1 Purpose and Organization of Report

In February 2001, the NYSDEC retained Shaw to complete the RI/FS for the former Jimmy's Dry Cleaner Site under the New York State Superfund Standby Contract Work Assignment # D003666-32.0. This document serves as the FS Report for Operable Unit 1 (OU1). The purpose of this FS is to develop and evaluate alternatives for appropriate remedial response actions that may be needed to prevent or mitigate the effects of volatile organic compounds (VOCs) contamination at the Jimmy's Dry Cleaner and surrounding sites.

This FS Report is designed to provide the reader with a summary of the RI and exposure assessment and guide the reader through the development of the remedial action objectives (RAOs) and evaluation of the remedial alternatives to address those RAOs. To that purpose this FS is divided into the following sections:

Section 1 presents a general summary of the RI and exposure assessment. This section includes information describing the study area, its history (including previous investigations), the nature and extent of contamination, the exposure assessment, and the interim remedial measure taken at this Site.

Section 2 presents a summary of the applicable or relevant and appropriate requirements (ARARs), develops the RAOs, and presents the general response actions (GRAs) for Operable Unit 1.

Section 3 presents an identification and screening of technologies as appropriate to Operable Unit 1. It proceeds to identify technologies and process options for each GRA.

Section 4 presents the development of remedial alternatives to meet the remedial action objectives for Operable Unit 1. Narratives discuss the elements of each alternative and the remedial action objectives that they address.

Section 5 presents a detailed analysis of the remedial alternatives developed in **Section 4**. A detailed analysis of each retained alternative in accordance with the National Contingency Plan (NCP), is presented.

Section 6 presents a comparative summary of the detailed analysis discussed in **Section 5**.

1.2 Background Summary

1.2.1 Site Description

Jimmy's Dry Cleaner's Operable Unit 1, located in Nassau County at 61 Nassau Road in Roosevelt, New York (**Figure 1-1, Site Location Map**), is rectangular in shape, and consists of approximately one acre of land including the dry cleaner building (**Figure 1-2, Site Map**). The one acre area and the former dry cleaner building will be referred to within the FS Report as the "Site", or Operable Unit 1 (OU1), as presented in **Figure 1-2**. The properties directly adjacent and down-gradient of the Site, where additional off-site assessment activities were performed will be referred to as the "down-gradient area", or Operable Unit 2 (OU2), as presented in **Figure 1-3**.

The former dry cleaner building is oriented roughly north – south and is comprised of a single-story masonry building built on a concrete slab. The building is approximately 4,000 square feet in area per the Utility Location Map (**Figure 1-4**). A small portion of the building, on the south end, is currently under commercial use as a delicatessen (Deli). Most of the Site is covered by the building and asphalt or gravel parking areas. Vacant lots located immediately adjacent to the north and west sides of the building are being used for vehicle and materials storage.

Immediately adjacent to the building on its south side is a small storage area used by the Deli. The eastern side of the property is utilized as a parking area for the Deli.

Back doors are located on both the northwest corner and southwest corner of the building. The entrance to the Deli and the former dry cleaning facility are located on the eastern side of the building facing Nassau Road. The area surrounding the Site is a mixture of residential and commercial properties. The commercial properties are located predominantly along Nassau Road. Most utilities enter the Site through underground connections with the exception of electricity, which enters the Site via overhead cables (**Figure 1-4**). The facility currently discharges wastewater to a sanitary sewer. Historical discharges were directed to an on-site dry well located at the northeast corner of the property near Nassau Road.

Currently, the dry cleaning facility is abandoned. The dry cleaning equipment has been cleaned and remains in the building. All waste associated with the equipment and former dry cleaning operations have been removed from the Site.

1.2.2 Site History

In 1988, as a result of a site inspection by the Nassau County Department of Health (NCDOH), it was concluded that the dry cleaning operations and hazardous material storage at Jimmy's Dry Cleaners presented a significant risk to public health and the environment. This conclusion was based on the observation of poor housekeeping practices; specifically, leaking dry cleaning equipment and inappropriate hazardous waste storage practices. The NCDOH also noted the presence of an unregistered below grade fuel oil tank and potential for discharge of hazardous materials to a dry well located near the dry cleaning facility (**Figure 1-4**). To evaluate subsurface conditions relative to the NCDOH site inspection, three environmental site investigations were performed at the Site and down-gradient of the Site prior to the current RI/FS Program.

In the spring of 1994 CA Rich Consultants, Inc. conducted the first investigation at the Site. The information currently available from this investigation indicates that both soil and groundwater samples were collected. However, only analytical data for groundwater samples which were collected adjacent to the former dry cleaner building are available in the report. The investigation identified elevated VOC concentrations in the groundwater at the Site.

To further evaluate soil and groundwater conditions near the former dry cleaner, a second subsurface investigation was conducted by the NCDOH in December 1995. During this investigation, the NCDOH collected additional soil and groundwater samples on-site. The results of the investigation confirmed the presence of VOCs in soil above Technical and Administrative Guidance Memorandum (TAGM) 4046 concentrations and in groundwater above NYSDEC Division of Water Technical and Operation Guidance Series (TOGS 1.1.1) Ambient Water Quality Standards and Guidance Values, near the former dry cleaner.

Subsequent to the CA Rich Consultants, Inc. and the NCDOH investigations, the NYSDEC performed a limited groundwater investigation in November 1999. During this investigation the NYSDEC collected groundwater samples down-gradient of the Site. The investigation identified the presence of VOCs at concentrations above TOGS 1.1.1in groundwater at significant distances down-gradient of the Site.

Based on the results of the historic investigations, the NYSDEC determined that an RI/FS was required for the Site to comprehensively characterize and delineate chemical constituents and evaluate remedial alternatives, as necessary. In February 2001 the NYSDEC retained Shaw to complete the RI/FS for the Former Jimmy's Dry Cleaner Site under the State Superfund Standby Contract Work Assignment D003666-32.0.

Shaw, in conjunction with the NYSDEC, developed a RI/FS Work Plan "Remedial Investigation Feasibility Study (RI/FS) Work Plan, Jimmy's Dry Cleaner" (Work Plan), IT Corporation, Inc. July 20, 2001 (Work Plan). Upon approval of the Work Plan, Shaw implemented the activities outlined in the Work Plan between August 2001 and December 2002.

A total of 34 soil gas samples were collected, eight soil borings were completed, 29 temporary groundwater sampling locations were installed, eight permanent monitoring wells and two piezometers were installed, and an indoor air quality monitoring program was implemented for the Site and several neighboring residences.

1.2.3 Geologic and Hydrogeologic Characteristics

1.2.3.1 Regional Geology

The Site is located in western Long Island, which generally consists of approximately 1,000 to 1,500 feet of clastic, glacial sediments described as glacial kame deposits, fluvial sands or variably sorted till moraine deposits. These sediments were deposited during the last glacial retreat (D. Cadwell, *Surficial Geologic Map of New York, Lower Hudson Sheet*, 1989). The glacial sediments are described as (in descending order) Upper Pleistocene Glacial Deposits, Lower Pleistocene Glacial Deposits, Magothy Formation, and the Raritan Formation with the Lloyd Sand Member. Precambrian Bedrock underlies the glacial sediments (**Figure 1-5, Geologic Cross-Section**).

According to the information presented by Cadwell, the Pleistocene deposits, which extend from grade to a depth of approximately 200 feet consist of poorly sorted sand and gravel with local lenses of fine sand, silt and/or clay. The RI field investigation was used to define the local characteristics of this formation and evaluate the presence of the chemical constituents of concern at various depths. The underlying Magothy formation consists predominantly of silty sands with isolated lenses of clay and organic material. Although the Pleistocene and Magothy sediments represent local water bearing units, reportedly the groundwater supply for the area of Roosevelt, New York is obtained from deep production wells completed in the Magothy formation. The Pleistocene glacial deposits and the Magothy formation lie above the Raritan Formation and the Precambrian bedrock which were not investigated during the field investigations due to their depth.

1.2.3.2 Site Geology

The Site's geology and the geology of the down-gradient area are based on the soil classifications made during the site investigation and RI field activities. The soil classifications were consistent with the regional and local geology reported for Nassau County, New York. As noted, the RI investigation and associated soil classifications were conducted exclusively in the upper and lower Pleistocene Glacial Deposits. Soils collected at the Site from the ground surface to depths of 20 feet below ground surface (bgs) consist of brown and light brown, medium to fine grain sands, with varying amounts of subrounded gravel, and trace amounts of silt. The moisture contents found within the soil increase with depth and proximity to the water table that was encountered at approximately 20 feet bgs.

Soil observed down-gradient consists of brown and gray medium grain sands, varying amounts of gravel, and trace amounts of silt. Based on the vertical distribution of chemical constituents to a depth of approximately 120 feet bgs, it appears that the less permeable strata are not fully preventing vertical groundwater flow and vertical contaminant migration has occurred. However, based on the groundwater analytical profile, a more highly impermeable stratigraphic layer may exist at 120 feet bgs, inhibiting vertical contaminant migration.

1.2.3.3 Surface Water

There are no surface water bodies on the Site or immediately adjacent to the Site. Surface water in the form of rainfall typically follows the gentle sloping topography of the Site and adjacent properties. The Site's runoff generally flows to the east towards Nassau Road and is collected within storm water drain locations depicted in **Figure 1-4**. The collected runoff is then directed through the storm water sewer system to the south.

1.2.4 Hydrogeology

1.2.4.1 Regional Hydrogeology

Review of the regional hydrogeology of Nassau County indicates that groundwater generally flows in a southerly direction. The soil-groundwater interface is typically encountered at approximately 20 feet bgs within the glacial deposits. There are three primary water bearing aquifers underlying Long Island. These aquifers (Glacial Deposits, Magothy, and Raritan) are considered to be hydraulically connected, with the Glacial and Magothy contributing recharge to the underlying Raritan aquifer. Groundwater flows south towards the Middle and East Bays of Long Island, New York. These bays are located approximately 3.5 miles south of the Site.

1.2.4.2 Site Hydrogeology

The Site investigations and RI field investigations confirm that groundwater generally flows to the south from the Site at an average gradient 0.08%. The uppermost aquifer encountered during RI activities was at approximately 15 to 20 feet below ground surface.

Horizontal groundwater velocity was calculated using the following parameters (taken from a nearby site that is characteristic of Long Island hydrology): average hydraulic conductivity 250 feet per day, an assumed porosity of 0.25, and a uniform constant aquifer with a continuous thickness of 200 feet from ITMW-1 to ITMW-30. Groundwater gauging data collected on May 6, 2002 at ITMW-1 (h1) and ITMW-30 (h2) were used to determine the head at each location using the following equation:

$$q_1 = \frac{K(h_1^2 - h_2^2)}{2L}$$

Where:

h_1 is the head at the origin
h_2 is the head at L
K is the hydraulic conductivity
L is the distance from the origin at the point where h_2 is measured
q_1 is the flow per unit width

Using the above parameters, a q_1 of 128.82 square feet per day was calculated. Then letting t_1 represent the thickness of the aquifer, V was calculated using the following formula:

$$V = \frac{q_1}{n_{eff} t_1}$$

Where:

V is the horizontal groundwater velocity
n_{eff} is the effective porosity

Using the above parameters, a horizontal groundwater flow velocity of 2.58 feet per day was calculated.

1.2.5 Nature and Extent of Contamination

This section is organized by environmental media and summarizes the extensive information presented in the RI. Media discussed in this section include indoor (ambient) air, soil gas, soil, and groundwater.

1.2.5.1 Indoor Air

Historic Indoor Air Quality Monitoring

Historical indoor air data were evaluated using the guidance value available at the time, 100 micrograms per cubic meter ($\mu g/m^3$), the NYSDOH Ambient Air Guideline for PCE (Guidance Value) from the NYSDOH Fact Sheet, Tetrachloroethene (Perc) in Indoor Air and Outdoor Air, October 1997. However, current and future indoor air data will be compared to background concentrations, (10 $\mu g/m^3$), consistent with the NYSDOH's revised Tetrachloroethene (Perc) in Indoor and Outdoor Air (May 2003) fact sheet.

Prior to the closure of the Jimmy's Dry Cleaner facility in November 1998, the NCDOH performed an initial Indoor Air Quality monitoring event on September 29, 1998. A total of four samples were collected from the Deli and the Deli's rear storage room. The samples were analyzed according to NYSDOH Method 311-9. Tetrachloroethene (PCE) was detected at concentrations of 1,250 and 1,400 $\mu g/m^3$ at the Deli and at 930 and 970 $\mu g/m^3$ at the Deli's rear storage room (**Table 1-1**). These concentrations exceeded the 100 $\mu g/m^3$ NYSDOH Ambient Air Guideline for PCE and NYSDOH Background Levels for PCE (10 $\mu g/m^3$).

Subsequent to the closure of the dry cleaning facility, the NCDOH performed two additional Indoor Air Quality monitoring events on January 5, 1999 and August 17, 2000 to further evaluate indoor air quality in the on-site structure only. Also during this time the NYSDEC began their site investigation in November 1999. As in the previous monitoring event, the NCDOH collected a total of four samples from the two select monitoring locations, which were analyzed for PCE according to NYSDOH Method 311-9. PCE was detected at each sample location at concentrations both above the Guidance Value and Background Levels.

August 28, 2001

On August 28, 2001 the NCDOH performed the fourth Indoor Air Quality monitoring event. A total of nine samples were collected and analyzed for PCE according to NYSDOH Method 311-9. Samples were collected from within the commercial building located at 497 North Main Street, Freeport, NY, residences at #34 and #40 Dutchess Street, the school building located east of the Site at 66 Nassau Road, Roosevelt, NY, and the Deli. The sample collected from the Deli had PCE concentrations of 108 $\mu g/m^3$, above the NYSDOH Ambient Air Guideline and Background Levels. The remaining eight samples exhibited concentrations of PCE well below the Guidance Value and Background Levels.

May 9, 2002

On May 9, 2002 the NCDOH collected and analyzed a total of nine indoor samples for PCE according to NYSDOH Method 311-9. Five of the nine samples were collected at the Miss Shelly School. The remaining four samples were collected from KFC, #40 Dutchess Street (2 samples collected), and the Deli located within the former dry cleaner building. PCE was not detected at the Miss Shelly School. PCE was detected at concentrations of 70 $\mu g/m^3$ at the KFC, 490 $\mu g/m^3$ and 280 $\mu g/m^3$ at #40 Dutchess Street, and at 900 $\mu g/m^3$ at the Deli (see **Table 1-1**). The sampling results exceeded both the Guidance Value and Background Levels.

July 1, 2002

On July 1, 2002 the NCDOH returned to the Site to collect an additional round of Indoor Air Quality samples. The NCDOH collected samples from the Deli, and the residences at #40 and #44 Dutchess Street. All samples collected were analyzed for PCE according to NYSDOH Method 311-9. Results indicated that the sample collected from the Deli was the only PCE sample above the Guidance Value and Background Levels, with a concentration of 230 $\mu g/m^3$. Subsequent to the July 1, 2002 monitoring event, it was decided by representatives of the NYSDOH, the NCDOH, and the NYSDEC that an Interim Remedial Measure (IRM) was required to abate impacts to ambient air detected with the Deli and residences at #40 Dutchess Street and that an Indoor Air Quality monitoring program was required for select building locations in the area surrounding the Site. As of the date of this FS there have been 10 indoor air sampling events. Additional Indoor Air Quality monitoring events were performed on August 28, 2001, May 9, 2002, July 1, 2002, November 25, 2002, January 13, 2003, March 5, 2003 and September 2003.

IRM Results

In July 2002, a Soil Vapor Extraction (SVE) system was installed as an IRM to inhibit the migration of VOCs to buildings in the area of the Site. The SVE system included the installation of a vacuum blower and seven vapor extraction wells to provide an area of low vapor pressure near the building foundations of the former dry cleaner building and #40 Dutchess Street (**see Section 1.2.7, Interim Remedial Measure**). The SVE system was activated on August 7, 2002 and the system was calibrated and monitored at this time. Since activation, Site visits were performed weekly to monitor and adjust the SVE systems operation. After the September 18, 2002 site visit, the system's operating parameters were stable and it was deemed no longer necessary for weekly site visits. Site visits are now conducted bi-weekly.

November 25, 2002

On November 25, 2002, following the installation of the SVE system, the NYSDEC retained Shaw to complete additional indoor air quality monitoring to evaluate conditions at several of the previously sampled locations as well as one additional monitoring location. The May 9, 2002 sampling locations that had non-detectable concentrations of PCE were not resampled on November 25, 2002. The November 25, 2002 monitoring event was also utilized to evaluate the effect of the SVE system on reducing the concentrations of PCE in the Deli and in #40 Dutchess Street. A total of four samples were collected from the Deli, KFC, #40 Dutchess Street and #44 Dutchess Street. All samples were sent to Galson Laboratory for analysis of PCE according to NYSDOH Method 311-9. PCE concentrations in samples collected from KFC and the Deli were above Background Levels. Concentrations of PCE within each of the samples were below the Guidance Value and the IRM was considered to be an effective means of reducing the concentrations of VOCs in and around the sampled locations.

January 13, 2003

On January 13, 2003 an additional indoor air quality monitoring event was performed to evaluate conditions within the Deli, KFC and #40 Dutchess Street. Samples were collected and analyzed for the presence of PCE according to NYSDOH Method 311-9. Access to #44 Dutchess Street was not available on this sampling date. The results of the sampling event indicate that concentrations of PCE were below the Guidance Value in all sampled locations. Concentrations of PCE in the Deli were above Background Levels. It was concluded that the IRM was successfully reducing concentrations of VOCs in and around the sampled locations.

March 5, 2003

On March 5, 2003 indoor air samples were collected at KFC, #40 Dutchess Road, #44 Dutchess Road, and the Deli. Samples were analyzed for the presence of PCE according to NYSDOH Method 311-9. PCE was detected at concentrations slightly above the Guidance Value of 100 $\mu g/m^3$ within the Deli during the sampling event. Concentrations of PCE in the Deli and at #40 Dutchess Street were above Background Levels. Prior to the March 5, 2002 sampling event, PCE had not been detected above the Guidance Value within the Deli following the implementation of the IRM. The elevated concentrations of PCE at this location may have been a result of extremely cold temperatures and ground frost noted during the months of January and February 2003. In order to inhibit further migration of VOCs to the Deli and other nearby buildings, the extraction rate at SVE wells near the Deli were increased during the April 2003 Site visit.

May 1, 2003

On May 1, 2003, indoor air samples were collected from KFC and the Deli and analyzed for the presence of PCE according to NYSDOH Method 311-9. The laboratory analytical data indicated that PCE concentrations were below the Guidance Value, but above Background Levels, at all of the sample locations.

September 23, 2003

On September 23, 2003, indoor air samples were collected from KFC, the Deli and #40 Dutchess Street and analyzed for the presence of PCE according to NYSDOH Method 311-9. The laboratory analytical data indicated that PCE concentrations were below the Guidance Value at each of the sample locations. Only concentrations of PCE in the Deli were above Background Levels.

Additional indoor air samples will be collected in the future to further evaluate air quality within select building locations.

1.2.5.2 Soil Gas

Soil gas samples were collected in order to investigate the extent of VOCs in shallow unsaturated soils in the immediate vicinity of the former Jimmy's Dry Cleaner building as well as the area of the Miss Shelly School located on the east side of Nassau Road. The results were reviewed to evaluate potential areas of spills and releases as well as to determine if indoor air quality monitoring was necessary to determine if impacts to soil from former dry cleaning operations resulted in air quality issues in adjacent properties.

A total of 34 soil gas samples were collected at the Site. Samples VP-1, VP-2, VP-3, VP-3B, VP-4, VP-4B, VP-5, VP-6, VP-7, and VP-9 through VP-33 were collected from 2 to 4 feet bgs at select locations in, and adjacent to, the former dry cleaner building. Samples were analyzed by an on-site laboratory or sent to fixed based laboratory for analysis for VOCs by USEPA Methods TO-14 and 8021.

VOCs were detected in 31 of the 34 soil gas samples collected. The most prominent VOC detected in the soil gas was PCE. Additional VOCs were detected at lesser concentrations and included trichloroethene, methylene chloride, 1,1-dichloroethene, toluene, ethylbenzene, and xylenes.

Concentrations of PCE ranged from non-detect (VP-21) to 26,000 mg/m^3 (VP-10). Trichloroethene was detected in vapor points VP-14 and VP-23 at concentrations of 18 and 4 mg/m^3, respectively. Methylene chloride was detected in VP-27 at a concentration of 1 mg/m^3. Trace concentrations of 1,1-dichloroethene were detected in VP-1, VP-5, VP-7, VP-20, VP-26, VP-27, and VP-28. Toluene was detected at concentrations of 180 and 11 mg/m^3 in VP-25 and VP-31, respectively. Ethylbenzene was detected in VP-10, VP-25, and VP-31 at concentrations of 71, 77, and 4 mg/m^3, respectively. Xylenes (o-, m-, and p- isomers) were detected at various concentrations in vapor points VP-10, VP-25, VP-27, and VP-31. The soil vapor analytical results are presented graphically on **Figure 1-6, PCE Distribution in Soil Gas** and summarized in **Table 1-2**.

The soil gas sampling results reveal elevated PCE impacts to soil beneath the former dry cleaner building and in shallow soils in the area surrounding the building. The highest concentrations of PCE were recorded at VP-9 and VP-10, located within the northwest corner of the building. VP-9 and VP-10 are located immediately adjacent to the dry cleaning equipment and appear to represent a loss of dry cleaning chemicals from the dry cleaning process. This conclusion is supported by NCDOH historic reports noting the poor condition and leaking dry cleaning equipment in this area while dry cleaning operations were still underway. With no spill prevention measures, spilled dry cleaning solvents (PCE) within the building would have migrated to fractures or drains in the building's floor/foundation and ultimately into the underlying soils or potentially to the dry well noted near the northeast corner of the building.

Elevated concentrations of PCE in soil vapor were also identified at VP-6, VP-13, VP-14 and VP-22 that are located close to the building's northern and eastern walls near building access doors. The elevated concentrations of PCE in these locations represent areas where releases of dry cleaning chemicals may have occurred as a result of surface dumping, storage of leaking equipment, or potential discharges of wastes to the former dry well location. Historic records report the storage of used dry cleaning equipment containing potential solvent reservoirs outside of the northwest corner of the building. A dry well location was identified in the area of VP-22 and a catch basin was noted near VP-14.

Elevated concentrations of toluene, ethylbenzene, and xylenes were detected in soil gas sampling locations near the Miss Shelly's School east of Nassau Road. These compounds do not appear to be related to the dry cleaning operation and an existing or former heating oil tank may have resulted in these analytes being present in this area. Shaw notified the NYSDEC via e-mail and facsimile in July 2002 of the elevated concentrations.

As a result of the elevated soil gas analytes detected at and near the Site, Shaw completed an Indoor Air Quality monitoring program on behalf of the NCDOH and the NYSDEC to define any impacts to buildings in the area of the Site.

1.2.5.3 Soil

A total of 14 soil borings were completed at the Site during the Site investigations and during the RI. Soil gas sampling results were used to aid in the selection of soil boring locations. From the 14 soil borings, a total of 56 soil samples were collected from various depths for VOC analysis according to USEPA Method 8021.

VOCs were detected in soils at various concentrations in all 56 samples. The dominant compound detected in the soil samples was PCE. Concentrations of PCE ranged from 330,000 μg/kg in ITSB-5 (18 to 20 feet bgs) to non-detect in ITSB - 1 (12 to 16 feet bgs). The soil sampling analytical results are presented graphically in **Figure 1-7, Distribution of PCE in Soil**. Additional compounds detected in soil include vinyl chloride, methylene chloride, and 1,1,1-trichloroethane. These compounds were detected at multiple sampling locations and at various depths. Vinyl chloride is a degradation compound of PCE and may be related to historic releases of PCE at the Site. 1.1.1-Trichloroethane may be related to impurities in the dry cleaning solvents. Methylene chloride is commonly used as a laboratory solvent in the preparations of several analytical methods and can be detected in laboratory analysis at low levels. Though the possibility exists of the presence of methylene chloride at the Site, the concentrations observed in the soil analytical are thought to be laboratory artifacts and not the direct result of dry cleaning operations conducted at the Site. This assumption is based upon the fact that methylene chloride was not detected above 8 µg/kg in the 1995 sample data, while the 2001 data reports methylene chloride at approximately 200 to 1500 µg/kg over the entire sampling data, regardless of PCE concentrations (e.g. ITSB-6 at 8 to 12 feet bgs.) A complete summary of the soil analytical results is presented in **Table 1-3.**

Areas where elevated concentrations of VOCs were detected in soil corresponded closely with the areas where elevated VOCs were detected in soil gas. Highly elevated concentrations of PCE were noted in shallow soils (0 to 4 feet) at soil borings ITSB-4 and ITSB-5 which are located in the building near the former dry cleaning operations. These results further indicate that a loss of dry cleaning constituents occurred in this area as a result of former operations. Highly elevated concentrations of PCE were also noted at the 8 to 12 foot sampling interval within ITSB-7 that is located adjacent to the dry well east of the building. Visual observations of the dry well revealed that the bottom of the dry well is approximately 8 feet below grade. These results indicate a potential release of dry cleaning fluids to the dry well.

Highly elevated concentrations of VOCs were identified in shallow soils directly adjacent to the dry cleaning equipment (ITSB-4 and ITSB-5), at moderate depths several feet from the dry cleaning equipment (ITSB-2 and ITSB-3) and on the water table directly down-gradient of the dry cleaning equipment. This distribution of chemical constituents in unsaturated soils is indicative of a substantial loss of dry cleaning constituents within the former dry cleaner.

1.2.5.4 Groundwater

During the RI, a total of seven groundwater samples were collected from various depths at three OU1 sampling locations. Samples were collected from ITGW-1, ITGW-2 and ITGW-3 to evaluate the vertical and lateral distribution of chemical constituents and potential risks to local receptors. A complete summary of the sampling methodology is presented in **Section 2.2.4**. Analytical results have been tabulated and are presented in **Table 1-4.**

The most prominent VOC detected in groundwater was PCE. The most elevated concentrations of PCE were detected in ITGW-3 at approximately 3,900 µg/L. ITGW-3 is located in the southern portion of the Site. The next most elevated concentration of PCE in groundwater was detected at ITGW-2 at 1,500 μg/L. ITGW-2 is located in the northeast portion of the Site.

During the groundwater investigation phase of the RI, groundwater samples were collected at multiple depths to help define the vertical extent of chemical constituents. Concentrations of PCE were observed in groundwater samples collected from the 20-foot sample interval to depths of approximately 60 feet bgs. The depth of the deepest sample collected in OU1 was 60 feet, however downgradient groundwater data suggest that PCE may exceed groundwater standards at depths up to 150 feet below ground surface, as depicted on Figure 1-9.

The distribution of elevated concentrations of PCE in groundwater at OU1 is consistent with those observed with a discharge of dense non-aqueous phase liquids (DNAPL) to a porous aquifer, similar to the underlying aquifer at OU1. In this scenario, PCE will move down through the aquifer until it encounters a less permeable strata. When the DNAPL reaches the less permeable strata it moves laterally in the direction of groundwater flow until a break or discontinuity is reached in the less permeable strata, and then the DNAPL will continue to move downward until another less permeable stratigraphic unit is encountered. This process will continue until the DNAPL reaches equilibrium conditions in the aquifer. As of the date of the RI report, concentrations of PCE were also observed 3,400 feet down-gradient of the Site (ITDGW-36). The horizontal extent of impacts to groundwater by PCE is approximately 120 to 150 feet wide. (**Figure 1-8, Distribution of PCE in Groundwater**). The vertical distribution of impacts to groundwater by PCE is presented in **Figure 1-9, Distribution of PCE in Groundwater, Cross Section**.

There were no potential groundwater receptors identified in the immediate area of the Site.

1.2.6 Exposure Assessment

A qualitative exposure assessment was performed during the RI on both OU1 and OU2. for the purposes of this, only OU1 will be discussed in the following sections.

The qualitative exposure assessment (EA) was used to determine the current and potential future exposure pathways associated with baseline (that is, current or unremediated) site conditions. The EA identified chemicals of potential concern (COPCs) and complete exposure pathways (mechanisms by which receptors may come into contact with site-related contaminants). The risk to receptors via complete pathways was then assessed based on comparison to risk-based screening levels in the context of current and reasonably foreseeable site exposures. The role of completed, ongoing and proposed remedial activities at the Site in mitigating exposures was addressed where appropriate. The EA used data from the historic site investigations conducted at the Site and down-gradient area.

The human health exposure assessment process was derived from the guidance set forth in the United States Environmental Protection Agency's Risk Assessment Guidance for Superfund (RAGS; 1989, 1991). The ecological evaluation was based on the NYSDEC's Fish and Wildlife Impact Assessment for Hazardous Waste Sites (1994), with additional input from USEPA's Ecological Risk Assessment Guidance for Superfund (ERAGS; 1999).

1.2.6.1 Chemicals of Potential Concern

To select COPCs, the analytical results for air, soil, soil gas, and groundwater were compared to risk-based screening levels to determine whether levels measured are likely to present unacceptable exposures. The screening levels used are the risk-based concentrations (RBCs) developed by USEPA Region III (USEPA, 2003), the NYSDOH indoor air guideline for PCE New York State Department of Health Fact Sheet, Tetrachloroethene (Perc) in Indoor and Outdoor Air, May 2003, New York State recommended soil cleanup objectives from the New York State Department of Environmental Conservation's Technical and Administrative Guidance Memorandum # HWR-94-4-46 (TAGM 4046), Recommended Soil Cleanup Objectives, and the New York State Groundwater Standards and Guidance Values for protection of human health from the use of groundwater as a drinking source, New York State Department of Environmental Conservation Department of Water Technical and Operational Guidance Series (TOGS 1.1.1) Ambient Water Quality Standards and Guidance Values. The RBCs are calculated using the Standard RAGS formulas for established exposure scenarios (residential and industrial). They do not necessarily characterize actual exposure in any site-specific situation. However, they do represent measures of safe concentrations using a series of conservative assumptions. Therefore, chemicals with concentrations below screening levels can generally be omitted as COPCs.

The RBCs are based on toxicity factors (TFs) developed by USEPA. The TFs are carcinogenic potency factors (for cancer-causing endpoints) and reference doses for safe exposure based on noncarcinogenic toxicity. The RBCs, therefore, incorporate the available information on the toxicity of the associated constituents. Additional toxic effect-specific information can be found in USEPA's Integrated Risk Information System (IRIS) database (USEPA, 2000a).

AIR

The USEPA has calculated an RBC for PCE in air of 0.63 µg/m^3. This is a risk assessment screening value that corresponds to an excess lifetime cancer risk of one in one million, or 10^{-6}. This value is similar to, or lower than, the concentrations of PCE typically found in indoor air. The RBC is lower than the NYSDOH guideline value of 100 µg/m^3. The NYSDOH's May 2003 Tetrachloroethene (Perc) In Indoor and Outdoor Air Document, which provides the basis for the 100 µg/m^3 guideline, discusses this discrepancy as follows:

> "The purpose of the guideline is to help guide decisions about the nature of efforts to reduce PERC exposure. Reasonable and practical actions should be taken to reduce PERC exposure when indoor air levels are above background, even when they are below the guideline of 100 mcg/m3. The urgency to complete these actions increases with indoor air levels, particularly when air levels are above the guideline, and additional actions taken if the initial actions do not sufficiently reduce PERC levels. Finally, NYSDOH recommends taking immediate action to reduce exposure when an air level is ten-times or more higher than the guideline (that is, when the air level is 1,000 mcg/m3 or higher). In all cases, the specific corrective actions to be taken depend on a case-by-case evaluation of the situation. The goal of the recommended actions is to reduce PERC levels in indoor air to as close to background as practical."

Table 1-1 presents the indoor air samples collected by Shaw and the Nassau County Department of Health (NCDOH). Based on the site use, PCE was the only constituent that was analyzed from the indoor air samples.

The ambient air results measured by the NYSDOH confirm the presence of PCE above the USEPA RBC in two of the five residences and both commercial establishments investigated. However, only the samples from 40 Dutchess Street and the Deli collected in May 2002 had ambient air results over the NYSDOH PCE guideline of 100 µg/m^3. At the request of the NYSDOH and the NYSDEC, a low volume soil vapor extraction (SVE) system was installed near the dry cleaner building and near 40 Dutchess Street. Subsequent air results from 40 Dutchess Street did not exceed the NYSDOH PCE guidance value, while the deli has had periodic slight exceedances.

SOIL

Table 1-3 presents the soil analytical results from the soil boring investigations. For the selection of COPCs, the soil results were compared to the minimum of the residential RBC or the NYSDEC TAGM soil cleanup objective to protect groundwater quality (NYSDEC, 1994).

Nineteen of the 48 soil samples shown on **Table 1-3** exceeded the NYSDEC TAGM 4046 cleanup objective for PCE. Only PCE was identified as a COPC due to the detections above the applicable screening levels and their frequency of detection.

GROUNDWATER

A summary of groundwater data is presented in **Table 1-4**. The screening levels used are the (primarily) risk-based New York State Groundwater Standards.

PCE was identified as a COPC due to its site relatedness and the frequency and concentration of its detections.

1.2.6.2 Exposure Assessment

The potential contact media at the Site are ambient air, soil and down-gradient groundwater. The exposure assessment evaluated the potential exposures to potential receptors under both current and future scenarios.

1.2.6.2.1 Current Scenarios

Current human populations that were considered in this qualitative exposure assessment include industrial/utility workers at or near the Site, commercial workers or customers at commercial establishments (e.g., Deli), and residents to the west of the Site along Dutchess Street. These populations may be exposed to chemicals volatilizing from groundwater and subsurface soil underneath structures may occur for these populations. Potential exposure to chemicals in surface soil may be possible for off-site residents. Potential inhalation exposure to wind-born particulates from excavations at or near the Site is possible; however, this is expected to be short-term and controlled conditions would usually be employed in such conditions to limit exposure. Potential inhalation exposure to wind-born particulates is also possible for these populations though this is expected to be limited in open air conditions. Water production wells do exist to the south of the Site, but these are about one mile away and are not impacted by site contaminants. Currently, there are no residential exposures to groundwater contaminants.

1.2.6.2.2 Future Scenarios

Future uses of the Site and immediate off-site areas are expected to remain similar to current uses. Thus, the current exposure scenarios also apply for future uses of the Site and surrounding areas. Future human populations considered in this qualitative exposure assessment include industrial/utility workers at or near the Site; commercial workers or customers at commercial establishments (e.g., Deli); residents to the west of the Site along Dutchess Street; and residents to the south of the Site (hydrologically down-gradient of the Site).

Construction workers are considered in the event of any redevelopment at or near the Site. Potential exposures for construction workers include exposures to incidental ingestion of and dermal contact with surface and subsurface soils, inhalation of soil particulates, contact with groundwater, and inhalation of chemicals that volatilize from soil or groundwater. Because of the presence of subsurface utility lines in the area of the Site, utility workers could be exposed via the same pathways as the construction workers.

It is possible that future public water supply wells or domestic wells could be installed in the vicinity of the contaminated groundwater. A public water supply well is proposed for installation by the Village of Freeport at the corner of Prince Avenue and Wallace Street, approximately 1,400 feet west of the Site. For the purposes of this FS, this exposure route was considered for both OU1 and OU2. Thus, future residents could also be exposed to contaminants in groundwater through consumption of groundwater, dermal contact with water, or inhalation of volatile contaminants in the air during showering or similar activities. Exposures via the public water supply are not expected because the public water supply is routinely monitored and, if necessary, treated to ensure that it complies with drinking water standards. Shaw has installed a monitoring well between the proposed well location and the PCE plume to monitor any possible migration of PCE.

1.2.6.2.3 Construction/Utility Workers

Utility workers on or off the Site and potential future construction workers may be exposed to COPCs in site media via the following mechanisms:

- Incidental ingestion
- Dermal contact
- Inhalation of constituents volatilized from soil

VOCs are present in soils near the Site; therefore, exposure to COPCs in soil by utility workers or construction workers would be likely. Though a few of the COPCs exceeded NYSDEC TAGMs, only one soil sample had any VOC concentrations exceeding the industrial RBCs. A sample collected from a depth of 18 to 20 feet bgs from a soil boring inside the Site structure contained PCE at 330 mg/kg. The industrial RBC is 110 mg/kg. Based on the limited extent of contamination above the industrial RBCs and the depth of this contamination and because the

RBC is based on daily exposure (250 days/year), it is unlikely that utility workers or construction workers will have unacceptable exposures from direct contact with soils and incidental soil ingestion. Mitigation measures to control exposures during excavation activities would further reduce exposures.

PCE could volatilize out of soils during excavations. Given that any such excavation would normally occur outdoors, ventilation would prevent accumulation of volatilized PCE to levels of health concern.

1.2.6.2.4 Commercial Workers/Commercial Customers

Commercial workers or customers at commercial establishments (e.g., the Deli) may be exposed via the mechanism of inhalation of VOCs from indoor air.

Indoor air concentrations of PCE have been measured above the NYSDOH criterion of 100 $\mu g/m^3$. Since the installation of a low volume SVE system, PCE concentrations have been below this level, with the exception of a limited time period near the March 5, 2003 sampling event. Under current conditions (including the SVE system), commercial workers are not exposed to unacceptable levels of PCE in air. Though the most recent air sampling event in March 2003 indicated levels (119 μg/m) just above the NYSDOH guidance value, the frequency of exposure is less than that assumed for residential exposure. Thus, exposure to PCE through indoor air at the Deli is expected to be minimal. However, exposures may have occurred prior to the installation of the SVE system and, because VOCs exist in subsurface soils, groundwater and soil vapor, conditions could develop that could lead to unacceptable exposures. Customers at commercial establishments are less likely to be exposed to unacceptable levels due to the intermittent and transient nature of their contact with any unacceptable ambient air conditions.

1.2.6.2.5 Residential Populations

Residential populations may be exposed to COPCs under the following conditions:

- Inhalation of VOCs from indoor air
- Water consumption
- Inhalation of VOCs from groundwater while showering
- Dermal contact with VOCs in water
- Incidental soil ingestion

Indoor air analytical results for PCE, presented in **Table 1-1,** collected from a residence west of the Site along Dutchess Street indicate levels in May 2002 of 280 and 490 μg/m^3. A low volume SVE system was installed near this location and subsequent ambient air results from November 2003, January 2003, and March 2003 were below the NYSDOH guideline of 100 μg/m^3. The NYSDOH (2000) has stated the following regarding residential exposures:

> "When evaluating concentrations of PCE in air, NYSDOH uses its Guideline Value of 100 μg/m^3 for PCE. The guideline is not a line between air levels that cause health effects and those that do not. The health effects of PCE depend on the level and duration of exposure. NYSDOH is particularly concerned about residential exposure where individuals may be exposed for many hours per day on a prolonged basis. For residential scenarios, NYSDOH also compares air testing results to levels typically found in indoor air to evaluate whether the levels are above background ranges."
>
> "At a minimum, the goal of remedial activities should be to reduce perc concentrations to below the 100 μg/m^3 guideline. In all cases the NYSDOH recommends that simple, common sense actions to reduce exposure should be taken even if an air level is below 100 μg/m^3. Therefore, remedial actions that serve to further reduce exposure, including measures that reduce indoor air concentrations of contaminants to typical or background ranges, should be implemented. Concentrations of PCE in affected structures will continue to be monitored as remedial activities progress to determine the effectiveness of these activities at reducing PCE concentrations."

Measured ambient air results for other buildings were either at non-detectable levels or below the 100 μg/m^3 guideline in other areas sampled. Under current conditions (including the SVE system), residents are not exposed to unacceptable levels of PCE in air. However, exposures may have occurred prior to installation of the SVE system and, because VOCs exist in subsurface soils, groundwater, and soil vapor, conditions could develop that could lead to unacceptable exposures.

Groundwater concentrations of PCE and several other VOCs have been detected above MCLs for several, with laboratory detection limits above MCLs. The use of groundwater as a household water supply could lead to exposure via ingestion, dermal contact and inhalation, particularly while showering. Private wells were not identified by the RI. Therefore, there is no current pathway of exposure through private well use. This does not preclude the possibility of private wells in the future that could result in exposures to VOC concentrations above the MCLs.

Residents could also be exposed to COPCs through direct contact with contaminated soil and incidental ingestion of soil. Concentrations of several VOCs are reported in soils above the NYSDEC TAGMs and some RBCs. These unacceptable levels are generally found at the Site and in subsurface soils. Thus, continued exposure by residents at unacceptable levels is unlikely.

1.2.6.3 Environmental Evaluation

Step II of NYSDEC's Fish and Wildlife Impact Assessment (FWIA), "Contaminant-Specific Impact Analysis," requires a review of exposure mechanisms (Step IIA, "Pathway Analysis"), followed, if necessary, by a "Criteria-Specific Analysis" (Step IIB). Step IIB, which involves a comparison to ecological-based toxicity screening levels, is only required if complete pathways of significance are identified.

Receptors

The Site is located in a highly developed area. Most of the land is either paved or covered with structures. Currently, land use in the vicinity of the Site and immediately surrounding the Site is mixed between commercial and residential properties. Generally the area of the Site and properties to the north and south of the Site along Nassau Road are commercial. Properties located to the west and east of the Site (east of Nassau Road) are residential. There are no aquatic resources in the area of the Site. The possibility of the presence of sensitive or endangered species is highly remote. Flora and fauna present would be hard, adaptive species.

Contaminated media at the Site consist of groundwater in the vicinity of the Site and soils surrounding the Site structure; soil contamination is predominantly subsurface. Furthermore, the COPCs at the Site are mainly VOCs, which would have a very short half-life in surface materials.

Pathways

Based on the detection of PCE in some surface soils and in soil gas, it is possible that there is PCE present in these media. However, due to the developed nature of the Site, exposures would be minimal. No ecological impacts are expected associated with the Site and no further evaluation is warranted.

1.2.6.4 Risk Summary

The qualitative human health exposure assessment evaluated both local residents, workers or customers at commercial establishments, and utility or construction workers near the Site for screening purposes. Though there are no current unacceptable exposures related to local residents, indoor air conditions could develop that could lead to unacceptable exposures.

Commercial workers could also be exposed to unacceptable levels if conditions were to change. Additionally, potential future use of groundwater as a household and drinking water source could result in unacceptable exposures through consumption of VOCs in drinking water, inhalation of VOCs (particularly while showering), and dermal contact with VOCs in water if wells were established in the vicinity of the VOC plume.

1.2.7 Interim Remedial Measure

During the RI of OU1, high levels of PCE vapor were found within the site building which prompted the NYSDEC to require the implementation of an IRM. In May 2002, Shaw, on the behalf of the NYSDEC, implemented an IRM at the Site. The primary purpose of the IRM was to take immediate steps to reduce concentrations of halogenated volatile organic compounds in the unsaturated (vadose) zone of the area including the Deli and neighboring residences.

The IRM included a limited SVE designed to reduce VOC soil vapor concentrations in the area including the Deli and neighboring residences. The limited SVE system is comprised of a 1.5 horse power vacuum extraction blower, two vapor-phase carbon canisters and seven shallow vapor extraction wells connected by a 2-inch diameter schedule 80 polyvinyl chloride (PVC) trunk line. The vapor extraction wells vary in total depth from 5 to 10 feet bgs, each well includes 3 to 5 feet of well screen. The SVE system layout is presented as **Figure 1-10**.The SVE system has been in continuous operation since August 7, 2002.

2.0 REMEDIAL ACTION OBJECTIVES AND GENERAL RESPONSE ACTIONS

2.1 Introduction

The purpose of this FS is to develop and evaluate remedial alternatives that address the remedial response actions and are potentially applicable for the reduction of potential risks to human health and the environment at OU1. This section of the FS describes the development of the RAOs for impacted media detected during the RI at OU1, and how the RAOs will be used to evaluate potentially applicable remedial alternatives within this FS. The general requirements for this work are described in the RI/FS Work Plan,(IT Corporation, July 20, 2001) and relevant guidance documents, including the NYSDEC TAGM 4030 (NYSDEC, 1990) and USEPA guidance for developing remedial actions (USEPA, 1988).

The RAOs are medium-specific (i.e., soil, groundwater, soil gas/indoor air) goals for protecting human health and the environment. They are developed by determining COPCs, exposure routes, and qualitative and quantitative goals for cleanup.

In accordance with USEPA guidance (USEPA, 1988), RAOs for protecting human receptors should express a remediation goal for COPCs in association with an exposure route, as protection may be achieved by reducing exposure (such as capping an area, limiting access, or providing an alternate water supply), as well as reducing COPC levels. In **Section 2.2**, the COPCs identified at OU1 during the RI Report are discussed with respect to each medium along with the qualitative and quantitative goals for COPC response actions.

GRAs are media-specific actions that will satisfy the RAOs. The process used to generate the Site's GRAs is consistent with the NCP under the Comprehensive Environmental Compensation and Liability Act (CERCLA) and NYSDEC guidance documents. This process ensures that a wide range of potential exposures is considered during the development of remedial alternatives for the OU1. GRAs for each medium of concern at the Site are developed in **Section 2.3**.

2.2 Remedial Action Objectives

The RAOs for this site are determined for each specific media. Each media's COPCs were evaluated with respect to standards, criteria and guidelines (SCGs), OM ARARs to determine RAOs. The three media that are of concern at the Site are groundwater, soil, and soil gas/indoor air. For the purposes of developing RAOs and screening of remedial technologies, soil gas and indoor air have been combined. Also, RAOs applicable to the treatment and disposal of these media's are considered.

Extensive chemical and physical data collected at OU1 were screened during the exposure assessment (discussed in **Section 1.2.5**) to identify COPCs from among the chemical constituents detected in the various media sampled. To select COPCs, the analytical results for air, soil, and groundwater were compared to risk-based screening levels, TAGM 4046 and TOGS 1.1.1, to determine whether levels measured are likely to present unacceptable exposures. The screening levels used are the RBCs developed by USEPA Region III (USEPA, 2000b) and the NYSDOH guideline for PCE (1999c). The RBCs were calculated using RAGS formulas for established exposure scenarios (residential and industrial). They do not necessarily characterize actual exposure in any site-specific situation. However, they represent measures of safe concentrations using a series of conservative assumptions. Therefore, chemicals with concentrations below the screening levels can generally be omitted as COPCs.

SCGs and ARARs are integral to RAO development and are included in each RAO to determine qualitative and quantitative cleanup goals. In addition, there are general ARARs that are applicable to the entire process. Some of these include Resource Conservation and Recovery Act (RCRA) and USEPA Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA USEPA/540/G-89/004.

NYSDEC SCGs and Federal ARARs for inactive hazardous waste sites interpret applications of other SCGs and ARARs. Regulations and guidance for New York State's *Inactive Hazardous Waste Disposal Site Remedial Program*, 6 NYCRR Part 375 (NYSDEC, 1992) were promulgated to promote the orderly and efficient administration of Article 27, Title 13 of the Environmental Conservation Law (ECL). The scope, nature, and content of an inactive hazardous waste site remedial program performed in accordance with this statute are to be determined on a site-specific basis. Specifically, Part 375 pertains to the development and implementation of remedial programs under authority of ECL Article 27. Furthermore, subpart 375-1.10(c)(1) states that "due consideration" must be given to SCGs when evaluating remedial alternatives for Class 2 inactive hazardous waste disposal sites. The regulation states that such "consideration" should be given to guidance "determined, after the exercise of engineering judgment, to be applicable on a case-specific basis" (6 NYCRR 375.1-10(c)(1)(ii)).

These SCGs include both New York State's criteria applicable to cleanup of contaminated media and Federal ARARs that may be more stringent than the State's criteria. As part of this FS, SCGs were evaluated for site applicability in order to develop the medium-specific RAOs. SCGs can be chemical-specific or site-specific guidelines. Most of the requirements outlined in this document are chemical-specific guidelines listed in tables for the different media involved. Site location-specific requirements for clean-up come into play when specific site characteristics impact or restrict the actions taken in that particular area. These will be addressed as needed.

2.2.1 Groundwater

Chemicals of Potential Concern

Analysis of the groundwater data shows that the only COPC in this media is PCE.

SCGs and ARARs

Both New York State and Federal ARARs and SCGs, along with RBCs discussed in the exposure assessment, have been evaluated to determine the preliminary remediation goals for the contaminated groundwater. The preliminary remediation goals for the COPCs in groundwater are listed in **Table 2-1**.

Table 2-1 presents the differences between:

- New York State Water Quality Standards for Surface Waters and Groundwater,
- USEPA Water Quality Standards in terms of Primary and Secondary MCLs (maximum contaminant levels as part of the Safe Drinking Water Act),
- National Academy of Sciences Drinking Water and Health standards for SNARLs (suggested no adverse response levels) and
- USEPA Office of Water, Drinking Water Regulations and Health Advisories for USEPA SNARLs.

The Safe Drinking Water Act MCLs provide standards for the treatment of groundwater and surface water for public potable water supplies and the New York State Water Quality Regulations (6 NYCRR Part 703.5) are used to protect human health and the environment. The NYS Water Quality Standards are the most stringent, and therefore, will be used as the groundwater SCGs.

Remedial Action Objectives

There are two remedial objectives for the on-site groundwater:

1) Mitigate further downstream contamination of groundwater to the extent practical; and
2) Remediate on-site groundwater to the requirements of NYS Water Quality standards as presented in **Table 2-1**.

2.2.2 Soil

Chemicals of Potential Concern

Only PCE was identified as a COPC due to detections in soil above the applicable screening levels and its frequency of detection.

SCGs and ARARs

The applicable SCGs and ARARs for PCE cleanup requirements for soil contamination are listed in **Table 2-2**.

The primary guidance for soil clean-up values under Part 375 remedial actions is derived in the Technical and Administrative Guidance Memorandum on Determination of Soil Clean-up Objectives and Clean-up Levels HWR-94-4046 (TAGM 4046). TAGM provides a basis for determining generic soil cleanup values that essentially ensure that all significant threats to human health and/or the environment posed by an inactive hazardous waste site are eliminated. The TAGM's health based levels for cancer risks are contained in USEPA's Health Effects Assessment Summary Tables (HEASTs). TAGM's health based levels for systemic toxicants are calculated from RfDs (reference doses) also contained in the HEASTs. Both of these values are compiled and updated quarterly by the NYSDEC's Division of Hazardous Substances Regulation. The two health based values for carcinogens and toxicants developed by the USEPA show that cleanup to the TAGM objective would be well below the acceptable limits for even carcinogenic compounds. Therefore, the SCG for PCE in soil is 1.4 mg/kg as per TAGM 4046.

Remedial Action Objectives

There are two RAOs for the Site soil:

1) Mitigate continued contact with and degradation of the groundwater by contaminated soil by treating the impacted soil to the established SCG; and

2) Mitigate further contamination of soil gas and indoor air by treating the impacted soil to the established SCG.

2.2.3 Soil Gas/Indoor Air

Chemicals of Potential Concern

Indoor air sampling and analysis reported one compound, PCE, that was above the RBCs.

SCGs and ARARs

New York State and Federal regulations have been considered as SCGs and ARARs for the soil gas/indoor air contaminants. The criteria to be considered are listed in **Table 2-3**.

Table 2-3 presents the New York State Department of Health Tetrachloroethene (Perc) In Indoor and Outdoor Air document background range and USEPA Region III risk-based concentrations for indoor air. The USEPA Region III RBCs, calculated using the Standard Risk Assessment Guidance for Superfund (RAGs, 1989, 1991), are discussed in the exposure assessment presented in **Section 1.2.5**. In accordance with NYSDEC and NYSDOH recommendations, the NYSDOH PCE background range will be used as the site PCE soil gas/indoor air SCG based upon the following rationale:

> "The purpose of the guideline is to help guide decisions about the nature of efforts to reduce PERC exposure. Reasonable and practical actions should be taken to reduce PERC exposure when indoor air levels are above background, even when they are below the guideline of 100 mg/m^3. The urgency to complete these actions increases with indoor air levels, particularly when air levels are above the guideline, and additional

actions taken if the initial actions do not sufficiently reduce PERC levels. Finally, NYSDOH recommends taking immediate action to reduce exposure when an air level is ten-times or more higher than the guideline (that is, when the air level is 1,000 mcg/m3 or higher). In all cases, the specific corrective actions to be taken depend on a case-by-case evaluation of the situation. The goal of the recommended actions is to reduce PERC levels in indoor air to as close to background as practical." (NYSDOH, May 2003).

Remedial Action Objectives

There are two remedial action objectives for the on-site soil gas/indoor air:

1) Reduce risk of exposure in indoor facilities to contaminated soil gas; and
2) Mitigate further migration of contaminated soil gas.

2.2.4 Extracted Groundwater

Chemicals of Potential Concern

Since groundwater extraction may be a potential remedial alternative for the contaminated groundwater SCGs and ARARs related to discharge of extracted groundwater may be applicable. Based on this assumption, the chemical of ***SCGs and ARARs*** concern in this media is PCE.

Under New York State law, to discharge the extracted groundwater to a surface water or back to groundwater, a State Pollutant Discharge Elimination System (SPDES) permit must be obtained. The preliminary remediation goals for the COPCs in groundwater as listed in **Table 2-1** will also meet the SPDES requirements.

2.2.5 Off-gases

Chemicals of Potential Concern

Hydrochloric acid and PCE may be present in off-gases from potential treatment alternatives. Since soil gas/indoor air extraction and treatment may be considered potential remedial alternatives, SCGs and ARARs related to discharge of gases containing these COPCs may be applicable.

SCGs and ARARs

New York State Department of Environment Conservation Division of Air Resources DAR-1 provides the requirements and standards for air discharge permits. DAR-1 Annual Guideline Concentrations (AGCs) and Short-Term Guideline Concentrations (SCGs), as updated in July 2000, will be used as the off-gas discharge requirements. **Table 2-4** presents these requirements.

2.3 General Response Actions

GRAs are media-specific actions that satisfy the remedial action objectives. The process used to develop the GRAs is compliant with the NCP under CERCLA (USEPA, 1988) and NYSDEC (NYSDEC, 1990). This process ensures that a wide range of potential responses is considered during the development of the remedial alternatives for the Site.

Figure 2-1 presents a matrix of GRAs for each media at the Site. The general response actions included in this figure are:

- No Further Action,
- Institutional Controls,
- Removal/Disposal,
- *Ex-situ* Treatment and Disposal,
- *In-situ* Treatment, and
- *In-situ/Ex-situ* Treatment.

GRAs available for contaminated groundwater include:

- No Further Action,
- Institutional Controls,
- *In-situ* Treatment, and
- *Ex-situ* Treatment and Disposal.

GRAs available for contaminated soil include:

- No Further Action,
- Institutional Controls,
- Removal and Disposal, and
- *In-situ/Ex-situ* Treatment.

GRAs available for contaminated soil gas/indoor air include:

- No Further Action,
- Institutional Controls,
- *In-situ/Ex-situ* Treatment

Each of these GRAs are discussed below.

No Further Action

"No Further Action" is considered a baseline general response against which all other actions can be measured. This alternative assumes that no further actions will be implemented at the site. However, it should be noted that even if no further action were to be implemented, there is an interim remedial measure that has already been implemented. (See **Section 1.2.6**).

Further screening of this alternative is not required. It is retained as a general option for the later assembly of alternatives (**Section 4.0**) and for the comparative purpose in the detailed analysis (**Section 5.0**).

Institutional Controls

Under this response category, measures would be taken to restrict access to contaminated areas and/or control specified activities in the contaminated areas. Both physical and legal means could be utilized to restrict and control access. Physical controls include access restrictions such as fencing, postings, warning signs, and other barriers. Legal controls include zoning and environmental easements.

Containment

This GRAs refers to the use of natural or engineered barriers on-site to minimize potential direct contact with, or migration of, contaminated media. Technologies within this response category include contact barriers, capping, vertical barriers, and surface controls (e.g., drainage/grading).

Removal and Disposal

This GRA refers to those activities in which the impacted media is removed from the environment and disposed of at an appropriate facility.

***Ex-situ* Treatment and Disposal**

This GRA refers to those activities in which the impacted media is removed from the environment and treated by an appropriate technology. Once treated, the media is disposed in an appropriate manner.

***In-Situ* Treatment**

This GRA refers to technologies that would accomplish treatment in place without a removal phase.

***In-Situ/Ex-Situ* Treatment**

This GRA refers to technologies that would accomplish much of the treatment *in-situ*, but may require at least one phase to be removed and treated prior to disposal.

3.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

This section identifies and describes potentially applicable technologies and process options for each GRA and presents a screening of each technology and process option. The technologies are grouped by media (groundwater, soil, and soil gas/indoor air). To help expedite the screening process, a preliminary evaluation of each technology and process option was performed to determine which technologies are applicable for the given media, based on COPCs, RAOs, SCGs, and ARARs discussed in **Section 2**. **Table 3-1** presents the media-specific GRA's, remedial technologies and process options, and preliminary evaluation results.

3.1 Screening of Technologies

In this section the remedial action technologies presented in **Table 3-1** that passed the preliminary evaluation will be screened to limit the number of technologies and options that may be subsequently used to formulate remedial action alternatives. The formulation of alternatives is discussed in **Section 4.0** and the detailed analysis of each alternative is discussed in **Section 5.0**.

The screening process of the technologies, presented in **Table 3-2**, is based on how the following three criteria are applicable to the study area conditions:

- Effectiveness,
- Implementability, and
- Cost.

Effectiveness: The technologies are evaluated on their effectiveness relative to other technologies, considering:

- How effective the technology is in achieving remedial action objectives; and
- How proven and reliable the process is in addressing the contaminants of concern.

Implementability: Process options are evaluated for institutional and technical implementability. The technical feasibility is used to eliminate certain process options that are ineffective and clearly not applicable to the site conditions. The deciding factors for this issue are:

- Difficulty in constructing and operating the process option,
- Potentially adverse health and environmental impacts created during the implementation,
- Potential material handling difficulties, and
- Adverse effects of the chemicals and other materials used by the technologies.

Cost: Cost plays a limited role at this stage of the screening process. Relative unitized costs are used in the analysis. Technologies that are an order of magnitude or greater in unitized cost are screened out if the option did not offer any greater effectiveness, reliability, or environmental protection than other options. The cost comparison is generally limited to process options, under a particular technology type. Costs are only discussed where they affect the screening process.

The various technologies and options by media are presented in the following sections.

3.1.1 Screening of Groundwater Technologies

3.1.1.1 No Further Action

The "No Further Action" alternative has been included as a baseline GRA against which all other actions can be measured. This alternative assumes that no further actions will be implemented at the site. However, it should be noted that even if no further action were implemented, there is an interim remedial measure that has already been implemented. (See **Section 1.2.6**)

Further screening of this alternative is not required. It is retained as a general option for the later assembly of alternatives (**Section 4.0**) and for comparative purposes in the detailed analysis (**Section 5.0**).

3.1.1.2 Institutional Controls

Institutional controls are physical or legal measures taken to prevent direct exposure to impacted media. Institutional controls are not technologies; however, they can be used to enhance long-term effectiveness and permanence of a remedial action. Potentially implementable measures that could be taken include access restrictions, zoning restrictions, and environmental easements. The remedial technology types which could be utilized to implement institutional controls are identified in **Table 3-1** and include access restrictions, environmental easements, and zoning restrictions.

Access Restrictions: Access restrictions could include fencing, alarm systems, security gates and patrols, and other physical barriers that would restrict access to the selected Site areas. Other measures to control specific activities could be employed as dictated by future land use. Workers engaged in activities potentially exposing them to impacted media would require Occupational Safety and Health Administration (OSHA) training and certification (29 CFR 1910.120), medical fitness testing, and other appropriate documentation, including an approved Health and Safety Plan. These plans would stipulate appropriate protective measures to prevent worker exposures during the completion of work on-site.

> **Effectiveness:** This option effectively minimizes the potential of direct contact exposure scenarios for groundwater.
>
> **Implementability:** The nature of this technology warrants no discussion of technical considerations. This technology is readily implementable.
>
> **Cost:** Cost for access restrictions is minimal.
>
> **Conclusions:** This option is potentially applicable and is retained for further consideration.

Environmental Easement and Zoning Restrictions: Environmental easement and zoning restrictions can be used to limit exposure risks by regulating future site activities. These types of institutional controls may include prohibiting the use of the property for residential, school, recreational, and/or food growing purposes for as long as contamination is present at the site.

> **Effectiveness:** These actions would effectively minimize exposure risks at the Site.
>
> **Implementability:** Environmental easements are typically more readily implementable than zoning restrictions due to the local government approval process required to create special zoning districts.
>
> **Cost:** The cost to implement either an environmental easement or zoning restriction cannot be accurately assessed this time; however, they are considered to be reasonable.
>
> **Conclusion:** These options are potentially applicable and are retained for further consideration.

3.1.1.3 In-Situ Treatment

In-situ treatment refers to technologies that would accomplish treatment in place without a removal phase. Several chemical and biological treatment technologies were retained for further evaluation during this preliminary screening.

Chemical Treatment

In-situ chemical treatment includes process options such as *in-situ* chemical reduction using nano-scale zero-valent iron and *in-situ* chemical oxidation using hydrogen peroxide, ozone, or permanganate. *In-situ* chemical reduction may be achieved through the injection of nano-scale zero-valent iron into the formation. As contaminated groundwater passively flows through the injected area, the zero-valent iron will dechlorinate the chlorinated compounds, converting them to innocuous compounds such as ethene. *In-situ* chemical oxidation entails the injection of chemical oxidants into the subsurface to destroy the contaminants by converting them to innocuous compounds such as carbon dioxide, water, and chloride.

Chemical Oxidation

Permanganate injection, a chemical oxidation technology, uses the permanganate ion to oxidize organic contaminants in the subsurface to non-toxic compounds. Permanganate (MnO_4-, delivered either as potassium ($KMnO_4$) or sodium salts ($NaMnO_4$) is a common oxidant widely used in the water treatment industry to remove and precipitate dissolved metals, and in the sewage treatment industry to treat sulfide odors. MnO_4^- ions will react with and oxidize a wide range of common organic compounds, relatively quickly and completely. In particular, MnO_4^- ions react rapidly with the non-conjugated (i.e., nonaromatic) double bonds in chlorinated ethenes such as PCE, trichloroethene (TCE), dichloroethene (DCE) isomers, and vinyl chloride.

Shaw has completed numerous successful field applications of permanganate injection with the percent reduction of chlorinated ethenes ranging from >60% to >99%.

Permanganate oxidizes the chlorinated ethenes to CO_2 and chloride ions. The balanced chemical equation for potassium permanganate oxidation of PCE (for example) is:

PCE: $4KMnO_4 + 3C_2Cl_4 + 4H_2O \text{--->} 6CO_2 + 4MnO_2 + 4K^+ + 12Cl^- + 8H^+$

Sodium permanganate ($NaMnO_4$) may also be used and has the advantage of being available as a 40% liquid solution. $NaMnO_4$ oxidation of PCE follows the same reaction pathways as $KMnO_4$, except that the reaction forms Na^+ ions rather than the K^+ ions:

PCE: $4NaMnO_4 + 3C_2Cl_4 + 4H_2O \text{--->} 6CO_2 + 4MnO_2 + 4Na^+ + 12Cl^- + 8H^+$

A disadvantage of sodium permanganate is its higher cost compared to the potassium form.

In-situ oxidation is a chemical reaction. The effectiveness of treatment depends on the following three factors:

- The kinetics of the reaction between the permanganate and the contaminant compounds,
- The contact between the oxidant and the contaminants, and
- Competitive reactions of permanganate with other reduced/oxidizable species.

If the contaminant being targeted for *in-situ* chemical oxidation is reactive (i.e., chlorinated ethenes), and sufficient oxidant has been added to overcome the demand from other reduced species, the limiting factor to the successful application of *in-situ* oxidation is the transport of the oxidant to the areas where contaminants are present, not the reaction itself between the permanganate and the contaminants. The oxidation of contaminants by permanganate is an essentially an instantaneous reaction. If the permanganate contacts the contaminant, it will react. Significant oxidation can be observed in as little as a few hours after addition. By contrast, travel times for the permanganate to migrate away from the injecting point may be on the order of a day to weeks, depending on the rate of groundwater flow.

The primary limitation to permanganate treatment is the ability to apply the permanganate *in-situ* and to maintain efficient contact between the permanganate and the contaminants. Low permeability soils and highly heterogeneous soils present a challenge to apply permanganate to the target location.

Effectiveness: This is a viable option for the treatment of the chemical compounds present in groundwater at the site. A pilot test at the site would be required to determine the site-specific chemical transport properties of the aquifer.

Implementability: This option would require the necessary injection permits from the applicable state and local agencies. Chemical oxidation has been performed at several sites nationwide. Delivery systems include storage tanks and pressure pumps. The required equipment and trained personnel are readily available to implement the treatment.

Cost: The initial cost of permanganate treatment is usually higher compared to ex-situ treatment methods, but because there are no continuing operations and maintenance (O&M) costs, the total project cost may ultimately be less depending upon project duration.

Conclusion: This option is retained for further evaluation.

Hydrogen Peroxide Injection

Hydrogen peroxide (H_2O_2) is typically used with ferrous iron (Fe^{2+}) as a catalyst to produce Fenton's Reagent, which yields a highly reactive hydroxyl radical (OH-). The hydroxyl radical breaks the carbon-hydrogen bonds of organic molecules, thereby degrading most organic compounds, including the COPCs found at the site. The simplified stoichiometric reaction for the degradation of PCE (C_2HCl_4) is given by the following equation:

$$6H_2O_2 + 2C_2Cl_4 \dashrightarrow 4CO_2 + 2H_2O + 8HCl + O_2$$

The residual hydrogen peroxide decomposes to water and oxygen in the subsurface, and the remaining iron precipitates out of solution. The optimum pH range to facilitate the generation of the hydroxyl radical is between 2 and 4, necessitating the addition of an acid to the subsurface.

The method of delivery of the oxidants may vary. The oxidant is either injected through a series of wells, mixed with the iron catalyst and then injected, or combined with a stabilizer and then injected. Because of its high volatility, hydrogen peroxide is typically mixed with a stabilizer prior to injection.

Effectiveness: Hydrogen peroxide oxidation has been proven effective for remediation of chlorinated compounds in groundwater. The effectiveness of the treatment usually depends on the success of the delivery method.

Implementability: Hydrogen peroxide oxidation is readily implemented using existing technology and qualified vendors. The primary limitation associated with the implementation of this treatment is the ability to deliver the peroxide to the subsurface to maintain efficient contact between the peroxide and the contaminants. Other limitations include handling issues associated with the hazardous nature of the chemicals (peroxide is a class II oxidizer). Special measures may also be required during chemical delivery because of the potential for peroxide to break down to water vapor and oxygen, causing fugitive VOC emissions and pressure buildup in the subsurface.

Cost: The hydrogen peroxide oxidation cost is moderate to high compared to other process options. The cost will depend on the quantity of chemicals required for effective treatment.

Conclusion: This process option will not be retained for remedial alternative development due to safety concerns associated with chemical handling and the potential environmental effects associated with the addition of an acid to the subsurface.

Chemical Oxidation Using Ozone

Ozone (O_3) is a strong oxidant capable of oxidizing contaminants directly or through hydroxyl radical formation. The simplified stoichiometric reaction for the degradation of PCE by ozone is given by the following equation:

$$2O_3 + 6H_2O + 3C_2Cl_4 \text{--->} 6CO_2 + 12HCl$$

As with hydrogen peroxide, *in-situ* oxidation using ozone requires acidic conditions. The ozone is produced on-site and delivered via closely spaced points such as sparging wells.

Effectiveness: Ozone oxidation has proven to be effective in lowering the toxicity and volume of chlorinated compounds in groundwater. The effectiveness of the treatment is dependent on the success of the delivery method.

Implementability: The ozone oxidation process option is not easily implemented because the ozone must be generated on-site. Ozone is a criteria air pollutant per the USEPA and is very reactive and corrosive to materials. It reacts quickly in the subsurface and does not migrate long distances from the delivery point; therefore, many injection points would be required. The depth of the injection also requires high-pressure compressors.

Cost: Since ozone must be generated on-site and a large number of injection wells are required for effective delivery, the ozone oxidation cost would be high compared to other process options.

Conclusion: This process option will not be retained for remedial alternative development due to the depth of injection, high cost associated with the on-site generation of ozone, and the corrosive and reactive nature of the oxidant.

Nano-Scale Zero-Valent Iron

An innovative technology, nano-scale zero-valent iron (NSZVI) utilizes iron filing particles in the 3 to 10 Angstrom unit size to accomplish abiotic dechlorination of organic contaminants. This exceedingly small-scale particle is being developed to overcome the clotting and injection dispersion problems encountered with micro-scale iron particles in deep well injection scenarios. The zero-valent iron is typically injected to create a subsurface treatment zone perpendicular to groundwater flow direction. As groundwater flows through the treatment zone, chlorinated organics are reduced to innocuous compounds through successive dechlorination reactions. The mechanism is believed to involve abiotic reductive dechlorination by monatomic hydrogen, which is liberated (in low concentrations) during the reaction of water with metallic iron in an anaerobic environment. Research has shown that microbial activity is increased in and around the NSZVI treatment barrier.

Effectiveness: The effectiveness of the nano-scale zero-valent iron barrier is dependent on groundwater flow characteristics, groundwater quality, thickness of the iron treatment zone, and the reactivity of the iron. The concentrations of contaminants entering the barrier must be well characterized such that there is sufficient residence time for the contaminants to be treated prior to leaving the reactive portion of the barrier.

A concern associated with the use of zero-valent iron is decreasing iron reactivity over time due to a build-up of corrosion products (iron oxides) or other precipitates (carbonate deposition in alkaline water) on the iron surface. Excess oxygen may oxidize iron, resulting in the formation of iron oxide minerals that reduce the reactivity of the iron surface. A bench-scale treatability testing would be required to determine the amount of iron necessary to achieve abiotic dechlorination and to quantify the factors influencing contaminant degradation rates and the lifetime of the zero-valent iron. This technology will require an extended period of time (i.e. 1 plus years) to achieve remedial goals.

Implementability: The nano-scale zero-valent iron barrier can be installed using commercially available well drilling and direct push equipment. The bottom of the zero-valent iron barrier would be installed below the deepest contaminated portion of the aquifer so that groundwater would flow through the porous reactive medium contained in the barrier.

Cost: The cost for the nano-scale zero-valent iron barrier is moderate to high compared to the other process options. O&M costs, primarily associated with periodic groundwater monitoring, would be low after installation of the nano-scale zero-valent iron barrier. Costs could escalate, however, if the zero-valent iron needed replacement due to a reduction in reactivity over time.

Conclusion: Although an effective technology, nano-scale zero-valent iron may be restrictive due to cost and length of implementation. Therefore, this technology will not be retained.

Biological Treatment

In-situ biological treatment of the groundwater contaminant plume may be achieved by amending the groundwater with organic carbon, nutrients, oxygen, or other substrates to stimulate microbial biodegradation of the contaminants (biostimulation). The amendments would be injected via delivery systems such as injection wells or direct-push technology. The goal of biological treatment is to biodegrade the COPCs to innocuous end products such as ethene, ethane, chloride ions, or carbon dioxide. Should the native microbial populations be present in insufficient numbers to support the degradation of the COPCs, then native microbes can be cultured in the laboratory and re-injected back into the subsurface with the other amendments (bioaugmentation).

In-Situ Anaerobic Bioremediation

In-situ anaerobic bioremediation entails the addition of an electron donor (i.e., carbon source) within the subsurface to stimulate indigenous anaerobic microorganisms to biodegrade contaminants. At OU1, the COPCs (PCE, TCE, 1,1-DCE, 1,2-DCA, cis-1,2-DCE, and VC) may be degraded under anaerobic conditions via reductive dechlorination where carbon is used as an energy source by the anaerobic microbes (in the subsurface) and the chlorinated ethenes and ethanes are used as respiratory substrates, or electron acceptors, during metabolism. Chlorine atoms are sequentially removed from the chlorinated contaminant and replaced with hydrogen atoms. Microbial activity is supported by an external carbon source such as lactate, or emulsified oil. Without an organic carbon source, the dehalogenation reaction ceases and the chlorinated solvents persist in the groundwater. The carbon source is typically injected (either continuously or as a batch delivery) into the groundwater and allowed to diffuse throughout the plume. Groundwater amendment with nutrients (i.e., ammonia and phosphate) or microorganisms may be required to further enhance the *in-situ* anaerobic bioremediation process.

Effectiveness: *In-situ* anaerobic bioremediation may be effective for remediating groundwater at OU1. The subsurface conditions at the site may be suitable for anaerobic bioremediation of the COPCs to innocuous end products via the reductive dechlorination pathway. This technology will require an extended period of time (i.e. 1 plus years) to achieve remedial goals.

Implementability: Lactate and emulsified oil can be delivered with commercially available equipment. Delivery systems include injection rods advanced using direct-push technology and injection wells. Commercial vendors are available to implement the carbon source addition. The installation of groundwater extraction wells may be required for groundwater control and to enhance the distribution of the carbon source throughout the aquifer. The installation of additional monitoring wells may be required to assess the effectiveness of the remedial action. A qualified contractor could install the monitoring wells with commercially available equipment and materials.

Cost: The overall cost for *in-situ* anaerobic treatment is expected to be moderate compared to other process options due to the limited amount of labor and equipment required for addition of the carbon source. Monitoring and reporting costs would be incurred until treatment goals are achieved.

Conclusion: An objective of the OU1 FS is to mitigate the continuing source of downgradient groundwater contamination as quickly as possible. Therefore, the *in-situ* aerobic bioremediation option will not be retained, as it will require a greater length of time than other options to achieve remedial goals.

In-situ Aerobic Bioremediation

In-situ aerobic bioremediation typically entails increasing the dissolved oxygen concentration in the subsurface to stimulate aerobic microorganisms to degrade contaminants. Under aerobic conditions, microorganisms use dissolved oxygen in the groundwater as a respiratory substrate (electron acceptor). With sufficient oxygen, microorganisms will completely oxidize many organic chemicals to carbon dioxide and water. Chlorinated solvents may be biodegraded through several different mechanisms; however, each mechanism has specific requirements and preferences for the type of solvent that can be degraded. One such mechanism is cometabolism. The COPCs at the Site may be biodegraded via cometabolism under aerobic conditions in the presence of a suitable substrate (e.g., methane, propane, or butane) to stimulate the aerobic microbial populations and generate the enzymes necessary to induce co-metabolic biodegradation. Through a second mechanism, less highly-chlorinated compounds (e.g., DCE and VC) may undergo metabolic oxidation under aerobic conditions, resulting in the formation of carbon dioxide, water, and chloride. *In-situ* aerobic conditions can be induced through the direct injection of an air stream into the aquifer via injection wells, or through the injection of chemicals capable of releasing oxygen such as oxygen-releasing compound or dilute hydrogen peroxide.

Effectiveness: Aerobic degradation of PCE does not occur under natural conditions because it is a highly oxidized compound. However, the COPCs at the site may degrade via co-metabolic pathways under aerobic conditions in the presence of a suitable substrate (e.g., methane, propane, or butane) to stimulate the microbes and generate the required enzymes. Without a suitable substrate, the co-metabolic degradation of PCE will not proceed under aerobic conditions. Although an innovative technology, aerobic cometabolism of PCE is expected to be effective if sufficient distribution of dissolved oxygen and the gaseous substrate is achieved.

Implementability: *In-situ* aerobic bioremediation would be difficult to implement because of the depth of the contamination (as deep as 200 feet bgs). The required air injection pressures would only be achieved with extensive compressor capabilities thereby limiting the effective delivery of an air stream amended with a gaseous substrate. Short-circuiting and low radii of influence would be expected in this type of lithology. In addition, the high hydraulic conductivity at the site and significant depth of contamination would limit the distribution of dissolved oxygen and substrate via advective mechanisms, which would further limit the implementability of the technology.

Cost: The overall cost for the treatment system is expected to be high compared to other process options. Channeling effects during the administration of a gas substrate into the subsurface would increase the number of required injection wells, which would increase capital costs and O&M costs.

Conclusion: The *in-situ* aerobic bioremediation option will not be retained for remedial alternative development. Due to the lack of a suitable substrate for co-metabolic degradation of PCE and the complicating factors associated with delivering an air stream into the subsurface, *in-situ* aerobic bioremediation would not be implementable at the site.

3.1.1.4 In-Situ/Ex-Situ Treatment

*In-situ/ex-s*itu treatment refers to technologies that would accomplish much of the treatment *in-situ*, but may require one phase to be removed and treated prior to disposal. Air sparging/SVE is one such technology.

Air Sparging/Soil Vapor Extraction: Air sparging is a method of removing dissolved phase contaminants from groundwater. This process uses air as a carrier fluid for the transfer of the COPCs. Pressurized air is injected into the saturated and contaminated aquifer where the air forms bubbles, which rise up through the aquifer coming into contact with dissolved phase and immiscible phase contaminants. The pressurized air is generated using a compressor or blower and applied within the aquifer, below the contamination, via air sparging wells, which are constructed specifically for this purpose and installed with conventional well installation equipment. The contaminants volatilize into the rising air stream and are carried out of the aquifer in gaseous form (*in-situ* air stripping). Typically, the gaseous emissions are collected from the vadose zone with a complementary SVE system and the extracted vapors containing the contaminant are processed through an air treatment system.

Effectiveness: Air sparging/SVE is a proven technology and is widely used to remediate contaminated groundwater. Used alone or in combination with other technologies, air sparging/soil vapor extraction can be used for source area removals or for plume control and reduction of chlorinated solvents in shallow to moderate groundwater plume depths. However, air sparging/SVE systems have not been proven effective for use in deep contamination scenarios such as those found at the site. Short-circuiting of the injected air stream along preferential flow-paths within the formation would be expected at the site, which would limit the effectiveness of the technology.

Implementability: The air sparge/SVE wells and processing equipment are commercially available and installed using conventional methods. Once installed and operating, the O&M requirements are generally lower than groundwater extraction and treatment systems, because it is generally less expensive to move and treat air rather than groundwater.

Cost: The cost for air sparging and/or SVE is generally moderate for shallow to moderate groundwater plume depths, but is much greater for deeper groundwater plume depths.

Conclusion: Use of air sparge/SVE technology is not an appropriate technology for the remediation of groundwater at this site. Therefore, this method is not retained for further evaluation.

In-situ Density-Driven Air Stripping

The *in-situ* density-driven air stripping process option is designed with a grid of wells screened near the top and bottom of the contaminated groundwater zone. Air is injected into the bottom of the well casing through a drop tube placed within the well casing. The air forms bubbles that flow upward, displacing water and lowering the density of the water column within the well casing. The density reduction creates an upward vertical gradient that draws groundwater in through the lower screen and pushes aerated (stripped) water out through the upper screen. Volatile contaminants are stripped from the water by partitioning into the air stream. The contaminated air stream is extracted using a vacuum blower and treated to remove the chlorinated compounds prior to discharge.

Effectiveness: The *in-situ* density-driven air stripping will not be effective in reducing the concentrations of the COPCs in groundwater at the site. The *in-situ* air stripping system is generally ineffective in deep applications such as are present at the site. The compressor requirements and utility costs become prohibitive at depths beyond 100 feet. Chemical precipitates often form during the air stripping process and clog the well screens, thereby limiting groundwater recirculation.

Implementability: A limited number of patented *in-situ* density-driven air stripping systems are commercially available. The selected design must be pilot tested prior to implementation of the full-scale treatment system. In addition, *ex-situ* air pollution abatement controls may be required for the off-gas created by the vacuum blower.

Cost: The cost of installing an *in-situ* density-driven air stripping system is moderate to high compared to other process options. The cost would depend on the capacity of the compressor and vacuum blower, the number of stripping wells, and the cost of the air pollution control equipment.

Recommendation: This process option will not be retained for detailed analysis. The technology is neither field-proven nor effective in deep applications similar to those observed at the site. Additionally, the cost of the air pollution control equipment and associated maintenance could be prohibitive.

3.1.1.5 Ex-Situ Treatment and Disposal

Based on previous discussion in this section, groundwater could be extracted by several means. The removal of groundwater would be performed primarily to remove the source of continuing groundwater contamination down-gradient. The removed groundwater requires treatment prior to disposal.

Extraction and treatment: An extraction and treatment system would provide source removal, hydraulic control, and containment of the site contamination. This process option is a combination of many different technologies. A typical extraction and treatment system consists of recovery wells with pumps and a treatment system for removal of the VOCs and metals from the contaminated groundwater. A conventional groundwater treatment comprises the following unit operations and equipment:

- Equalization tank for collection of groundwater from different wells and attenuation of contaminant levels prior to treatment;
- Metals removal equipment consisting of an inclined plate clarifier (IPC), chemical feed systems (sodium hydroxide and polymer) and sludge pump for removal of precipitated metal hydroxides;
- IPC effluent collection tank with a transfer pump;

- Filtration consisting of a set of bag filters (minimum) for removal of suspended solids carried over from the IPC;
- Air stripper with a blower and an effluent sump pump;
- Liquid and vapor phase granular activated carbon systems for polishing of the air stripper effluent and removal of VOCs from air stripper off-gas, respectively;
- Discharge system

Effectiveness: Extraction and treatment is one of the most widely used options for treatment of groundwater contaminated with VOCs at CERCLA sites and elsewhere. Based on the available information, it is estimated that properly located extraction wells could be able to capture sufficient groundwater flow to restrict off-site migration of contamination and would recover and treat contaminated groundwater from the Site.

Implementability: The recovery wells, process equipment and discharge system comprising the extraction and treatment option is commercially available and installed using conventional methods. Based on the specific equipment, the treatment process is typically enclosed within a building or suitable structure. Selecting a location for the treatment enclosure and performing the trenching and piping would be easily implementable.

Cost: The capital cost for extraction and treatment at the Site and the down-gradient area is high, when compared to No Action or short-term remedial alternatives. Additionally, the total cost of the extraction and treatment system is relatively expensive due to long-term O&M costs, when compared to other appropriate technologies.

Conclusion: Extraction and treatment systems are an effective and reliable technology for remediation of groundwater contaminated with VOCs. However, extraction and treatment systems would have higher capital costs than other technologies. Extraction and treatment systems will be retained for further consideration as a stand-alone technology and as a backup to other remedial alternatives.

3.1.2 Screening of Soil/Soil Gas/Indoor Air Technologies

3.1.2.1 No Further Action

The "No Further Action" alternative has been included as a baseline general response against which all other actions can be measured. This alternative assumes that no further actions will be implemented at the site. However, it should be noted that even if no further action were implemented, there is an interim remedial measure which has already been implemented. (See **Section 1.2.6**).

Further screening of this alternative is not required. It is retained as a general option for the later assembly of alternatives (**Section 4.0**) and for comparative purposes in the detailed analysis (**Section 5.0**).

3.1.2.2 Institutional Controls

Institutional controls are physical or legal measures taken to prevent direct exposure to impacted media. Institutional controls are not technologies; however, they can be used to enhance long-term effectiveness and permanence of a remedial action. The remedial technology types which could be utilized to implement institutional controls are identified in **Table 3-1** and include access restrictions, environmental easements, and zoning restrictions.

Access Restrictions: Access restrictions could include fencing, alarm systems, security gates and patrols, and other physical barriers that would restrict access to the selected site areas. Other measures to control specific activities could be employed as dictated by future land use. Workers engaged in activities potentially exposing them to impacted media would require OSHA training and certification (29 CFR 1910.120), medical fitness testing, and other appropriate documentation, including an approved Health and Safety Plan. These plans would stipulate appropriate protective measures to prevent worker exposures during the completion of work on-site.

> **Effectiveness:** This option effectively minimizes the potential of direct contact exposure scenarios for soil.
>
> **Implementability:** The nature of this technology warrants no discussion of technical considerations.
>
> **Cost***:* Cost for access restrictions is minimal.
>
> **Conclusions:** This option is potentially applicable and is retained for further consideration.

Environmental Easement and Zoning Restrictions: Environmental easement and zoning restrictions can be used to limit exposure risks by regulating future site activities. These types of institutional controls may include prohibiting the use of the property for residential, school, recreational, and/or food growing purposes for as long as contamination is present at the site.

> **Effectiveness:** These actions would effectively minimize exposure risks at the Site.
>
> **Implementability:** Environmental easements are typically more readily implementable than zoning restrictions, due to the local government approval process required to create special zoning districts.

Cost: The costs to implement either a environmental easement or zoning restriction cannot be accurately assessed at this time; however, they are considered to be reasonable.

Conclusion: These options are potentially applicable and are retained for further consideration.

3.1.2.3 Containment

The containment of soil contamination provides protection from direct contact of contamination with potential receptors and prevents contamination migration. Soil contamination may migrate through the soil column to the groundwater due to precipitation leaching though the soil, or the flushing of storm drains/dry wells on-site. Capping is the only containment technology identified for soil contamination.

Capping: Containment can be accomplished through the use of a capping system that reduces the amount of precipitation that infiltrates and percolates into and out of impacted soils. Impermeable capping systems are typically constructed using synthetic liners and compacted clay. Low permeability caps can also be constructed using dense-grade or hydraulic-grade asphalt. Portions of the Site are currently covered with asphaltic pavement. Although the asphalt pavement is not specifically designed to act as a low permeability barrier, it would nevertheless limit the amount of direct infiltration if extended to the rest of the Site.

Effectiveness: Construction of a low permeability cap at the site would effectively prevent direct exposure to the impacted media and prevent vertical migration of precipitation through the impacted media to the groundwater. However, it would not prevent horizontal flow of groundwater through the impacted media, which is a primary mechanism for off-site contamination.

Implementability: This technology is easily implemented.

Cost: This option has marginal cost.

Conclusions: This technology is implementable and has a relatively low cost, however it would not prevent horizontal flow of groundwater through the impacted media. Therefore, this technology will not be retained.

3.1.2.4 Removal and Disposal

Removal and disposal refers to those activities that remove impacted soil from the environment and dispose of it at an appropriate facility in accordance with State and Federal regulations. Soil removal activities would be performed to the elevation of the water table, or a depth of approximately 20 feet below grade. Demolition of the site building and the removal of its foundation would be required to facilitate the excavation activities.

Effectiveness: Soil removal and disposal activities at the Site would be effective in achieving the remedial action objectives and addressing site COPCs; therefore, this technology will be retained for further consideration.

Implementability: This technology is implementable. However, the Site building would have to be removed prior to the commencement of soil removal activities unless the removal activities are combined with *in-situ/ex-situ* technologies.

Cost: This option has moderate to high cost.

Conclusions: This option is appropriate for this site, and will be retained.

3.1.2.5 In-Situ/Ex-Situ Technologies

In-situ/ex-situ treatment refers to technologies that would accomplish much of the treatment *in-situ*, but may require one phase to be removed and treated prior to disposal (*ex-situ*). SVE is one such technology.

Soil Vapor Extraction: SVE is an *in-situ* process where adsorbed VOC contaminants are removed from the vadose zone (dry) soils by mechanically applying a vacuum to the subsurface. The applied vacuum creates air movement in the subsurface and contaminants are volatilized and extracted with the air that moves through the soil pore spaces. These vapors are drawn through the extraction system, and process pump or blower that vents either directly to the atmosphere or through a vapor abatement system if required. The off- gases will be treated to achieve air discharge limits. The vacuum is applied to the subsurface either through shallow trenches or vertical wells installed by conventional means.

Effectiveness: SVE is one of the most widely used and effective process options for treatment of the vadose zone soils contaminated with the VOCs at CERCLA sites and elsewhere. Based on the available information, it is estimated that properly located SVE extraction wells will be able to capture sufficient contaminant mass at the source area soils to minimize contaminant flux into the groundwater. This technology would recover and treat contaminated soil vapors from the source area at the Site.

Implementability: The recovery wells, process equipment and discharge system are commercially available and installed using conventional methods. Based on the required equipment, the treatment process is typically enclosed within a building or suitable structure. SVE technology has been installed and operated at numerous sites since the early 1990's.

Cost: The capital cost for a source area remediation system at the Site is moderate, when compared to No Action or short-term remedial alternatives. However, the total cost of the SVE remediation could be moderately expensive due to potential long-term O&M costs and vapor treatment maintenance that would be dependent upon the project duration.

Conclusion: An SVE system is an effective and reliable technology for remediation of the source area soils contained within the vadose zone. This technology is retained for further consideration as a stand-alone technology or in combination with other technologies for development of remedial alternatives.

3.2 Summary of Technologies Retained for Remedial Alternative Development

The following groundwater remedial technologies have been retained for the development of remedial alternatives:

- No further action
- Access limitations
- Environmental easement and zoning restrictions
- Chemical oxidation
- Extraction and treatment

The following soil/soil gas/indoor air remedial technologies have been retained for the development of remedial alternatives:

- No further action
- Access limitations
- Environmental easement and zoning restrictions
- Removal and disposal
- Soil vapor extraction

4.0 DEVELOPMENT AND SCREENING OF ALTERNATIVES

4.1 Development of Alternatives

The technologies retained in **Section 3.0** are assembled into remedial alternatives designed to achieve the RAOs discussed in **Section 2.0**. The RAOs are goals developed to protect human health and the environment. The remedial alternatives are assembled to address the three media of concern at the Site: groundwater, soil, and soil gas/indoor air.

The range of alternatives for the Jimmy's Dry Cleaner Site have been developed within the framework of the regulatory guidelines outlined in the RI/FS Guidance Document (USEPA 1988). The alternatives address both site-specific source control and management of groundwater migration concerns.

A brief discussion of the alternatives developed for each media and the rationale behind their development is presented in the following sections. The detailed evaluation of the retained alternatives is then presented in **Section 5.0**.

4.1.1 Development of Groundwater Alternatives

Alternative 1: No Action

Groundwater Alternative 1 (GWA-1), the No Action alternative, has been included to provide a baseline by which to compare other alternatives. Under this alternative groundwater would not be treated and the site conditions would remain the same. Groundwater monitoring would continue for approximately 30 years.

Alternative 2: Extraction and Treatment

Groundwater Alternative 2 (GWA-2) would consist of an extraction and treatment system to capture and treat existing groundwater contamination at OU1 and prevent the continued migration of contaminated groundwater outside of OU1. In this alternative, the groundwater treatment system would reduce the concentration of COPCs to meet the SCGs listed in **Table 2-1**. Groundwater would be extracted from the contaminated aquifer at approximately 50 gallons per minute through two recovery wells, pumped to a treatment system and then discharged into a local discharge point. A typical groundwater treatment system would consist of an equalization tank and transfer pump, a set of bag filters for removal of suspended solids, a low-profile air stripper with a sump and a sump pump, liquid phase granular activated carbon (GAC) vessels for polishing the liquid stream prior to discharge, and GAC vessels for removal of VOCs from the air stripper off-gas prior to discharge to the atmosphere. **Figure 4-2** is a site area map that shows a conceptual groundwater treatment system layout for this alternative.

Extraction and treatment is an effective means to actively control groundwater flow in the subsurface. This is especially relevant in regard to the control of migrating dissolved phase plumes. Extraction and treatment systems can be designed to control and recover plumes to prevent further migration.

Effectiveness: Extraction and treatment is a viable option for the treatment of the chemical compounds present in groundwater at the Site. A pump test and groundwater monitoring at the site would be required to determine the site-specific properties of the aquifer for the groundwater extraction system design.

Implementability: The extraction and treatment option would require applicable water and air discharge permits from applicable state and local agencies. The implementability of this option would also require the identification of an appropriate discharge point for treated water. Extraction and treatment technology is widely used, well understood, and readily available.

Cost: The capital cost for extraction and treatment at the Site and the down-gradient area is high, when compared to No Action or short-term remedial alternatives. Additionally, the total cost of the extraction and treatment system is relatively expensive due to long-term O&M costs, when compared to other appropriate technologies.

Conclusion: This remedial alternative is retained for further evaluation.

Alternative 3: *In-Situ* Treatment Using Chemical Oxidation

In Groundwater Alternative 3 (GWA-3), potassium permanganate or a similar oxidant would be used to provide *in-situ* chemical oxidation of the dissolved phase plume. Prior to the initiation of a full-scale permanganate treatment system, a pilot-scale injection would be needed. The pilot-scale test would provide the level of data needed for the accurate design of full-scale injection. For this pilot test, potassium permanganate would be mixed on-site and injected into monitoring wells located at OU1. Several monitoring wells would be field tested for various parameters prior to injection, and then on a periodic basis following injection. Groundwater samples would be collected for analysis from these monitoring wells on a weekly to monthly basis.

The full-scale injection would be designed to treat the entire on-site saturated thickness of the dissolved phase contaminant plume encountered on the Site. Concentrations of COPCs in the OU1 plume would be reduced to levels that meet the SCGs listed in **Table 2-1**. A typical process option consists of potassium permanganate mixed on-site and then injected into shallow and deep monitoring wells. Additional deep and shallow monitoring wells would need to be installed for the permanganate injection and subsequent post-injection performance monitoring. **Figure 4-3** is a site area map that shows a conceptual chemical oxidation plan for this alternative.

Effectiveness: This is a viable option for the treatment of the chemical compounds present in groundwater at the site. A pilot test at the site would be required to determine the site-specific chemical transport properties of the aquifer.

Implementability: This option would require the necessary injection permits from the applicable state and local agencies. Chemical oxidation has been performed at many sites nationwide. The required equipment and personnel are readily available to implement the treatment.

Cost: The initial cost for chemical oxidation remediation is usually higher compared to other treatment methods, but because there are no continuing O&M costs, the total project cost depends upon whether additional injections are required to reduce contaminants to closure levels.

Conclusion: This remedial alternative is retained for further evaluation.

4.1.2 Development of Soil/Soil Gas/Indoor Air Alternatives

Alternative 1: No Action

Soil Alternative 1 (SA-1), the No Action alternative, has been included to provide a baseline by which to compare other alternatives. Under this alternative, a limited volume of soil would be treated with the continuance of the IRM activities. The remainder of the soils at the Site would remain untreated. **Figure 4-4** is a site area map that shows the layout of the existing SVE system that is currently operating as an IRM.

Alternative 2: SVE

Soil alternative 2 (SA-2) would utilize an SVE system to treat contaminated soil on-site. SVE is an *in-situ* and *ex-situ* process where adsorbed VOC contaminants are removed from the vadose zone soils by physically applying a vacuum to the subsurface. The applied vacuum creates an air movement in the subsurface and contaminants are volatilized and extracted with the air that moves through the soil pore spaces. These vapors are drawn through the extraction system and process pump/blower that vents either directly to the atmosphere or through a vapor abatement system if required. The off-gases will be treated to achieve discharge limits. The vacuum is applied to the subsurface either through shallow trenches or vertical wells installed by conventional means.

Approximately three SVE wells, each having a radius of influence of approximately 50 feet, would be installed to treat vadose zone soils where PCE concentrations exceed 1.4 mg/kg. This value is the NYSDEC's generic soil cleanup objective from TAGM 4046, unadjusted for site-specific criteria. **Figure 4-5** is a site area map that shows a conceptual SVE system layout for this alternative.

Effectiveness: SVE is one of the most widely used and effective process options for treatment of the vadose zone soils contaminated with VOCs at CERCLA sites and elsewhere. Based on available information from the small-scale SVE system operating as an IRM, it is estimated that properly located SVE extraction wells will be able to capture sufficient contaminant mass at the source area soils to minimize contaminant flux into the groundwater. This technology would also recover and treat contaminated soil vapors from the remainder of the Site.

Implementability: The recovery wells, process equipment and discharge systems are commercially available and installed using conventional methods. Based on the required equipment, the treatment process may be enclosed within a building or suitable structure. SVE technology has been installed and operated at numerous sites since the early 1990's.

Cost: The capital cost for an SVE process option at the Site is moderate, when compared to No Action or other short-term remedial alternatives. The total cost of SVE remediation would be low to moderate, depending upon the project duration.

Conclusions: An SVE system would be an effective and reliable technology for remediation of the source area soils contained within the vadose zone. This remedial alternative is retained for further consideration.

Alternative 3: Excavation and Off-Site Disposal

Soil Alternative 3 (SA-3) would include the excavation of soils where PCE concentrations exceed 1.4 mg/kg. This value is the NYSDEC's generic soil cleanup objective from TAGM 4046, unadjusted for site-specific criteria. The estimated volume of PCE-impacted soils that would be excavated and disposed off-site is approximately 9,000 cubic yards. The depth of excavation would be approximately 20 feet below grade, or to the elevation of the groundwater table. The site building would be demolished to facilitate excavation activities. Post excavation analysis of soils would be used to characterize the material for disposal at a permitted off-site facility. The material would then be transported by trucks to the off-site facility for disposal in accordance with State and Federal regulations. **Figure 4-6** is a site area map that shows a conceptual excavation plan for this alternative.

Effectiveness: This is a viable option for the removal of the chemical compounds present in the vadose zone at the Site.

Implementability: This option would be readily accomplished with standard construction personnel.

Cost: The cost for excavation and off-site disposal is higher initially compared to *in-situ* treatment methods, but because there are no continuing O&M costs, the total project cost may ultimately be less.

Conclusions: This remedial alternative is retained for further consideration.

5.0 DETAILED ANALYSIS OF ALTERNATIVES

5.1 Introduction

In this section, remedial action alternatives developed and retained for further consideration in **Section 4.0** are described and evaluated in detail. The detailed evaluation of alternatives provides information to facilitate the comparison of alternatives and the selection of a final remedy. In accordance with the guidance documents, the seven CERCLA screening criteria are used in the detailed analysis:

1) Overall Protection of Human Health and the Environment
2) Compliance with SCGs, ARARs, and Other Regulations
3) Short-Term Effectiveness
4) Long-Term Effectiveness
5) Reduction in Mobility, Toxicity, and Volume
6) Implementability
7) Cost

The analysis of alternatives is two-tiered. The first tier is comprised of two threshold factors: 1) overall protection of human health and the environment, and 2) compliance with SCGs, ARARs, and other regulations. Any selected remedy must result in overall protection of human health and the environment. Similarly, the SCGs, ARARs, and other regulations must be complied with unless there is an over riding reason why compliance is not possible. The second tier is comprised of the remaining five criteria. The relative merits and problems associated with meeting these factors must be balanced in arriving at a remedy. The issues associated with each of these seven criteria are briefly described below.

Overall Protection of Human Health and the Environment

This criterion addresses the overall protection of human health and the environment by eliminating, reducing or controlling site risks posed through the exposure pathways. This includes direct contact risks and potential risks to ecosystems.

Compliance with SCGs, ARARs, and Other Regulations

This criterion evaluates how each alternative complies with SCGs, ARARs and other regulations. The three regulatory categories of ARARs that will be considered are chemical-specific, location-specific, and action-specific. Additionally, the need for waivers will be addressed, if appropriate.

Short-Term Effectiveness

The effectiveness of an alternative in protecting human health and the environment during construction and implementation is assessed under short-term effectiveness. This criterion encompasses concerns about short-term impacts, as well as the length of time required to implement the alternative. Factors such as cross media impacts, the need to transport contaminated material through populated areas, current site operations, and the potential disruption of neighborhoods and ecosystems may be pertinent.

A site-specific health and safety plan would be prepared, which would include the potential impacts of a particular remediation activity and contain measures to address the concerns.

Long-Term Effectiveness

The evaluation of an alternative under this criterion addresses the results of the remedial action, in terms of residual risk and residual mass of VOCs remaining in a particular media after the completion of the alternative.

Reduction in Mobility, Toxicity, and Volume

This criterion involves the assessment of the following factors:

- Degree of expected reduction of VOC contamination, in terms of concentration and mass,
- The mass of VOCs or the volume of impacted media that will be destroyed or contained, and
- Degree of expected reduction of VOC mobility.

This criterion also addresses changes in risks due to changes in contaminant mobility, toxicity, or volume.

Implementability

This criterion involves an evaluation of the alternative with respect to performance, reliability, and implementability. Performance and reliability focus on the ability of the alternative to meet specific goals or clean-up levels. The implementability of an alternative addresses construction and operation in regards to the site-specific conditions. Implementability also addresses the difficulties or impediments of implementing a particular treatment option at the site. It also focuses on the time and effort required obtaining appropriate approvals, and addressing other administrative issues.

Cost

Capital and O&M order-of-magnitude maintenance costs are evaluated for each alternative under each scenario. These costs include design and construction costs, remedial action operating costs, other capital and short-term costs, costs associated with maintenance, and costs of performance evaluations, including monitoring. All costs are calculated on a present worth basis and are accurate to –30% to +50%. The USEPA 2000 Guidance document was used to establish costs and uniform comparison between remedial alternatives. Detailed cost estimates are provided in **Appendix A**.

5.2 Detailed Analysis of Individual Alternatives

Alternatives formulated in **Section 4.0** for detailed analysis are grouped by medium in this section as follows:

Groundwater Alternative 1: No Action
Groundwater Alternative 2: Extraction and treatment
Groundwater Alternative 3: Chemical Oxidation

Soil/Soil Gas/Indoor Air Alternative 1: No Action
Soil/Soil Gas/Indoor Air Alternative 2: SVE
Soil/Soil Gas/Indoor Air Alternative 3: Excavation and off-site disposal

5.2.1 Groundwater Alternative 1: No Action

The No Action alternative represents a baseline against which other applicable alternatives are measured. Under this alternative no remedial action would be taken to address the VOC contamination in the groundwater. The only activity that will be performed at the site would be 30 years of groundwater monitoring during the natural attenuation of the contaminants in the aquifer.

5.2.1.1 Overall Protection of Human Health and the Environment
This alternative would not reduce potential risks to human health or the environment.

5.2.1.2 Compliance with SCGs, ARARs, and Other Regulations
This alternative would not comply with SCGs, ARARs, and other regulations related to the VOCs in the groundwater at the site.

5.2.1.3 Short-Term Effectiveness
No short-term adverse impacts would result from implementing this alternative because there are no construction activities associated with it.

5.2.1.4 Long-Term Effectiveness
This alternative would result in a slow gradual reduction of the VOCs in both levels and toxicity as natural attenuation processes continue to occur. Residual theoretical upperbound risks would decline correspondingly from the existing theoretical risk levels.

5.2.1.5 Reduction in Mobility, Toxicity and Volume
The No Action alternative does not reduce mobility, toxicity or volume of the contaminants. Contaminants would continue to migrate (volume expansion) throughout the environment and their toxicity would remain relatively consistent with the possibility of natural attenuation having a minimal effect on the concentration levels of individual contaminants.

5.2.1.6 Implementability
Since no action would be taken to implement this alternative, technical feasibility and performance would not be an issue.

5.2.1.7 Cost
There would be limited capital or maintenance costs associated with this alternative. The only cost associated with this alternative would be for periodic groundwater monitoring. Assuming that groundwater monitoring will extend for 30 years, the total net present worth cost for this activity, as outlined in **Table A-1** in **Appendix A**, is estimated to be $264,344.

5.2.2 Groundwater Alternative 2: Extraction and Treatment

Groundwater Alternative 2 would consist of the installation of two groundwater extraction wells at OU1 and an extraction and treatment system to treat the contaminated groundwater.

Groundwater would be extracted using standard recovery wells and transferred to a treatment system. The treatment system would include an influent equalization tank, metals removal equipment, air stripper, liquid and vapor-phase GAC and an effluent equalization tank. The system would be designed to comply with the air and surface water discharge criteria.

The implementation of this alternative would include design, construction, and operation and maintenance of the groundwater treatment plant and groundwater recovery wells and pumps.

Groundwater extracted from the on-site wells would be transferred via an underground force main (header) to the treatment system, which would be located at the south end of OU1. Groundwater collected from the recovery system would be collected in an equalization tank to regulate flow and settle larger suspended solids. An air stripper and liquid-phase GAC unit would remove VOCs from the extracted groundwater. The VOCs in the air stripper off-gas would be removed in vapor-phase GAC prior to discharge to the atmosphere. Treated water would be pumped to a discharge location using a transfer pump and buried discharge pipe.

The extraction and treatment system would operate for approximately 30 years to reduce the VOC concentrations to compliance levels.

5.2.2.1 Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment as on-site VOC-impacted groundwater would be captured, treated, and prevented from further migration. This alternative would reduce the concentrations of VOCs in the aquifer to below MCLs in approximately 30 years, reduce the amount of plume growth and migration, and would, therefore, meet the RAOs presented in this FS Report.

5.2.2.2 Compliance with SCGs, ARARs, and Other Regulations

Implementation of this alternative would achieve chemical-specific ARARs on-site in approximately 30 years. This alternative would provide significant reductions of contaminants in the groundwater and reduce further migration of the contaminated groundwater. Therefore, the goal of the removal action, to minimize exposure and contaminant migration, and restoration of the aquifer, would be met by this alternative.

This alternative would also comply with action-specific and chemical-specific ARARs related to the discharge of the groundwater and the air discharge. Compliance with action-specific ARARs would be met through proper design and sizing of the remedial equipment. System effluent sampling and reporting for the treatment system would document compliance with all discharge standards. Compliance with ARARs for air emissions would be met by complying with the technical requirements of the appropriate air permitting and utilizing off-gas treatment prior to discharge. This alternative would be designed and operated to comply with applicable ARARs governing air emissions to minimize adverse impacts to human health and the environment.

5.2.2.3 Short-Term Effectiveness

Potential short-term risks to construction workers and the community may exist during the installation of the remediation system components specified within this alternative. During the installation of the extraction wells and foundation for the treatment building, exposure to contaminated media would be minimized through the use of personal protective equipment and engineering controls. Implementation of a site-specific health and safety program would minimize other short-term risks.

5.2.2.4 Long-Term Effectiveness

This alternative would provide an effective long-term remedy for COPCs present in groundwater at the Site. VOC contaminated groundwater would be removed and treated in an on-site treatment system. The extraction and treatment system would permanently capture, remove and contain existing VOC concentrations within the source area and would prevent migration of VOCs beyond the OU1 boundaries. Because each well would operate independently, certain wells may be turned off once clean-up goals are achieved while maintaining long-term effectiveness. Routine operations and maintenance of the extraction and treatment system would ensure proper system performance.

5.2.2.5 Reduction in Mobility, Toxicity and Volume

This alternative would reduce the overall volume of toxic contaminants present in the aquifer, provide a permanent remedy for reduction of contaminant toxicity, mobility and volume through extraction and treatment, and meet the USEPA statutory preference for treatment as a principal element. Implementation of this alternative would provide for moderate to high reductions in the risk of exposure from additional groundwater migration. Groundwater impacted by VOC concentrations greater than MCLs, not captured by this system, would be naturally attenuated. Based on case histories at other CERLCA sites, the extraction and treatment system would be expected to reduce VOC plume concentration, mobility, and volume significantly. VOCs within the aquifer would be expected to be reduced to MCLs in approximately 30 years.

5.2.2.6 Implementability

This alternative would be implementable at the Site. Extraction and treatment systems are commonly used for remediation of contaminated aquifers. Recovery wells can be installed at the required depths. Construction of a treatment system and a discharge water detention basin would be relatively straightforward tasks. Prior to discharging treated effluent, a discharge permit would need to be obtained.

5.2.2.7 Cost

Capital costs associated with this alternative include: the installation of on-site recovery wells, on-site extraction and treatment system and facility, and the implementation of a groundwater monitoring program. The capital cost for this alternative is approximately $1,951,750.

The present worth cost also takes into consideration the following:

- Operating and maintaining the on-site extraction wells and extraction and treatment system for approximately 30 years.
- Quarterly sampling of four wells for the first 10 years, and semi-annual groundwater sampling for the following 20 years.
- Reporting function for the duration of operation.

The total net present worth cost for the extraction and treatment system, as outlined in **Table A-2** in **Appendix A** is estimated to be $11,803,204.

5.2.3 Groundwater Alternative 3: Chemical Oxidation

This remedial alternative would consist of a solution of potassium permanganate to treat the entire saturated thickness of the OU1 contaminant plume. The permanganate solution would be injected via several injection wells to be installed across OU1. The injection wells would be screened throughout the contaminated portion of the saturated zone to maximize contact with contaminated media.

5.2.3.1 Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment as it destroys dissolved VOC contaminants and prevents further plume migration. This alternative would reduce the concentrations of VOCs in groundwater to below cleanup levels and therefore meets the RAOs presented in this FS Report.

5.2.3.2 Compliance with SCGs, ARARs, and Other Regulations

This alternative would provide for significant reductions of contaminants in the groundwater at OU1 and reduce further migration of the contaminated groundwater. Therefore, the goal of the remedial alternative, to minimize exposure and contaminant migration and restoration of the aquifer, would be met by this alternative.

5.2.3.3 Short-Term Effectiveness

Potential short-term risks to construction workers and the community might exist during activities involving the installation of monitoring wells, collection of groundwater data, and mixing and injection of permanganate. Exposure to contaminated media, during the installation of the monitoring wells, would be minimized through the use of personal protective equipment. Applicable protective gear and a spill response plan will also be used during the handling, mixing, and injection of the permanganate solution. Similar protocols would be implemented for all associated groundwater gauging and sampling activities. Additionally, short-term effects during the installation of this alternative can be minimized by implementing an effective site-specific health and safety program, and through the use of institutional controls.

5.2.3.4 Long-Term Effectiveness

This alternative would provide an effective long-term remedy for VOCs present in the groundwater at OU1. This alternative's long-term effectiveness would permanently destroy existing dissolved phase VOC concentrations on the OU1 site as well as prevent the continued off-site migration of VOCs. The alternative would provide a reduction of the total contaminant mass and prevent down-gradient VOC migration.

5.2.3.5 Reduction in Mobility, Toxicity and Volume

This alternative would reduce the overall volume of toxic contaminants present in the saturated zone; provide a permanent remedy for reduction of contaminant toxicity, mobility, and volume through treatment; and meet the USEPA statutory preference for treatment as a principal element. Groundwater impacted with VOCs not reached or affected by permanganate would be naturally attenuated.

5.2.3.6 Implementability

Permanganate is an oxidizing chemical ideal for the application to groundwater for the treatment of a variety of VOCs, specifically chlorinated ethenes. Permanganate has been used at sites throughout the country, in a variety of geologic settings for the destruction of the compounds found at OU1. Injection of permanganate would be accomplished through injection wells constructed in an identical manner to existing monitoring wells. The structure existing on-site present the only restriction to successful implementation of a permanganate injection. However, this obstacle could be overcome by the design and application of an injection system that would ensure the migration of permanganate to locations underneath the building

5.2.3.7 Cost

The capital cost for this alternative is approximately $2,615,445 with a total estimated net present worth of $2,699,487, as outlined in **Table A-3** in **Appendix A**. This cost estimate may be altered substantially based upon the results of the pilot study.

5.2.4 Soil/Soil Gas/Indoor Air Alternative 1: No Action

The No Action alternative represents a baseline against which other alternatives are measured. Under this alternative no remedial action other than the existing IRM, would be taken to address the VOC contamination in the vadose zone source area. The only other activity that would be performed at the site would be indefinite groundwater monitoring as the contaminants leach into the groundwater and undergo natural attenuation of the contaminants in the aquifer.

5.2.4.1 Overall Protection of Human Health and the Environment

This alternative would not reduce potential risks to human health and the environment.

5.2.4.2 Compliance with SCGs, ARARs, and Other Regulations

This alternative would not comply with SCGs, ARARs, and other regulations related to the VOCs found in the soils at the Site.

5.2.4.3 Short-Term Effectiveness

No short-term adverse impacts would result from implementing this alternative since there are no additional construction activities associated with it.

5.2.4.4 Long-Term Effects

This alternative would result in a gradual reduction of the VOCs in both levels and toxicity as natural attenuation processes continue to occur. Residual theoretical upper-bound risks would decline correspondingly from the existing theoretical risk levels.

5.2.4.5 Reduction in Mobility, Toxicity and Volume

The No Action alternative has a limited reduction in mobility, toxicity or volume of the contaminants. Contaminants would generally continue to migrate (volume expansion) throughout the environment and their toxicity would remain relatively consistent, with a possibility of gradual natural attenuation having a minimal effect on the concentration levels of individual contaminants over time.

5.2.4.6 Implementability

Since limited action would be taken to implement this alternative, technical feasibility and performance are not an issue.

5.2.4.7 Cost

There are limited capital or maintenance costs associated with this alternative. The only costs associated with this alternative would be for continuance of the IRM and groundwater monitoring. Assuming that soil monitoring will extend for 30 years, the total net present worth cost for this activity is estimated to be $780,119, as outlined in **Table A-4** in **Appendix A**.

5.2.5 Soil/Soil Gas/Indoor Air Alternative 2: SVE

This remedial alternative consists of the installation of approximately three deep SVE wells (to approximately 20 feet bgs) to extract contamination in the OU1 vadose zone. The OU1 vadose zone extends to approximately twenty feet below grade.

The soil vapors would be extracted using standard extraction wells and transferred to a treatment system via subsurface pipe. The on-site treatment system would treat the off- gases to achieve compliance with the appropriate air discharge criteria. The system would be located on the southern portion of OU1.

The implementation of this alternative would include the design, construction, operation and maintenance of the soil vapor extraction and treatment system.

5.2.5.1 *Overall Protection of Human Health and the Environment*

This alternative would be protective of human health and the environment because on-site VOC contamination would be extracted from the vadose zone, and would be treated to achieve air discharge limits, thus preventing further migration of contaminants from OU1.

This alternative would reduce the concentrations of VOCs in the vadose zone to below cleanup levels and reduce the amount of plume growth and migration; therefore, this alternative meets the RAOs presented in this FS Report.

5.2.5.2 *Compliance with SCGs, ARARs, and Other Regulations*

Implementation of this alternative would be expected to achieve chemical-specific ARARs on-site in approximately five years. This alternative would provide for significant reductions of contaminants in the groundwater and reduce further migration of the contaminated groundwater. Therefore, the goal of the removal action, to minimize exposure and contaminant migration, and restoration of the aquifer, would be met by this alternative.

This alternative would also comply with action-specific and chemical-specific ARARs related to the discharge of the groundwater and the air discharge. Compliance with action-specific ARARs would be met through proper design and sizing of the remedial equipment. System effluent sampling and reporting for the treatment system would document compliance with all discharge standards. Compliance with ARARs for air emissions would be met by complying with the technical requirements of the appropriate air permitting and utilizing off-gas treatment prior to discharge. This alternative would be designed and operated to comply with applicable ARARs governing air emissions to minimize adverse impacts to human health and the environment.

5.2.5.3 *Short-Term Effectiveness*

Potential short-term risks to construction workers and the community may exist during activities involving the installation of the remedial components specified within this alternative. During the installation of the extraction wells and foundation for the treatment building, exposure to contaminated media will be minimized through the use of personal protective equipment. Personal protective gear for workers during sampling activities would help minimize similar associated risks. Additionally, implementing an effective site-specific health and safety program and institutional controls can minimize short-term effects during the installation of this alternative.

This remedial alternative would be designed and operated to comply with applicable ARARs governing treated air discharge and to minimize adverse impacts to human health and the environment.

5.2.5.4 Long-Term Effectiveness

This alternative would provide an effective long-term remedy for COPCs present in the vadose zone at the Site. The vacuum extraction system would capture and remove the existing VOC contamination located within the defined source area and prevent further migration of VOCs to the aquifer.

The soil vapor recovery wells would permanently remove the contaminants of concern from the vadose zone and would provide a reduction of total contaminant mass and prevent downward VOC migration.

A long-term on-site management strategy that incorporates controlling contaminated soil exposure pathways would effectively minimize the risks associated with the VOC-contaminated source area. Routine operations and maintenance of the extraction system would ensure proper system performance. A monitoring program would be established to measure the contaminant levels present in the effluent stream prior to discharge. In addition, pressure drop would be monitored across the vacuum pump to monitor potential fouling conditions, which may impact treatment efficiency. An air monitoring program would be established to measure contaminant levels within the emissions from the air treatment unit prior to discharge. Soil monitoring data will help determine the overall effectiveness of this alternative. Routine operations and maintenance of the remediation system would ensure proper system performance.

5.2.5.5 Reduction in Mobility, Toxicity and Volume

This alternative would reduce the overall volume of toxic contaminants present in the vadose zone, provide a permanent remedy for reduction of contaminant toxicity, mobility and volume through treatment and destruction, and meet the USEPA statutory preference for treatment as a principal element. Implementation of this alternative would provide for moderate to high reductions in the risk of exposure from additional contamination of the groundwater. Remaining contamination at OU1 not captured by the SVE system would be naturally attenuated over time.

5.2.5.6 Implementability

This alternative would be readily implementable at OU1. The soil vapor extraction process is commonly used in the remediation of VOC-contaminated vadose zone soils. The system would be reliable and could achieve the specified performance criteria for removal of the organic compounds. Vapor extraction wells can be drilled to the depths required and permits regulating the discharge of the treated air stream would be attainable.

5.2.5.7 Cost

Capital costs associated with this alternative include the installation of approximately three on-site vapor extraction wells, an on-site extraction system and facility, and the implementation of a groundwater monitoring program. The capital cost for this alternative is approximately $882,041 as outlined in **Table A-5** in **Appendix A**. The total net present worth cost for the SVE alternative is estimated to be $1,460,181.

5.2.6 Soil/Soil Gas/Indoor Air Alternative 3: Excavation and Off-Site Disposal

This remedial option would include the excavation of soils where PCE concentrations exceed 1.4 mg/kg. This value is the NYSDEC's generic soil cleanup objective from TAGM 4046, unadjusted for site-specific criteria. The depth of excavation would be approximately 20 feet below grade, or to the elevation of the groundwater table. The site building would be demolished to facilitate excavation activities. The excavated soils would be transported to a permitted facility for disposal in accordance with State and Federal regulations.

5.2.6.1 Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment by removing adsorbed phase VOCs in the source area soils, thus preventing leaching to groundwater. This alternative would reduce the concentrations of VOCs in soil to below cleanup levels and therefore meets the RAOs presented in this FS report.

5.2.6.2 Compliance with SCGs, ARARs, and Other Regulations
Implementation of this alternative would achieve chemical specific ARARs by the removal and placement of contaminated soil in a permitted off-site facility. This alternative would prevent future migration of contaminants into groundwater at OU1.

5.2.6.3 Short-Term Effectiveness
Potential short-term risks to construction workers and the community may exist during the implementation of building demolition and soil excavation and transportation activities. During demolition and excavation activities, exposure to contaminated media would be minimized through the use of engineering controls and personal protective equipment. Additionally, short-term risks during the application of this alternative would be minimized by implementing an effective site-specific health and safety program and developing a spill response plan and institutional controls.

5.2.6.4 Long-Term Effectiveness
This alternative would provide an effective long-term remedy for VOCs present in the vadose zone at OU1. Placement of VOC contaminated soils in an off-site landfill would be a permanent solution to reduce the mobility of VOCs in the environment. This alternative would also eliminate the vadose zone of OU1 as a continued source of groundwater contamination, thereby presenting a reduction in the transport of contaminants to off-site properties.

5.2.6.5 Reduction in Mobility, Toxicity and Volume
This alternative would effectively eliminate the overall volume of contaminants in the vadose zone of OU1. The on-site volume, mobility and toxicity of VOC-contaminated soils would be reduced by placement in an off-site disposal facility.

5.2.6.6 Implementability
Excavation of contaminated soils is a reliable option. Sheeting and bracing of the excavation area may be required to achieve the depth of twenty feet below grade. Standard equipment and labor would be utilized to implement the building demolition and excavation activities included in this alternative.

5.2.6.7 Cost
The total estimated present worth of this alternative is $7,983,089 as outlined in **Table A-6** in **Appendix A**.

6.0 COMPARATIVE ANALYSIS

This section compares, by media, the relative performance of each of the remedial alternatives retained for further detailed analysis using the specific evaluation criteria presented in **Section 5.0**. Comparisons are presented in a qualitative manner in order to identify substantive differences between the alternatives. As with the detailed evaluation, the following criteria were used for the comparative analysis:

1) Overall Protection of Human Health and the Environment
2) Compliance with SCGs, ARARs, and Other Regulations
3) Short-Term Effectiveness
4) Long-Term Effectiveness
5) Reduction in Mobility, Toxicity, and Volume
6) Implementability
7) Cost

The qualitative comparison is outlined in the following sections.

6.1 Comparative Analysis of Groundwater Remedial Alternatives

The Groundwater Remedial Alternatives are:

Alternative 1 – No Action

Alternative 2 – Extraction and Treatment

Alternative 3 – Chemical Oxidation

6.1.1 Overall Protection of Human Health and the Environment

The comparative evaluation of overall protection of human health and the environment evaluates attainment of SCGs, as well as the analysis of other criteria evaluated for each alternative (specifically, short- and long-term effectiveness). The evaluation of this criteria focuses on such factors as the manner in which the remedial alternatives achieve protection over time, the degree to which site risks would be reduced, and the manner in which each source of COPCs would be eliminated, reduced, or controlled.

Alternative 1 (No Action) would not be protective of human health and the environment. Alternative 2 (Extraction and Treatment) and Alternative 3 (Chemical Oxidation) would be protective of human health and the environment. Alternative 2 would effectively and permanently reduce potential human health exposure to the groundwater exceeding the SCGs by capturing, treating, and preventing further migration of VOC-impacted groundwater. Alternative 3 would effectively and permanently reduce potential human health exposure to the groundwater exceeding SCGs by oxidizing (destroying) the VOCs into inert compounds. Short-term impacts to both human health and the environment during the implementation of Alternatives 2 and 3 are minimal and easily managed.

6.1.2 Compliance with SCGs, ARARs, and Other Regulations

The comparative evaluation of the compliance of each Alternative focuses on the following criteria:

- Published NYSDEC Standards, Criteria, and Guidance (SCGs); and
- Other applicable federal relevant and appropriate requirements (ARARs).

Alternative 1 (No Action) would not comply with the SCGs and ARARs related to the VOCs in groundwater. Alternatives 2 and 3 would comply with the SCGs and ARARs by either capturing, treating and preventing further migration of VOC contaminated groundwater or by oxidizing the VOCs in the groundwater to inert compounds. All remedial actions would be completed in a manner compliant with action-specific standards (i.e., New York State SPDES, DAR-1, and other applicable criteria).

6.1.3 Short-Term Effectiveness

The short-term effectiveness comparison includes the evaluation of the relative potential for impacts to the nearby communities, site worker exposures, environmental impacts, and the time frame for implementation of the alternatives.

The implementation of Alternative 1 (No Action) would result in the least short-term impact, because no action would be taken to disturb the impacted groundwater or other media at the site. Of the alternatives that will achieve the SCGs, Alternative 3 (Chemical Oxidation) is anticipated to have the greatest short-term effectiveness. Alternative 3 presents controllable risk to the nearby communities, site workers, and the environment. Any risks associated with implementing Alternative 3 would be easily managed. The time required to achieve short-term protection with Alternative 3 would be significantly shorter than any other alternative. However, due to uncertainties associated with conditions at OU1, the estimated number of permanganate doses and treatment time may increase.

Alternative 2 (Extraction and treatment) would result in minimal short-term impacts that could be easily managed. However, it is estimated that Alternative 2 will take much longer (i.e., 30 years) to achieve the groundwater SCGs.

6.1.4 Long-Term Effectiveness

The comparative evaluation of long-term effectiveness focuses on the reduction of residual risk and adequacy and reliability of controls provided by each alternative.

Alternative 3 (Chemical Oxidation) is anticipated to have the greatest long-term effectiveness. Alternative 3 would permanently destroy VOCs in the groundwater by oxidation, thereby eliminating the VOC mass in groundwater and preventing off-site migration.

Alternative 2 (Extraction and treatment) would provide an effective long-term remedy for VOCs present in groundwater. Alternative 2 would permanently capture, remove, and contain existing VOC concentrations within the groundwater and prevent migration of VOCs down-gradient.

Alternative 1 (No Action) would have minimal long-term effectiveness. Implementation of Alternative 1 would result in a gradual reduction of VOCs in the groundwater as natural attenuation processes continue to occur.

6.1.5 Reduction in Mobility, Toxicity, and Volume

The comparative evaluation of the reduction of mobility, toxicity, and volume focuses on the ability of the alternative to address the impacted material on-site, the mass of material destroyed or treated, the irreversibility of the process employed, and the nature of the impacted materials after implementation of the alternative.

Alternative 1 would rely on natural attenuation and degradation to reduce the volume and toxicity of VOCs in the groundwater. Contaminants would continue to migrate throughout the environment and their toxicity would remain relatively consistent. Natural attenuation would have a minimal effect on the concentration levels of VOCs.

Alternative 2 (Extraction and Treatment) and Alternative 3 (Chemical Oxidation) would reduce the overall volume of toxic contaminants present in the aquifer, provide a permanent remedy for the reduction of contaminant toxicity, mobility, and volume through treatment, and meet the USEPA statutory preference for treatment as a principal element. Alternative 3 is a destructive technology that would eliminate COPCs in groundwater, while Alternative 2 would transfer the COPCs from one media to another for disposal.

6.1.6 Implementability

The comparative evaluation of implementability focuses on the feasibility of construction and operation of each alternative, the administrative feasibility, the availability or required disposal facilities, technical and service personnel, and contractors.

Alternative 1 (No Action) would be readily implementable. No construction would be required to implement this alternative. Subsequently, technical feasibility and performance are not an issue.

Alternative 2 (Extraction and Treatment) and Alternative 3 (Chemical Oxidation) would be readily implementable. The extraction and treatment systems are commonly used for remediation of contaminated aquifers. Groundwater recovery wells could be installed at the required depths. Chemical Oxidation would also be readily implementable, as it has been used for the treatment of the compounds found at OU1 at sites throughout the country and in a variety of geologic settings.

6.1.7 Cost

The comparative evaluation of the cost of remediation is based on the net present worth of each alternative. The total capital, annual O&M, periodic, and present worth costs for all Alternatives are presented in **Appendix A**. The costs associated with Alternative 1 are approximately $264,344. The costs associated with Alternative 2 are approximately $11,803,204. The costs associated with Alternative 3 are approximately $2,699,487.

6.2 Comparative Analysis of Soil/Soil Gas/Indoor Air Remedial Alternatives

The Soil/Soil Gas/Indoor Air Remedial Alternatives are:

Alternative 1 – No Action
Alternative 2 – SVE
Alternative 3 – Excavation and Off-Site Disposal

6.2.1 Overall Protection of Human Health and the Environment

The comparative evaluation of overall protection of human health and the environment evaluates attainment of SCGs, as well as the analysis of other criteria evaluated for each alternative (specifically, short- and long-term effectiveness). The evaluation of this criteria focuses on such factors as the manner in which the remedial alternatives achieve protection over time, the degree to which site risks would be reduced, and the manner in which each source of COPCs would be eliminated, reduced, or controlled.

Alternative 1 (No Action) would not be protective of human health and the environment. Alternative 2 (SVE) would be protective of human health and the environment by effectively reducing the COPC concentrations below the SCGs and by reducing the amount of plume growth attributed to the migration of COPCs in soil. Alternative 3 (Excavation and Off-Site Disposal) would be protective of human health and the environment by removing soils containing COPCs and placing them in a permitted disposal facility.

Short-term impacts to both human health and the environment during the implementation of Alternatives 2 and 3 would generally be minimal and easily managed. However, Alternative 3 would result in greater short-term impacts due to the transportation risks associated with this alternative. Alternatives 2 and 3 would be considered effective measures to protect against potential long-term human health risks and environmental impacts.

6.2.2 Compliance with SCGs, ARARs, and Other Regulations

The comparative evaluation of the compliance of each Alternative focuses on the following criteria:

- Published NYSDEC Standards, Criteria, and Guidance (SCGs); and
- Other applicable federal relevant and appropriate requirements (ARARs)

Alternative 1 (No Action) would not comply with the SCGs and ARARs related to the VOCs in soil. Alternatives 2 and 3 would comply with the SCGs and ARARs by either extracting and treating/oxidizing the COPCs or removing and disposing of COPCs in a permitted facility. All remedial actions would be completed in a manner compliant with action-specific standards (i.e., NYS SPDES, DAR-1, and other applicable criteria).

6.2.3 Short-Term Effectiveness

The short-term effectiveness comparison includes the evaluation of the relative potential for impacts to the nearby communities, site worker exposures, environmental impacts, and the time frame for implementation of the alternatives.

The implementation of Alternative 1 (No Action) would result in the least short-term impact, since no action would be taken to disturb the impacted soil or other media at the site. Of the alternatives that would achieve the SCGs, Alternative 2 (SVE) would present the least risk to site workers, the environment and nearby communities. The risks associated with implementing Alternative 2 would be more easily managed than those associated with Alternative 3 (Excavation and Off-Site Disposal). However, the time required to complete Alternative 2 is significantly longer than Alternative 3. It is anticipated that Alternative 3 would be completed within several months, while Alternative 2 would be completed in approximately 5 years.

6.2.4 Long-Term Effectiveness

The comparative evaluation of long-term effectiveness focuses on the reduction of residual risk and adequacy and reliability of controls provided by each alternative.

Alternative 1 (No Action) will have a minimal long-term effectiveness. Implementation of Alternative 1 would result in a gradual reduction of VOCs in the soil as the natural attenuation processes would continue to occur.

Alternative 2 (SVE) and Alternative 3 (Excavation and Off-Site Disposal) are anticipated to provide long-term effectiveness. Since both alternatives would include the transfer of COPCs from the Site to a permitted disposal facility, the alternatives have comparable reliability.

6.2.5 Reduction in Mobility, Toxicity, and Volume

The comparative evaluation of the reduction of mobility, toxicity, and volume focuses on the ability of the alternative employed to address the impacted material on-site, the mass of material destroyed or treated, the irreversibility of the process employed, and the nature of the impacted materials after implementation of the alternative.

Alternative 1 would rely on natural attenuation and degradation to reduce the volume and toxicity of COPCs in the soil. Contaminants would continue to migrate throughout the environment and their toxicity would remain relatively consistent. Natural attenuation would have a minimal effect on the concentrations of COPCs.

Alternative 2 (SVE) would reduce the overall volume of toxic contaminants present at OU1, provide a permanent remedy for the reduction of contaminant toxicity, mobility, and volume through on-site destruction (catalytic oxidation) and/or disposal in a permitted facility, and would meet the USEPA statutory preference for treatment as a principal element.

Alternative 3 (Excavation and Off-Site Disposal) would reduce the overall toxic contaminant volume present at OU1, provide a permanent remedy for the reduction of contaminant toxicity, mobility, and volume at OU1 through removal and disposal at a permitted facility. However, Alternative 3 would not reduce the overall contaminant volume, as it would rely entirely on the removal and placement of soils in a permitted facility.

6.2.6 Implementability

The comparative evaluation of implementability focuses on the feasibility of construction and operation of each alternative, the administrative feasibility, the availability of required disposal facilities, technical and service personnel, and contractors.

Alternative 1 (No Action) would be readily implementable. No construction would be required to implement this alternative. Subsequently, technical feasibility and performance would not be an issue.

Alternative 2 (SVE) and Alternative 3 (Excavation and Off-Site Disposal) would be readily implementable. Soil vapor extraction processes are commonly used in the remediation of VOC-contaminated vadose zone soils and would not require specialized labor or materials. The system would be reliable and would achieve the specified performance criteria for removal of COPCs. Excavation of soils to the depth proposed in this FS and building demolition activities would be implementable with common labor and equipment. Sheeting and bracing may be required to safely reach the excavation depth of 20 feet, but these materials would be readily available.

6.2.7 Cost

The comparative evaluation of the cost of remediation is based on the net present worth of each alternative. The total capital, annual O&M, periodic, and present worth costs all Alternatives are presented in **Appendix A**. The costs associated with Alternative 1 are approximately $780,119. The costs associated with Alternative 2 are approximately $1,460,181. The costs associated with Alternative 3 are approximately $7,983,089.

7.0 CONCLUSIONS

The submittal of this FS represents the completion of activities set forth in the RI/FS Work Plan for the Jimmy's Dry Cleaners Site, (IT Corporation, July 20, 2001). The evaluations presented within this report are based on the characterization of the OU1 as presented in the Jimmy's Dry Cleaners Site Remedial Investigation Report dated May 2003 (Shaw).

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TABLES

Table 1-1
Indoor Air Quality Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

		NYSDOH	Sample Date				
Sample Location	**Units**	**Guidance Value**	**09/29/98**	**01/05/99**	**08/17/00**	**08/28/01**	**05/09/02**
KFC - Kitchen	ug/m^3	100	NS	NS	NS	10	70
40 Dutchess (Bsmt. Living. Rm)	ug/m^3	100	NS	NS	NS	5 (PL)	NS
40 Dutchess (Bsmt. Bdrm/baby rm)	ug/m^3	100	NS	NS	NS	5 (PL)	**490**
40 Dutchess (Kitchen/First Floor)	ug/m^3	100	NS	NS	NS	5 (PL)	**280**
Deli - Front Room	ug/m^3	100	**1250/1400**	**400/400**	**510/480**	**108**	**900/870**
Deli - Storage Room (Back)	ug/m^3	100	**930/970**	**400/400**	**490/480**	NS	NS
Dupe 1 (Deli - Front Room)	ug/m^3	100	NS	NS	NS	NS	NS
Dupe 2 (40 Dutchess.Bsmt)	ug/m^3	100	NS	NS	NS	NS	NS
Dupe 3 (Deli - Front Room)	ug/m^3	100	NS	NS	NS	NS	NS
Dupe 4 (KFC)	ug/m^3	100	NS	NS	NS	NS	NS
44 Dutchess (Jackson Bsmt./Family Rm)	ug/m^3	100	NS	NS	NS	NS	NS
44 Dutchess (First Floor/Kitchen)	ug/m^3	100	NS	NS	NS	NS	NS
34 Dutchess (Bsmt. Rec Room)	ug/m^3	100	NS	NS	NS	5 (PL)/5 (PL)	NS
34 Dutchess (Bsmt. Bdrm)	ug/m^3	100	NS	NS	NS	5 (PL)	NS
34 Dutchess (First Floor/Kitchen)	ug/m^3	100	NS	NS	NS	5 (PL)	NS
MSUP - Bld. 1 Basement, store room	ug/m^3	100	NS	NS	NS	ND	ND
MSUP - Bld. 1 First floor, southwest corner	ug/m^3	100	NS	NS	NS	ND/ND	5 (PL)
MSUP - Bld. First floor, northwest corner	ug/m^3	100	NS	NS	NS	ND	5 (PL)
MSUP - Bld. 2 First floor, front room	ug/m^3	100	NS	NS	NS	ND	5 (PL)
MSUP - Bld. 2 First floor, rear room	ug/m^3	100	NS	NS	NS	ND	ND
MSUP - Bld. 3 Basement, computer room	ug/m^3	100	NS	NS	NS	ND	5 (PL)/5 (PL)
MSUP - Bld. 3 First floor, office	ug/m^3	100	NS	NS	NS	ND	ND
MSUP - Play area southwest of Bld. 1	ug/m^3	100	NS	NS	NS	ND/ND	5 (PL)
Background	ug/m^3	100	NS	NS	NS	NA	NA

Notes:
Bold = Value exceeds NYSDOH guidance value.
MSUP = Miss Shelly's School - 66 Nassau Road.
KFC = 497 North Main Street.
All samples were sampled for Tetrachloroethene by NYSDOH Method 311-9.
NYSDOH Guidance Value references NYSDOH's "Tetrachloroethene in Indoor and Outdoor Air", May, 2003.

NS = Not sampled.
NA = Not available.
ND = Not detected.
(PL) = value detected less than the reported value.
5 (PL)/5 (PL) = Indicates that the NCDOH collected a duplicate sample from this location.

Table 1-1
Indoor Air Quality Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

		NYSDOH	Sample Date					
Sample Location	**Units**	**Guidance Value**	**07/01/02**	**11/25/02**	**01/13/03**	**03/05/03**	**05/01/03**	**09/23/03**
KFC - Kitchen	ug/m^3	100	NS	18	6.4	3.3	42	5.9
40 Dutchess (Bsmt. Living. Rm)	ug/m^3	100	5 (PL)	NS	NS	NS	NS	NS
40 Dutchess (Bsmt. Bdrm/baby rm)	ug/m^3	100	5	1.0	5.2	24	NS	6.2
40 Dutchess (Kitchen/First Floor)	ug/m^3	100	NS	NS	NS	NS	NS	NS
Deli - Front Room	ug/m^3	100	**230**	67	48	**119**	69	26
Deli - Storage Room (Back)	ug/m^3	100	NS	NS	NS	NS	NS	NS
Dupe 1 (Deli - Front Room)	ug/m^3	100	NS	NS	49	NS	NS	NS
Dupe 2 (40 Dutchess.Bsmt)	ug/m^3	100	NS	NS	NS	20	NS	NS
Dupe 3 (Deli - Front Room)	ug/m^3	100	NS	NS	NS	NS	69	NS
Dupe 4 (KFC)	ug/m^3	100	NS	NS	NS	NS	NS	5.2
44 Dutchess (Jackson Bsmt./Family Rm)	ug/m^3	100	14	7.4	NS	2.6	NS	NS
44 Dutchess (First Floor/Kitchen)	ug/m^3	100	5 (PL)	NS	NS	NS	NS	NS
34 Dutchess (Bsmt. Rec Room)	ug/m^3	100	NS	NS	NS	NS	NS	NS
34 Dutchess (Bsmt. Bdrm)	ug/m^3	100	NS	NS	NS	NS	NS	NS
34 Dutchess (First Floor/Kitchen)	ug/m^3	100	NS	NS	NS	NS	NS	NS
MSUP - Bld. 1 Basement, store room	ug/m^3	100	NS	NS	NS	NS	NS	NS
MSUP - Bld. 1 First floor, southwest corner	ug/m^3	100	NS	NS	NS	NS	NS	NS
MSUP - Bld. First floor, northwest corner	ug/m^3	100	NS	NS	NS	NS	NS	NS
MSUP - Bld. 2 First floor, front room	ug/m^3	100	NS	NS	NS	NS	NS	NS
MSUP - Bld. 2 First floor, rear room	ug/m^3	100	NS	NS	NS	NS	NS	NS
MSUP - Bld. 3 Basement, computer room	ug/m^3	100	NS	NS	NS	NS	NS	NS
MSUP - Bld. 3 First floor, office	ug/m^3	100	NS	NS	NS	NS	NS	NS
MSUP - Play area southwest of Bld. 1	ug/m^3	100	NS	NS	NS	NS	NS	NS
Background	ug/m^3	100	NS	1.7	2.4	4.0	15	6.2

Notes:

Bold = Value exceeds NYSDOH guidance value.
MSUP = Miss Shelly's School - 66 Nassau Road.
KFC = 497 North Main Street.
All samples were sampled for Tetrachloroethene by NYSDOH Method 311-9.
NYSDOH Guidance Value references NYSDOH's "Tetrachloroethene in Indoor and Outdoor Air", May, 2003.

NS = Not sampled.
NA = Not available.
ND = Not detected.
(PL) = value detected less than the reported value.
5 (PL)/5 (PL) = Indicates that the NCDOH collected a duplicate sample from this location.

Table 1-2
Soil Gas Analytical Data
NYSDEC - Jimmys Dry Cleaner
Roosevelt, New York

Sample ID:	**ITVP-1**	**ITVP-2**	**ITVP-3*D10**	**ITVP-3B**	**ITVP-4*D10**	**ITVP-4B**	**ITVP-5**	**ITVP-6*D10**	**ITVP-7**
Sample Date:	8/6/01	8/6/01	8/6/01	8/9/01	8/6/01	8/9/01	8/6/01	8/6/01	8/7/01
Units:	**mg/m^3**	**mg/m^3**	**mg/m^3**	**mg/m^3**	**mg/m^3**	**mg/m^3**	**mg/m^3**	**mg/m^3**	**mg/m^3**
Volatile Organic Compounds									
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	NS
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	NS
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	NS
Tetrachloroethene	**17 J**	**190 EJ**	**400 J**	**130 E**	**510 EJ**	**110 E**	**130 EJ**	**1000 EJ**	NS
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS
M & P Xylene	ND	ND	ND	ND	ND	ND	ND	ND	NS
O Xylene	ND	ND	ND	ND	ND	ND	ND	ND	NS
1,1-Dichloroethene	**3.4**	ND	ND	ND	ND	ND	**1.8**	ND	**1.8**
Methylene Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND
t-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
c-1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Method Detection Limit	0.020	0.020	0.200	0.020	0.200	0.020	0.020	0.200	0.020
Total VOCs	**20.4 J**	**190 EJ**	**400 J**	**130 E**	**510 EJ**	**110 E**	**131.8 EJ**	**1000 EJ**	**1.8**

Notes:
Bold = Analytes detected above the detection limit.
*D = Dilution Factor.
ND = Not detected.
J = Indicates that the analyte concentration exceeded the Calibration Range.

Table 1-2
Soil Gas Analytical Data
NYSDEC - Jimmys Dry Cleaner
Roosevelt, New York

Sample ID:	**ITVP-7*D50**	**ITVP-9*D200**	**ITVP-10*D200**	**ITVP-11**	**ITVP-12**	**ITVP-13*D10**	**ITVP-13*D50**	**ITVP-14*D10**
Sample Date:	8/7/01	8/8/01	8/8/01	8/7/01	8/6/01	8/6/01	8/6/01	8/6/01
Units:	**mg/m^3**	**mg/m^3**	**mg/m^3**	**mg/m^3**	**mg/m^3**	**mg/m^3**	**mg/m^3**	**mg/m^3**
Volatile Organic Compounds								
Vinyl Chloride	ND	ND	ND	ND	ND	NS	ND	NS
Benzene	ND	ND	ND	ND	ND	NS	ND	NS
Toluene	ND	ND	ND	ND	ND	NS	ND	NS
Tetrachloroethene	**510 J**	**6000**	**26000 E**	**48 J**	**52 J**	NS	**3900 EJ**	NS
Ethylbenzene	ND	ND	**71**	ND	ND	NS	ND	NS
M & P Xylene	ND	ND	**77**	ND	ND	NS	ND	NS
O Xylene	ND	ND	**100**	ND	ND	NS	ND	NS
1,1-Dichloroethene	NS	ND	ND	ND	ND	ND	NS	ND
Methylene Chloride	NS	ND	ND	ND	ND	ND	NS	ND
t-1,2-Dichloroethene	NS	ND	ND	ND	ND	ND	NS	ND
1,1-Dichloroethane	NS	ND	ND	ND	ND	ND	NS	ND
c-1,2-Dichloroethane	NS	ND	ND	ND	ND	ND	NS	ND
1,1,1-Trichloroethane	NS	ND	ND	ND	ND	ND	NS	ND
1,2-Dichloroethane	NS	ND	ND	ND	ND	ND	NS	ND
Trichloroethene	NS	ND	ND	ND	ND	ND	NS	**18**
Method Detection Limit	1.0	4.0	4.0	0.020	0.020	0.200	1.0	0.200
Total VOCs	**510 J**	**6000**	**26248 E**	**48 J**	**52 J**	**BDL**	**3900 EJ**	**18**

Notes:
Bold = Analytes detected above the detection limit.
*D = Dilution Factor.
ND = Not detected.
J = Indicates that the analyte concentration exceeded the Calibration Range.

Table 1-2
Soil Gas Analytical Data
NYSDEC - Jimmys Dry Cleaner
Roosevelt, New York

Sample ID:	**ITVP-14*D50**	**ITVP-15**	**ITVP-15*D10**	**ITVP-16**	**ITVP-17**	**ITVP-18**	**ITVP-19**	**ITVP-19*D10**	**ITVP-20**
Sample Date:	8/6/01	8/7/01	8/7/01	8/7/01	8/7/01	8/7/01	8/7/01	8/7/01	8/7/01
Units:	mg/m^3	mg/m^3	mg/m^3	mg/m^3	mg/m^3	mg/m^3	mg/m^3	mg/m^3	mg/m^3
Volatile Organic Compounds									
Vinyl Chloride	ND	NS	ND	ND	ND	ND	NS	ND	ND
Benzene	ND	NS	ND	ND	ND	ND	NS	ND	ND
Toluene	ND	NS	ND	ND	ND	ND	NS	ND	ND
Tetrachloroethene	**2500 EJ**	NS	**410 J**	**36 J**	**39 J**	**40 J**	NS	**280**	**130 J**
Ethylbenzene	ND	NS	ND	ND	ND	ND	NS	ND	ND
M & P Xylene	ND	NS	ND	ND	ND	ND	NS	ND	ND
O Xylene	ND	NS	ND	ND	ND	ND	NS	ND	ND
1,1-Dichloroethene	ND	ND	NS	ND	ND	ND	ND	ND	**1.1**
Methylene Chloride	ND	ND	NS	ND	ND	ND	ND	ND	ND
t-1,2-Dichloroethene	ND	ND	NS	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	NS	ND	ND	ND	ND	ND	ND
c-1,2-Dichloroethane	ND	ND	NS	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	NS	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	NS	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	NS	ND	ND	ND	ND	ND	ND
Method Detection Limit	1.0	0.020	0.200	0.020	0.020	0.020	0.020	0.200	0.020
Total VOCs	**2500 EJ**	**BDL**	**410 J**	**36 J**	**39 J**	**40 J**	**BDL**	**280**	**131.1 J**

Notes:
Bold = Analytes detected above the detection limit.
*D = Dilution Factor.
ND = Not detected.
J = Indicates that the analyte concentration exceeded the Calibration Range.

Table 1-2
Soil Gas Analytical Data
NYSDEC - Jimmys Dry Cleaner
Roosevelt, New York

Sample ID:	**ITVP-21**	**ITVP-22**	**ITVP-23**	**ITVP-24**	**ITVP-25**	**ITVP-26**	**ITVP-27**	**ITVP-28**	**ITVP-29**
Sample Date:	3/7/02	3/7/02	3/7/02	3/7/02	3/7/02	3/7/02	3/7/02	3/7/02	3/7/02
Units:	**mg/m^3**	**mg/m^3**	**mg/m^3**	**mg/m^3**	**mg/m^3**	**mg/m^3**	**mg/m^3**	**mg/m^3**	**mg/m^3**
Volatile Organic Compounds									
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	NN	NN	NN	NN	NN	NN	NN	NN	ND
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlororodiflurομethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	**1.0**	**2.0**	**2.0**	ND
cis-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	**77 E**	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND	**1.0**	ND	ND
Styrene	ND	ND	ND	ND	ND	ND	ND	ND	
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	**1100 E**	**2100 E**	ND	**6.0**	**1.0**	**2.0**	**590 E**	**110 E**
Toluene	ND	ND	ND	ND	**180 E**	ND	ND	ND	**2.0**
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	**4.0**	ND	ND	ND	ND	ND	ND
Trichlorotrifluoroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND
m,p-Xylene	ND	ND	ND	ND	**240 E**	ND	**1.0**	ND	ND
o-Xylene	ND	ND	ND	ND	**81 E**	ND	ND	ND	ND
Method Detection Limit	1.0	1000	1000	1000	1000	1000	1000	1000	1000
Total VOCs	**BDL**	**1100 E**	**2104 E**	**BDL**	**584 E**	**2**	**6**	**592 E**	**112 E**

Notes:
Bold = Analytes detected above the detection limit.
*D = Dilution Factor.
ND = Not detected.
J = Indicates that the analyte concentration exceeded the Calibration Range.

Table 1-2
Soil Gas Analytical Data
NYSDEC - Jimmys Dry Cleaner
Roosevelt, New York

Sample ID:	**ITVP-30**	**ITVP-31**	**ITVP-32**	**ITVP-33**
Sample Date:	3/7/02	3/7/02	3/7/02	3/7/02
Units:	**mg/m^3**	**mg/m^3**	**mg/m^3**	**mg/m^3**
Volatile Organic Compounds				
Benzene	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND
Carbon tetrachloride	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND
Chloromethane	ND	ND	ND	ND
1,2-Dibromoethane	ND	ND	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND
Dichlorodifluromethane	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND
cis-1,2-Dichloroethene	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND
cis-1,3-Dichloropropene	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	ND	ND	ND
Ethylbenzene	ND	**4.0**	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND
Styrene	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND
Tetrachloroethene	ND	**5.0**	**2.0**	**2.0**
Toluene	ND	**11.0**	ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND
Trichlorotrifluoroethane	ND	ND	ND	ND
1,2,4-Trimethylbenzene	ND	ND	ND	ND
Vinyl chloride	ND	ND	ND	ND
m,p-Xylene	ND	**16.0**	ND	ND
o-Xylene	ND	**5.0**	ND	ND
Method Detection Limit	1000	1000	1000	1000
Total Vocs	**BDL**	**41**	**2**	**2**

Notes:
Bold = Analytes detected above the detection limit.
*D = Dilution Factor.
ND = Not detected.
J = Indicates that the analyte concentration exceeded the Calibration Range.

Table 1-3
Soil Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		**SP-1**	**SP-2**	**SP-2**	**SP-3**	**SP-5**	**SP-5**	**SP-6**	**South Lot**	**ITSB - 1**	**ITSB - 1**	**ITSB - 1**
Sample Depth (ft.):		5-7	0-2	5-7	13-15	0-2	5-7	5-7	0-2	0-4	4-8	8-12
Sample Date:		12/4/95	12/4/95	12/4/95	12/4/95	12/4/95	12/4/95	12/4/95	12/4/95	8/6/01	8/6/01	8/6/01
Units:		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Volatile Organic Compounds	**NYSDEC**											
by EPA Method 8021:	**Guidance Values**											
Vinyl Chloride	**120**	NS	NS	NS	NS	NS	NS	NS	NS	ND	ND	ND
Benzene	**60**	NS	NS	NS	NS	NS	NS	NS	NS	ND	ND	ND
Toluene	**1500**	NS	NS	NS	NS	NS	NS	NS	NS	ND	ND	ND
Tetrachloroethene	**1400**	**5**	**120**	**7**	**6**	**9**	**79**	**45**	**46**	**190.0**	ND	**58.0**
Ethylbenzene	**5500**	NS	NS	NS	NS	NS	NS	NS	NS	ND	ND	ND
M & P Xylene	**1200**	ND	**7**	ND	ND	ND	ND	ND	ND	ND	ND	ND
O Xylene	**1200**	ND	ND	ND	ND	ND	ND	ND	**100**	ND	ND	ND
1,1-Dichloroethene	**400**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	**100**	**8**	**9**	**8**	**5**	**6**	**8**	**7**	**8**	**240.0**	**240.0**	**230.0**
t-1, 2-Dichloroethene	**300**	NS	NS	NS	NS	NS	NS	NS	NS	ND	ND	ND
1,1-Dichloroethane	**200**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
c-1, 2-Dichloroethane	**NP**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	**760**	ND	**23**	**23**	**23**	**6**	**28**	**9**	**28**	ND	ND	ND
1, 2-Dichloroethane	**100**	NS	NS	NS	NS	NS	NS	NS	NS	ND	ND	ND
Trichloroethene	**700**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	**NP**	ND	**5**	ND	ND	ND	ND	ND	**5**	NS	NS	NS
1,3,5-Trimethylbenzene	**NP**	ND	ND	ND	ND	ND	**8**	ND	**270**	NS	NS	NS
p-Isopropyltoluene	**NP**	ND	ND	ND	ND	ND	**5**	ND	**26**	NS	NS	NS
Napthalene	**13000**	ND	ND	ND	ND	ND	ND	ND	**120**	NS	NS	NS
Method Detection Limit		NA	NA	NA	NA	NA	NA	NA	NA	50.0	50.0	50.0
Total VOCs		13	164	38	34	21	128	61	713	**430.0**	**240.0**	**288.0**

Notes:
ND = Not Detected.
NP = Not Promulgated.
NA = Not Available.
NS = Not sampled.
Bold = Analytes detected above the detection limit.
Shaded = Values above the guidance value.
D* = Dilution Factor.
NYSDEC Guidance Values reported from TAGM 4046 soil clean up objectives, 1994 and reported in ug/kg (ppb).

Table 1-3
Soil Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		ITSB - 1	ITSB - 1	ITSB - 2	ITSB - 2	ITSB - 2	ITSB - 2	ITSB - 2	ITSB - 3	ITSB - 3	ITSB - 3	ITSB - 3
Sample Depth (ft.):		12-16	16-20	0-4	4-8	8-12	12-16	16-20	0-4	4-8	8-12	12-16
Sample Date:		8/6/01	8/6/01	8/7/01	8/7/01	8/7/01	8/7/01	8/7/01	8/6/01	8/6/01	8/6/01	8/6/01
Units:		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Volatile Organic Compounds	NYSDEC											
by EPA Method 8021:	Guidance Values											
Vinyl Chloride	120	ND	ND	ND	ND	ND	ND	ND	ND	ND	353.1	376.7
Benzene	60	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	1500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	1400	ND	ND	360.0	1100.0	9800.0E	1400.0E	2000.0E	140.0	1200.0	1900.0	2600.0
Ethylbenzene	5500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M & P Xylene	1200	ND	ND	ND	ND	ND	ND	ND	ND	ND	53.0	ND
O Xylene	1200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	400	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	100	250.0	230.0	210.0	230.0	130.0	260.0	230.0	250.0	220.0	310.0	270.0
t-1, 2-Dichloroethene	300	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
c-1, 2-Dichloroethane	NP	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	760	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1, 2-Dichloroethane	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	700	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	NP	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1,3,5-Trimethylbenzene	NP	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
p-Isopropyltoluene	NP	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Napthalene	13000	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Method Detection Limit		50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
Total VOCs		250.0	230.0	570.0	1330.0	9930.0 E	1660.0 E	2230.0 E	390.0	1420.0	2616.1	3246.7

Notes:
ND = Not Detected.
NP = Not Promulgated.
NA = Not Available.
NS = Not sampled.
Bold = Analytes detected above the detection limit.
Shaded = Values above the guidance value.
D* = Dilution Factor.
NYSDEC Guidance Values reported from TAGM 4046 soil clean up objectives, 1994 and reported in ug/kg (ppb).

Table 1-3
Soil Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		ITSB - 3	ITSB - 3	ITSB - 3	ITSB - 3	ITSB - 3	ITSB - 4	ITSB - 4	ITSB - 4	ITSB - 4	ITSB - 4
Sample Depth (ft.):		0-4	4-8	8-12	12-16	16-20	0-4	4-8	8-12	12-16	16-18
Sample Date:		8/6/01	8/6/01	8/6/01	8/6/01	8/6/01	8/8/01	8/8/01	8/8/01	8/8/01	8/8/01
Units:		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Volatile Organic Compounds by EPA Method 8021:	NYSDEC Guidance Values										
Vinyl Chloride	120	ND	ND	353.1	376.7	342.7	ND	110.0	ND	ND	ND
Benzene	60	ND	ND	ND	ND	ND	180.0	170.0	ND	ND	ND
Toluene	1500	ND	ND	ND	ND	ND	190.0	180.0	ND	ND	ND
Tetrachloroethene	1400	140.0	1200.0	1900.0	2600.0	6616.6 D*5	23000.0E	680.0	270.0	170.0	490.0
Ethylbenzene	5500	ND	ND	ND	ND	ND	190.0	190.0	ND	ND	ND
M & P Xylene	1200	ND	ND	53.0	ND	ND	180.0	170.0	ND	ND	ND
O Xylene	1200	ND	ND	ND	ND	ND	180.0	160.0	ND	ND	ND
1,1-Dichloroethene	400	ND	ND	ND	ND	ND	130.0	260.0	ND	ND	ND
Methylene Chloride	100	250.0	220.0	310.0	270.0	6600.0E	730.0	830.0	520.0	560.0	610.0
t-1, 2-Dichloroethene	300	ND	ND	ND	ND	ND	ND	300.0	ND	ND	ND
1,1-Dichloroethane	200	ND	ND	ND	ND	ND	ND	160.0	ND	ND	ND
c-1, 2-Dichloroethane	NP	ND	ND	ND	ND	ND	ND	110.0	ND	ND	ND
1,1,1-Trichloroethane	760	ND	ND	ND	ND	ND	ND	270.0	ND	ND	ND
1, 2-Dichloroethane	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	700	ND	ND	ND	ND	ND	ND	170.0	ND	ND	ND
1,2,4-Trimethylbenzene	NP	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1,3,5-Trimethylbenzene	NP	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
p-Isopropyltoluene	NP	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Napthalene	13000	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Method Detection Limit		50.0	50.0	50.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0
Total VOCs		390.0	1420.0	2616.1	3246.7	13559.3 ED*5	24780 E	3760.0	790.0	730.0	1000.0

Notes:
ND = Not Detected.
NP = Not Promulgated.
NA = Not Available.
NS = Not sampled.
Bold = Values above the detection limit.
Shaded = Analytes detected above the guidance value.
D* = Dilution Factor.
NYSDEC Guidance Values reported from TAGM 4046 soil clean up objectives, 1994 and reported in ug/kg (ppb).

Table 1-3
Soil Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		ITSB - 4	ITSB - 5	ITSB - 5	ITSB - 5	ITSB - 5	ITSB - 5	ITSB - 5	ITSB - 5
Sample Depth (ft.):		18-20	0-4	4-8	8-12	12-14	14-16	16-18	18-20
Sample Date:		8/8/01	8/8/01	8/8/01	8/8/01	8/8/01	8/8/01	8/8/01	8/8/01
Units:		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Volatile Organic Compounds	**NYSDEC**								
by EPA Method 8021:	**Guidance Values**								
Vinyl Chloride	**120**	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	**60**	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	**1500**	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	**1400**	**3100.0**	**33000.0E**	**1400.0**	**1800.0**	**1500.0**	**890.0**	**2300.0**	**330000.0E**
Ethylbenzene	**5500**	ND	ND	ND	ND	ND	ND	ND	ND
M & P Xylene	**1200**	ND	ND	ND	ND	ND	ND	ND	ND
O Xylene	**1200**	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	**400**	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	**100**	470.0	1100.0	1500.0	1400.0	1300.0	1200.0	1300.0	ND
t-1, 2-Dichloroethene	**300**	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	**200**	ND	ND	ND	ND	ND	ND	ND	ND
c-1, 2-Dichloroethane	**NP**	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	**760**	ND	ND	ND	ND	ND	ND	ND	ND
1, 2-Dichloroethane	**100**	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	**700**	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	**NP**	NS	NS	NS	NS	NS	NS	NS	NS
1,3,5-Trimethylbenzene	**NP**	NS	NS	NS	NS	NS	NS	NS	NS
p-Isopropyltoluene	**NP**	NS	NS	NS	NS	NS	NS	NS	NS
Napthalene	13000	NS	NS	NS	NS	NS	NS	NS	NS
Method Detection Limit		100.0	250.0	250.0	250.0	250.0	250.0	250.0	2500.0
Total VOCs		**3570.0**	**34100.0 E**	**2900.0**	**2200.0**	**2800.0**	**2090.0**	**3600.0**	**330000 E**

Notes:
ND = Not Detected.
NP = Not Promulgated.
NA = Not Available.
NS = Not sampled.
Bold = Values above the detection limit.
Shaded = Analytes detected above the guidance value.
D* = Dilution Factor.
NYSDEC Guidance Values reported from TAGM 4046 soil clean up objectives, 1994 and reported in ug/kg (ppb).

Table 1-3
Soil Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		ITSB - 6	ITSB - 6	ITSB - 6	ITSB - 6	ITSB - 6	ITSB - 6	ITSB - 7	ITSB - 7	ITSB - 7	ITSB - 7	ITSB - 7
Sample Depth (ft.):		0-4	4-8	8-12	12-16	16-20	20-24	0-4	4-8	8-12	12-16	16-20
Sample Date:		8/7/01	8/7/01	8/7/01	8/7/01	8/7/01	8/7/01	8/6/01	8/6/01	8/6/01	8/6/01	8/6/01
Units:		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Volatile Organic Compounds	NYSDEC											
by EPA Method 8021:	Guidance Values											
Vinyl Chloride	120	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	60	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	1500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	1400	260.0	1500.0	ND	85.0	5900.0E	160.0	1100.0	180.0	8400.0 E	790.0	88.0
Ethylbenzene	5500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M & P Xylene	1200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
O Xylene	1200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	400	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	100	240.0	150.0	160.0	160.0	140.0	140.0	250.0	170.0	200.0	ND	160.0
t-1, 2-Dichloroethene	300	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
c-1, 2-Dichloroethane	NP	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	760	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1, 2-Dichloroethane	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	700	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	NP	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1,3,5-Trimethylbenzene	NP	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
p-Isopropyltoluene	NP	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Napthalene	13000	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Method Detection Limit		50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	500.0	50.0
Total VOCs		500.0	1650.0	160.0	160.0	6040.0 E	300.0	1350.0	350.0	9000.0 E	790.0	248.0

Notes:
ND = Not Detected.
NP = Not Promulgated.
NA = Not Available.
NS = Not sampled.
Bold = Analytes detected above the detection limit.
Shaded = Values above the guidance value.
D* = Dilution Factor.
NYSDEC Guidance Values reported from TAGM 4046 soil clean up objectives, 1994 and reported in ug/kg (ppb).

Table 1-3
Soil Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		ITSB - 8	ITSB - 8	ITSB - 8	ITSB - 8	ITSB - 8
Sample Depth (ft.):		0-4	4-8	8-12	12-16	16-20
Sample Date:		8/6/01	8/6/01	8/6/01	8/6/01	8/6/01
Units:		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Volatile Organic Compounds	**NYSDEC**					
by EPA Method 8021:	**Guidance Values**					
Vinyl Chloride	**120**	ND	ND	ND	ND	ND
Benzene	**60**	ND	ND	ND	ND	ND
Toluene	**1500**	ND	ND	ND	ND	ND
Tetrachloroethene	**1400**	**960.0**	**310.0**	**250.0**	**320.0**	**80.0**
Ethylbenzene	**5500**	ND	ND	ND	ND	ND
M & P Xylene	**1200**	ND	ND	ND	ND	ND
O Xylene	**1200**	ND	ND	ND	ND	ND
1,1-Dichloroethene	**400**	ND	ND	ND	ND	ND
Methylene Chloride	**100**	**200.0**	**200.0**	**240.0**	**210.0**	**150.0**
t-1, 2-Dichloroethene	**300**	ND	ND	ND	ND	ND
1,1-Dichloroethane	**200**	ND	ND	ND	ND	ND
c-1, 2-Dichloroethane	**NP**	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	**760**	ND	ND	ND	ND	ND
1, 2-Dichloroethane	**100**	ND	ND	ND	ND	ND
Trichloroethene	**700**	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	**NP**	NS	NS	NS	NS	NS
1,3,5-Trimethylbenzene	**NP**	NS	NS	NS	NS	NS
p-Isopropyltoluene	**NP**	NS	NS	NS	NS	NS
Napthalene	13000	NS	NS	NS	NS	NS
Method Detection Limit		50.0	50.0	50.0	50.0	50.0
Total VOCs		**1160.0**	**510.0**	**490.0**	**530.0**	**240.0**

Notes:
ND = Not Detected.
NP = Not Promulgated.
NA = Not Available.
NS = Not sampled.
Bold = Analytes detected above the detection limit.
Shaded = Values above the guidance value.
D* = Dilution Factor.
NYSDEC Guidance Values reported from TAGM 4046 soil clean up objectives, 1994 and reported in ug/kg (ppb).

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		**ITDGW-1**	**ITDGW-1**	**ITDGW-1**	**ITDGW-2**	**ITDGW-2**	**ITDGW-2**	**ITDGW-3**	**ITDGW-3**
Screen Interval (ft.bgs):		24-20	40-36	55-51	24-20	40-36	55-51	26-30	38-42
Sample Date:		8/9/2001	8/9/2001	8/9/2001	8/9/2001	8/9/2001	8/9/2001	8/7/2001	8/7/2001
Units:	**NYSDEC**	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	**GW Standard**								
Vinyl Chloride	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	1	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.7	<10	**680.0**	**190.0**	ND	**280.0**	<1000	**990.0E**	ND
Ethylbenzene	5	ND	ND	ND	ND	ND	ND	ND	ND
m,p-Xylenes	5	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	5	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	0.7	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	5	ND	ND	ND	ND	ND	ND	ND	ND
trans 1, 2 Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND
cis 1, 2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	1	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.6	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	1	ND	ND	ND	ND	ND	ND	ND	ND
Method Detection Limit		20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Total VOCs		ND	**680**	**190**	<20	**280**	<1000	**990 E**	ND

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC
NS: Not sampled.
ND: not detected above method detection limit.
Bold : concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		ITDGW-3	ITDGW-4	ITDGW-4	ITDGW-4	ITDGW-5	ITDGW-5	ITDGW-5
Screen Interval (ft.bgs):		58-62	24-20	40-36	52-48	20-24	36-40	56-60
Sample Date:		8/7/2001	8/9/2001	8/9/2001	8/9/2001	8/10/2001	8/10/2001	8/10/2001
Units:	**NYSDEC**	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	**GW Standard**							
Vinyl Chloride	0.3	ND	ND	ND	ND	**1.1**	ND	ND
Benzene	1	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.7	**860.0E**	**79.0**	**79.0**	**72.0**	**1.4**	**1.5**	**1.3**
Ethylbenzene	5	ND	ND	ND	ND	ND	ND	ND
m,p-Xylenes	5	ND	ND	ND	ND	ND	ND	ND
o-Xylene	5	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	0.7	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	5	ND	ND	ND	ND	ND	ND	ND
trans 1, 2 Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND
cis 1, 2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	1	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.6	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	1	ND	ND	ND	ND	ND	ND	ND
Method Detection Limit		20.0	20.0	20.0	20.0	1.0	1.0	1.0
Total VOCs		**860 E**	**79**	**79**	**72**	**2.5**	**1.5**	**1.3**

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.
NS: Not sampled.
ND: not detected above method detection limit.
Bold : concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		**ITDGW-6**	**ITDGW-6**	**ITDGW-7**	**ITDGW-7**	**ITDGW-7**
Screen Interval (ft.bgs):		36-40	60-64	20-24	36-40	56-60
Sample Date:		8/10/2001	8/10/2001	8/10/2001	8/10/2001	8/10/2001
Units:	**NYSDEC**	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	**GW Standard**					
Vinyl Chloride	0.3	ND	ND	ND	ND	ND
Benzene	1	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND
Tetrachloroethene	0.7	**6.4**	ND	ND	ND	**9.1**
Ethylbenzene	5	ND	ND	ND	ND	ND
m,p-Xylenes	5	ND	ND	ND	ND	ND
o-Xylene	5	ND	ND	ND	ND	ND
1,1-Dichloroethene	0.7	ND	ND	ND	ND	ND
Methylene Chloride	5	ND	ND	ND	ND	ND
trans 1, 2 Dichloroethene	5	ND	ND	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND	ND	ND
cis 1, 2-Dichloroethene	5	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	1	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.6	ND	ND	ND	ND	ND
Trichloroethene	1	ND	ND	ND	ND	ND
Method Detection Limit		1.0	1.0	1.0	1.0	1.0
Total VOCs		**6.4**	**BDL**	**BDL**	**BDL**	**9.1**

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.
NS: Not sampled.
ND: not detected above method detection limit.
Bold : concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		**GWGP-1**	**GWGP-2**	**SP-1**	**SP-2**	**DW-1 (1)**	**SP-4**	**SP-5**	**SP-6**
Screen Interval (ft.bgs):		na	na	21'-23'	21'-23'	na	21'-23	21'-23'	21'-23'
Sample Date:		4/7/1994	4/7/1994	12/4/1995	12/4/1995	12/4/1995	12/4/1995	12/4/1995	12/4/1995
Units:	**NYSDEC**	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	**GW Standard**								
1,1 Dichloroethene	5	ND	**1**	ND	ND	ND	ND	ND	ND
1,1 Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND
c,1-2 Dichloroethylene	5	ND	ND	ND	ND	ND	ND	**5**	**4**
trans,1-2 Dichloroethylene	5	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1 Trichloroethane	5	ND	ND	ND	ND	ND	ND	**1**	**1**
1,1,2 Trichloroethane	1	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	**17**	ND
Chloroform	7	ND	ND	ND	ND	**1**	**3**	**2**	ND
Chlorobenzene	5	ND	ND	ND	ND	ND	ND	**1**	ND
Bromoform	50	ND	ND	ND	ND	**3**	ND	ND	ND
Bromodichloromethane	50	ND	ND	ND	ND	**3**	ND	ND	ND
Dichlorodifluoromethane	20	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	50 (guid)	ND	ND	ND	ND	**6**	ND	ND	ND
methyl-tert butly ether	10 (guid)	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene (TCE)	5	**420**	**21**	ND	ND	ND	ND	**11**	**5**
Tetrachloroethene (PCE)	5	**38,000**	**31,000**	**1**	**54**	**120**	**1,600**	**32,000**	**11,000**
Total VOCs	na	**38,420**	**31,022**	**1**	**54**	**133**	**1,603**	**32,037**	**11,010**

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.
NS: Not sampled.
ND: not detected above method detection limit.
Bold : concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		**GP-1**	**GP-1**	**GP-1**	**GP-2**	**GP-2**	**GP-2**	**GP-3**	**GP-3**	**GP-3**
Screen Interval (ft.bgs):		19'	44'	67'	20'	44'	63'	20'	44'	60'
Sample Date:		11/03/99	11/03/99	11/03/99	11/04/99	11/04/99	11/04/99	11/04/99	11/99	11/99
Units:	**NYSDEC**	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	**GW Standard**									
1,1 Dichloroethene	5	NA	NA	NA	ND	ND	NA	ND	ND	ND
1,1 Dichloroethane	5	NA	NA	NA	ND	ND	NA	ND	**8**	**7**
c,1-2 Dichloroethylene	5	NA	NA	NA	ND	ND	NA	**180**	4	4
trans,1-2 Dichloroethylene	5	NA	NA	NA	ND	ND	NA	**7**	ND	ND
1,1,1 Trichloroethane	5	NA	NA	NA	ND	ND	NA	ND	**9**	**7**
1,1,2 Trichloroethane	1	NA	NA	NA	ND	ND	NA	ND	**16**	**6**
1,1,1,2-Tetrachloroethane	5	NA	NA	NA	ND	ND	NA	ND	ND	ND
Chloroform	7	NA	NA	NA	ND	ND	NA	ND	ND	ND
Chlorobenzene	5	NA	NA	NA	ND	ND	NA	ND	ND	ND
Bromoform	50	NA	NA	NA	ND	ND	NA	ND	ND	ND
Bromodichloromethane	50	NA	NA	NA	ND	ND	NA	ND	ND	ND
Dichlorodifluoromethane	20	NA	NA	NA	ND	ND	NA	ND	ND	ND
Dibromochloromethane	50 (guid)	NA	NA	NA	ND	ND	NA	ND	ND	ND
methyl-tert butly ether	10 (guid)	NA	NA	NA	ND	ND	NA	ND	**14**	**14**
Trichloroethylene (TCE)	5	NA	NA	NA	ND	ND	NA	**710**	ND	**3**
Tetrachloroethene (PCE)	5	0 (3)	**50 (3)**	**198**	**4,600**	**500**	**176 (3)**	**51**	**1,000**	**460**
Total VOCs		0(3)	**50(3)**	**198**	**4,600**	**500**	**176(3)**	**948**	**1,051**	**501**

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.
NS: Not sampled.
ND: not detected above method detection limit.
Bold : concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		GP-4	GP-4	GP-4	GP-5	GP-5	GP-5	GP-6	GP-6	GP-6	GP-7	GP-7	GP-7
Screen Interval (ft.bgs):		20'	46'	80'	20'	46'	72'	21'	49'	81'	20'	46'	62'
Sample Date:		11/05/99	11/05/99	11/05/99	11/09/99	11/09/99	11/09/99	11/10/99	11/10/99	11/10/99	11/11/99	11/11/99	11/11/99
Units:	**NYSDEC**	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	**GW Standard**												
1,1 Dichloroethene	5	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1 Dichloroethane	5	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**7**
c,1-2 Dichloroethylene	5	NA	**6**	ND	ND	ND	ND	ND	ND	ND	ND	ND	**160**
trans,1-2 Dichloroethylene	5	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1 Trichloroethane	5	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2 Trichloroethane	1	NA	ND	ND	ND	**1**	ND	ND	**9**	ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	5	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	7	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	5	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	50	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	50	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	20	NA	ND	ND	ND	ND	3	ND	ND	**9**	ND	ND	ND
Dibromochloromethane	50 (guid)	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
methyl-tert butly ether	10 (guid)	NA	ND	ND	ND	**1**	**4**	ND	**3**	10	ND	ND	**4**
Trichloroethylene (TCE)	5	NA	ND	ND	**1**	**1**	**1**	ND	**3**	**1**	ND	**2**	**73**
Tetrachloroethene (PCE)	5	ND(3)	**440**	**99**	**6**	**37**	**5**	**5**	**430**	**3**	**1**	**39**	**500**
Total VOCs		ND(3)	**446**	**99**	**7**	**40**	**13**	**5**	**445**	**23**	**1**	**41**	**744**

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.
NS: Not sampled.
ND: not detected above method detection limit.
Bold : concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		ITDGW-1	ITDGW-3	ITDGW-3*D10	ITDGW-3	ITDGW-3	ITDGW-3*D10	ITDGW-4B	ITDGW-4B	ITDGW-4B
Sample Depth (ft.):		20-25	62-58	62-58	42-38	30-26	30-26	102-98	82-78	62-58
Sample Date:		8/21/01	8/6/01	8/6/01	8/6/01	8/6/01	8/6/01	8/21/01	8/21/01	8/21/01
Units:		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	NYSDEC									
	GW Standard									
Dichlorodifluoromethane	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
Chloromethane	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
Vinyl Chloride	0.3	<10	<10	<100	<10	<10	<100	<10	<10	<10
Bromomethane	5	<10	<10	<100	<10	<10	<1000	<10	<10	<10
Chloroethane	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
Trichlorofluoromethane	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
1,1-Dichloroethene	0.7	<10	<10	<100	<10	<10	<100	<10	<10	<10
Carbon Disulfide	NR	<10	<10	<100	<10	<10	<100	<10	<10	<10
Acetone	50	<10	<10	<100	<10	<10	<100	<10	<10	<10
Methylene Chloride	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
methyl-tert butyl ether	10	<10	<10	<100	<10	<10	<100	<10	<10	<10
trans 1, 2 Dichloroethene	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
1,1-Dichloroethane	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
Vinyl Acetate	NR	<10	<10	<100	<10	<10	<100	<10	<10	<10
cis 1, 2-Dichloroethene	5	<10	**23**	<100	**24**	**10**	<100	<10	<10	<10
2-Butanone	50	<10	<10	<100	<10	<10	<100	<10	<10	<10
Chloroform	7	<10	<10	<100	<20	<10	<1000	<10	<10	<10
1,1,1-Trichloroethane	1	<10	<10	<100	<10	<10	<100	<10	<10	<10
Carbon Tetrachloride	0.4	<10	<10	<100	<10	<10	<100	<10	<10	<10
Benzene	1	<10	<10	<100	<10	<10	<100	<10	<10	<10
1,2-Dichloroethane	0.6	<10	<10	<100	<10	<10	<100	<10	<10	<10
Trichloroethene	1	<10	**10J**	<100	**11**	**5J**	<100	<10	<10	<10
1,2-Dichloropropane	1	<10	<10	<100	<10	<10	<100	<10	<10	<10
Bromodichloromethane	50	<10	<10	<100	<10	<10	<100	<10	<10	<10
Bold : concentrations above detection	0.4	<10	<10	<100	<10	<10	<100	<10	<10	<10
Shaded : Concentrations above guida	NR	<10	<10	<100	<10	<10	<100	<10	<10	<10
J : Estimated Concentration	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
trans-1, 3-Dichloropropene	NR	<10	<10	<100	<10	<10	<100	<10	<10	<10
1,1,2-Trichloroethane	1	<10	<10	<100	<10	**30**	<100	<10	<10	<10
Tetrachloroethene	0.7	<10	**1,600E**	**240D**	**3,900E**	**2,400E**	**420D**	<10	<10	<10
2-Hexanone	50	<10	<10	<100	<10	<10	<100	<10	<10	<10
Dibromochloromethane	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
Chlorobenzene	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
Ethylbenzene	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
m,p-Xylenes	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
o-Xylene	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
Styrene	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
Bromoform	50	<10	<10	<100	<10	<10	<100	<10	<10	<10
1,1,2,2-Tetrachloroethane	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
2-Chlorotoluene	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
4-Chlorotoluene	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
1,3-Dichlorobenzene	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
1,4-Dichlorobenzene	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
1,2-Dichlorobenzene	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
1,2,4-Trichlorobenzene	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
1,2,3-Trichlorobenzene	5	<10	<10	<100	<10	<10	<100	<10	<10	<10
Total VOCs		**BDL**	**1633 EJ**	**240 D**	**3935 E**	**2445 EJ**	**420 D**	**BDL**	**BDL**	**BDL**

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.

NS: Not sampled.
ND: Not detected above method detection limit.
Bold : Concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		ITDGW-4B	ITDGW-4B	ITDGW-6B	ITDGW-6B	ITDGW-6	ITDGW-6	ITDGW-6	ITDGW-8	ITDGW-8	ITDGW-8
Sample Depth (ft.):		42-38	22-18	102-98	82-78	64-60	40-36	24-20	102-98	82-78	62-58
Sample Date:		8/21/01	8/21/01	8/16/01	8/16/01	8/10/01	8/10/01	8/10/01	8/14/01	8/14/01	8/14/01
Units:		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	NYSDEC										
	GW Standard										
Dichlorodifluoromethane	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Chloromethane	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Vinyl Chloride	0.3	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Bromomethane	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Chloroethane	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Trichlorofluoromethane	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
1,1-Dichloroethene	0.7	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Carbon Disulfide	NR	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Acetone	50	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Methylene Chloride	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
methyl-tert butyl ether	10	<10	<10	13	<10	<10	<10	<10	<10	<10	<10
trans 1, 2 Dichloroethene	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
1,1-Dichloroethane	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Vinyl Acetate	NR	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
cis 1, 2-Dichloroethene	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
2-Butanone	50	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Chloroform	7	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
1,1,1-Trichloroethane	1	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Carbon Tetrachloride	0.4	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Benzene	1	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
1,2-Dichloroethane	0.6	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Trichloroethene	1	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
1,2-Dichloropropane	1	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Bromodichloromethane	50	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
cis 1, 3-Dichloropropene	0.4	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
4-Methyl-2-pentanone	NR	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Toluene	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
trans-1, 3-Dichloropropene	NR	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
1,1,2-Trichloroethane	1	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Tetrachloroethene	0.7	<10	<10	130	7J	< 10	< 10	< 10	<10	<10	<10
2-Hexanone	50	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Dibromochloromethane	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Chlorobenzene	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Ethylbenzene	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
m,p-Xylenes	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
o-Xylene	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Styrene	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Bromoform	50	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
1,1,2,2-Tetrachloroethane	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
2-Chlorotoluene	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
4-Chlorotoluene	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
1,3-Dichlorobenzene	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
1,4-Dichlorobenzene	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
1,2-Dichlorobenzene	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
1,2,4-Trichlorobenzene	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
1,2,3-Trichlorobenzene	5	<10	<10	< 10	< 10	< 10	< 10	< 10	<10	<10	<10
Total VOCs		**BDL**	**BDL**	**143**	**7 J**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.

NS: Not sampled.
ND: Not detected above method detection limit.
Bold : Concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		ITDGW-8	ITDGW-8	ITDGW-8	ITDGW-8	ITDGW-9	ITDGW-9	ITDGW-9	ITDGW-9	ITDGW-9	ITDGW-10
Sample Depth (ft.):		82-78	62-58	42-38	22-18	100-96	74-70	60-56	40-36	22-18	102-98
Sample Date:		8/14/01	8/14/01	8/14/01	8/14/01	8/14/01	8/15/01	8/15/01	8/15/01	8/15/01	8/16/01
Units:		ug/L	ug/L	ug/L	ug/L	ug/L	**ug/L**	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	**NYSDEC GW Standard**						**2**				
Dichlorodifluoromethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloromethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl Chloride	0.3	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	0.7	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon Disulfide	NR	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Acetone	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methylene Chloride	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
methyl-tert butyl ether	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
trans 1, 2 Dichloroethene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl Acetate	NR	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
cis 1, 2-Dichloroethene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Butanone	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform	7	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	1	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon Tetrachloride	0.4	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzene	1	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	0.6	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichloroethene	1	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloropropane	1	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromodichloromethane	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
cis 1, 3-Dichloropropene	0.4	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Methyl-2-pentanone	NR	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Toluene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
trans-1, 3-Dichloropropene	NR	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2-Trichloroethane	1	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Tetrachloroethene	0.7	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Hexanone	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibromochloromethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
m,p-Xylenes	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
o-Xylene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Styrene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chlorotoluene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Chlorotoluene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2,3-Trichlorobenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Total VOCs		**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.

NS: Not sampled.
ND: Not detected above method detection limit.
Bold : Concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		ITDGW-10	ITDGW-10	ITDGW-10	ITDGW-10	ITDGW-11(B)	ITDGW-11(B)	ITDGW-11(B)	ITDGW-11(B)	ITDGW-11(B)
Sample Depth (ft.):		82-78	62-58	42-38	22-18	102-98	82-78	62-58	42-38	22-18
Sample Date:		8/16/01	8/16/01	8/16/01	8/16/01	8/17/01	8/17/01	8/17/01	8/16/01	8/16/01
Units:		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	**NYSDEC**									
	GW Standard									
Dichlorodifluoromethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloromethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl Chloride	0.3	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	0.7	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon Disulfide	NR	<10	<10	<10	<10	<10	<10	<10	<10	<10
Acetone	50	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methylene Chloride	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
methyl-tert butyl ether	10	<10	<10	<10	<10	<10	<10	<10	<10	<10
trans 1, 2 Dichloroethene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl Acetate	NR	<10	<10	<10	<10	<10	<10	<10	<10	<10
cis 1, 2-Dichloroethene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Butanone	50	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform	7	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	1	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon Tetrachloride	0.4	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzene	1	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	0.6	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichloroethene	1	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloropropane	1	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromodichloromethane	50	<10	<10	<10	<10	<10	<10	<10	<10	<10
cis 1, 3-Dichloropropene	0.4	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Methyl-2-pentanone	NR	<10	<10	<10	<10	<10	<10	<10	<10	<10
Toluene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
trans-1, 3-Dichloropropene	NR	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2-Trichloroethane	1	<10	<10	<10	<10	<10	<10	<10	<10	<10
Tetrachloroethene	0.7	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Hexanone	50	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibromochloromethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
m,p-Xylenes	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
o-Xylene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
Styrene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	50	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chlorotoluene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Chlorotoluene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2,3-Trichlorobenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10
Total VOCs		**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.

NS: Not sampled.
ND: Not detected above method detection limit.
Bold : Concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		**ITDGW-12**	**ITDGW-12**	**ITDGW-12**	**ITDGW-12**	**ITDGW-12**	**ITDGW-21**	**ITDGW-21*D100**	**ITDGW-21**	**ITDGW-21*D100**
Sample Depth (ft.):		102-98	82-78	62-58	42-38	22-18	100-96	100-96	80-76	80-76
Sample Date:		8/17/01	8/17/01	8/17/01	8/17/01	8/17/01	8/27/01	8/27/01	8/27/01	8/27/01
Units:		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	**NYSDEC GW Standard**									
Dichlorodifluoromethane	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Chloromethane	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Vinyl Chloride	0.3	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Bromomethane	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Chloroethane	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Trichlorofluoromethane	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
1,1-Dichloroethene	0.7	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Carbon Disulfide	NR	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Acetone	50	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Methylene Chloride	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
methyl-tert butyl ether	10	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
trans 1, 2 Dichloroethene	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
1,1-Dichloroethane	5	<10	<10	<10	<10	1	<10	<1000	**5J**	<1000
Vinyl Acetate	NR	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
cis 1, 2-Dichloroethene	5	<10	<10	<10	<10	<10	**18**	<1000	**29**	<1000
2-Butanone	50	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Chloroform	7	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
1,1,1-Trichloroethane	1	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Carbon Tetrachloride	0.4	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Benzene	1	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
1,2-Dichloroethane	0.6	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Trichloroethene	1	<10	<10	<10	<10	<10	**9J**	<1000	<10	<1000
1,2-Dichloropropane	1	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Bromodichloromethane	50	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
cis 1, 3-Dichloropropene	0.4	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
4-Methyl-2-pentanone	NR	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Toluene	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
trans-1, 3-Dichloropropene	NR	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
1,1,2-Trichloroethane	1	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Tetrachloroethene	0.7	<10	**12**	<10	<10	<10	**15,000E**	**6,800D**	**6,900E**	**1,900D**
2-Hexanone	50	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Dibromochloromethane	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Chlorobenzene	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Ethylbenzene	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
m,p-Xylenes	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
o-Xylene	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Styrene	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Bromoform	50	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
1,1,2,2-Tetrachloroethane	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
2-Chlorotoluene	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
4-Chlorotoluene	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
1,3-Dichlorobenzene	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
1,4-Dichlorobenzene	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
1,2-Dichlorobenzene	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
1,2,4-Trichlorobenzene	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
1,2,3-Trichlorobenzene	5	<10	<10	<10	<10	<10	<10	<1000	<10	<1000
Total VOCs		**BDL**	**12**	**BDL**	**BDL**	**BDL**	**15027 EJ**	**6800 D**	**6934 EJ**	**1900 D**

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.

NS: Not sampled.
ND: Not detected above method detection limit.
Bold : Concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		ITDGW-21	ITDGW-21*D10	ITDGW-21	ITDGW-21	ITDGW-22	ITDGW-22	ITDGW-22*D100	ITDGW-22
Sample Depth (ft.):		62-58	62-58	42-38	22-18	102-98	82-78	82-78	62-58
Sample Date:		8/21/01	8/21/01	8/21/01	8/21/01	8/22/01	8/22/01	8/27/01	8/27/01
Units:		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	NYSDEC GW Standard								
Dichlorodifluoromethane	5	<10	<100	<10	<10	<10	<10	<1000	<10
Chloromethane	5	<10	<100	<10	<10	<10	<10	<1000	<10
Vinyl Chloride	0.3	<10	<100	<10	<10	<10	<10	<1000	<10
Bromomethane	5	<10	<100	<10	<10	<10	<10	<1000	<10
Chloroethane	5	<10	<100	<10	<10	<10	<10	<1000	<10
Trichlorofluoromethane	5	<10	<100	<10	<10	<10	<10	<1000	<10
1,1-Dichloroethene	0.7	<10	<100	<10	<10	<10	<10	<1000	<10
Carbon Disulfide	NR	<10	<100	<10	<10	<10	<10	<1000	<10
Acetone	50	<10	<100	<10	<10	<10	<10	<1000	<10
Methylene Chloride	5	<10	<100	<10	<10	<10	<10	<1000	<10
methyl-tert butyl ether	10	<10	<100	<10	<10	<10	<10	<1000	<10
trans 1, 2 Dichloroethene	5	<10	<100	<10	<10	<10	<10	<1000	<10
1,1-Dichloroethane	5	<10	<100	<10	<10	<10	<10	<1000	<10
Vinyl Acetate	NR	<10	<100	<10	<10	<10	<10	<1000	<10
cis 1, 2-Dichloroethene	5	**37**	<100	**16**	<10	<10	<10	<1000	<10
2-Butanone	50	<10	<100	<10	<10	<10	<10	<1000	<10
Chloroform	7	<10	<100	<10	<10	<10	<10	<1000	<10
1,1,1-Trichloroethane	1	<10	<100	<10	<10	<10	<10	<1000	<10
Carbon Tetrachloride	0.4	<10	<100	<10	<10	<10	<10	<1000	<10
Benzene	1	<10	<100	<10	<10	<10	<10	<1000	<10
1,2-Dichloroethane	0.6	<10	<100	<10	<10	<10	<10	<1000	<10
Trichloroethene	1	**8J**	<100	<10	<10	<10	<10	<1000	<10
1,2-Dichloropropane	1	<10	<100	<10	<10	<10	<10	<1000	<10
Bromodichloromethane	50	<10	<100	<10	<10	<10	<10	<1000	<10
cis 1, 3-Dichloropropene	0.4	<10	<100	<10	<10	<10	<10	<1000	<10
4-Methyl-2-pentanone	NR	<10	<100	<10	<10	<10	<10	<1000	<10
Toluene	5	<10	<100	<10	<10	<10	<10	<1000	<10
trans-1, 3-Dichloropropene	NR	<10	<100	<10	<10	<10	<10	<1000	<10
1,1,2-Trichloroethane	1	<10	<100	<10	<10	<10	<10	<1000	<10
Tetrachloroethene	0.7	**1900E**	**820D**	**520E**	**7J**	**42**	**8,500E**	**2,900D**	**88**
2-Hexanone	50	<10	<100	<10	<10	<10	<10	<1000	<10
Dibromochloromethane	5	<10	<100	<10	<10	<10	<10	<1000	<10
Chlorobenzene	5	<10	<100	<10	<10	<10	<10	<1000	<10
Ethylbenzene	5	<10	<100	<10	<10	<10	<10	<1000	<10
m,p-Xylenes	5	<10	<100	<10	<10	<10	<10	<1000	<10
o-Xylene	5	<10	<100	<10	<10	<10	<10	<1000	<10
Styrene	5	<10	<100	<10	<10	<10	<10	<1000	<10
Bromoform	50	<10	<100	<10	<10	<10	<10	<1000	<10
1,1,2,2-Tetrachloroethane	5	<10	<100	<10	<10	<10	<10	<1000	<10
2-Chlorotoluene	5	<10	<100	<10	<10	<10	<10	<1000	<10
4-Chlorotoluene	5	<10	<100	<10	<10	<10	<10	<1000	<10
1,3-Dichlorobenzene	5	<10	<100	<10	<10	<10	<10	<1000	<10
1,4-Dichlorobenzene	5	<10	<100	<10	<10	<10	<10	<1000	<10
1,2-Dichlorobenzene	5	<10	<100	<10	<10	<10	<10	<1000	<10
1,2,4-Trichlorobenzene	5	<10	<100	<10	<10	<10	<10	<1000	<10
1,2,3-Trichlorobenzene	5	<10	<100	<10	<10	<10	<10	<1000	<10
Total VOCs		**1945 EJ**	**820 D**	**536 E**	**7 J**	**42**	**8500 E**	**2900 D**	**88**

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.

NS: Not sampled.
ND: Not detected above method detection limit.
Bold : Concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		ITDGW-22	ITDGW-22*D100	ITDGW-22	ITDGW-23	ITDGW-23*D100	ITDGW-23	ITDGW-23	ITDGW-23	ITDGW-23	ITDGW-24
Sample Depth (ft.):		42-38	42-38	22-18	100-96	100-96	82-78	55-51	42-38	22-18	102-98
Sample Date:		8/27/01	8/27/01	8/27/01	8/27/01	8/27/01	8/27/01	8/27/01	8/27/01	8/27/01	8/27/01
Units:		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	**NYSDEC GW Standard**										
Dichlorodifluoromethane	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Chloromethane	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Vinyl Chloride	0.3	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Bromomethane	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Chloroethane	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Trichlorofluoromethane	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
1,1-Dichloroethene	0.7	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Carbon Disulfide	NR	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Acetone	50	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Methylene Chloride	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
methyl-tert butyl ether	10	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
trans 1, 2 Dichloroethene	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
1,1-Dichloroethane	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Vinyl Acetate	NR	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
cis 1, 2-Dichloroethene	5	<10	<1000	<10	**60**	<1000	<10	<10	<10	<10	**6J**
2-Butanone	50	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Chloroform	7	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	1	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Carbon Tetrachloride	0.4	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Benzene	1	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
1,2-Dichloroethane	0.6	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Trichloroethene	1	<10	<1000	**5J**	**28**	<1000	<10	<10	<10	<10	**8J**
1,2-Dichloropropane	1	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Bromodichloromethane	50	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
cis 1, 3-Dichloropropene	0.4	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
4-Methyl-2-pentanone	NR	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Toluene	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
trans-1, 3-Dichloropropene	NR	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
1,1,2-Trichloroethane	1	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Tetrachloroethene	0.7	**2,700E**	**810JD**	**42**	**6,100E**	**1,400D**	**59**	**54**	**73**	<10	**6,500E**
2-Hexanone	50	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Dibromochloromethane	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Chlorobenzene	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Ethylbenzene	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
m,p-Xylenes	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
o-Xylene	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Styrene	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Bromoform	50	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
2-Chlorotoluene	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
4-Chlorotoluene	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
1,2,3-Trichlorobenzene	5	<10	<1000	<10	<10	<1000	<10	<10	<10	<10	<10
Total VOCs		**2700 E**	**810 JD**	**47 J**	**6128 E**	**1400 D**	**59**	**54**	**73**	**BDL**	**6514 EJ**

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.

NS: Not sampled.
ND: Not detected above method detection limit.
Bold : Concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		ITDGW-24*D100	ITDGW-24	ITDGW-24	ITDGW-24*D100	ITDGW-24	ITDGW-24*D100	ITDGW-24	ITDGW-25
Sample Depth (ft.):		102-98	82-78	62-58	62-58	42-38	42-38	22-18	77-73
Sample Date:		8/27/01	8/27/01	8/27/01	8/27/01	8/27/01	8/27/01	8/27/01	8/29/01
Units:		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	NYSDEC GW Standard								
Dichlorodifluoromethane	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
Chloromethane	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
Vinyl Chloride	0.3	<1000	<10	<10	<1000	<10	<1000	<10	<10
Bromomethane	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
Chloroethane	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
Trichlorofluoromethane	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
1,1-Dichloroethene	0.7	<1000	<10	<10	<1000	<10	<1000	<10	<10
Carbon Disulfide	NR	<1000	<10	<10	<1000	<10	<1000	<10	<10
Acetone	50	<1000	<10	<10	<1000	<10	<1000	<10	<10
Methylene Chloride	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
methyl-tert butyl ether	10	<1000	<10	<10	<1000	<10	<1000	<10	<10
trans 1, 2 Dichloroethene	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
1,1-Dichloroethane	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
Vinyl Acetate	NR	<1000	<10	<10	<1000	<10	<1000	<10	<10
cis 1, 2-Dichloroethene	5	<1000	<10	**36**	<1000	**7J**	<1000	<10	**48**
2-Butanone	50	<1000	<10	<10	<1000	<10	<1000	<10	<10
Chloroform	7	<1000	<10	<10	<1000	<10	<1000	<10	<10
1,1,1-Trichloroethane	1	<1000	<10	<10	<1000	<10	<1000	<10	<10
Carbon Tetrachloride	0.4	<1000	<10	<10	<1000	<10	<1000	<10	<10
Benzene	1	<1000	<10	<10	<1000	<10	<1000	<10	<10
1,2-Dichloroethane	0.6	<1000	<10	<10	<1000	<10	<1000	<10	<10
Trichloroethene	1	<1000	<10	**16**	<1000	**7J**	<1000	<10	**15**
1,2-Dichloropropane	1	<1000	<10	<10	<1000	<10	<1000	<10	<10
Bromodichloromethane	50	<1000	<10	<10	<1000	<10	<1000	<10	<10
cis 1, 3-Dichloropropene	0.4	<1000	<10	<10	<1000	<10	<1000	<10	<10
4-Methyl-2-pentanone	NR	<1000	<10	<10	<1000	<10	<1000	<10	<10
Toluene	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
trans-1, 3-Dichloropropene	NR	<1000	<10	<10	<1000	<10	<1000	<10	<10
1,1,2-Trichloroethane	1	<1000	<10	<10	<1000	<10	<1000	<10	<10
Tetrachloroethene	0.7	**1,800D**	**110**	**3,300E**	**780JD**	**6,400E**	**1,600D**	**51**	**380E**
2-Hexanone	50	<1000	<10	<10	<1000	<10	<1000	<10	<10
Dibromochloromethane	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
Chlorobenzene	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
Ethylbenzene	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
m,p-Xylenes	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
o-Xylene	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
Styrene	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
Bromoform	50	<1000	<10	<10	<1000	<10	<1000	<10	<10
1,1,2,2-Tetrachloroethane	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
2-Chlorotoluene	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
4-Chlorotoluene	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
1,3-Dichlorobenzene	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
1,4-Dichlorobenzene	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
1,2-Dichlorobenzene	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
1,2,4-Trichlorobenzene	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
1,2,3-Trichlorobenzene	5	<1000	<10	<10	<1000	<10	<1000	<10	<10
Total VOCs		**1800 D**	**110**	**3352 E**	**780 JD**	**6414 EJ**	**1600 D**	**51**	**443 E**

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.

NS: Not sampled.
ND: Not detected above method detection limit.
Bold : Concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		ITDGW-25*10	ITDGW-25	ITDGW-25	ITDGW-25	ITDGW-26	ITDGW-26*D100	ITDGW-26	ITDGW-26*D10	ITDGW-26
Sample Depth (ft.):		77-73	62-58	42-38	22-18	98-94	98-94	82-78	82-78	62-58
Sample Date:		8/29/01	8/29/01	8/29/01	8/29/01	8/29/01	8/29/01	8/29/01	8/29/01	8/29/01
Units:		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	NYSDEC GW Standard									
Dichlorodifluoromethane	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Chloromethane	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Vinyl Chloride	0.3	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Bromomethane	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Chloroethane	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Trichlorofluoromethane	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
1,1-Dichloroethene	0.7	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Carbon Disulfide	NR	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Acetone	50	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Methylene Chloride	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
methyl-tert butyl ether	10	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
trans 1, 2 Dichloroethene	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
1,1-Dichloroethane	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Vinyl Acetate	NR	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
cis 1, 2-Dichloroethene	5	<1000	<10	<10	<10	**26**	<1000	**12**	<100	**52**
2-Butanone	50	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Chloroform	7	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
1,1,1-Trichloroethane	1	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Carbon Tetrachloride	0.4	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Benzene	1	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
1,2-Dichloroethane	0.6	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Trichloroethene	1	<1000	<10	<10	<10	**14**	<1000	<10	<100	**15**
1,2-Dichloropropane	1	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Bromodichloromethane	50	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
cis 1, 3-Dichloropropene	0.4	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
4-Methyl-2-pentanone	NR	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Toluene	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
trans-1, 3-Dichloropropene	NR	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
1,1,2-Trichloroethane	1	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Tetrachloroethene	0.7	**220D**	<10	**150**	<10	**11,000E**	**2,100D**	**1,400E**	**490D**	**330E**
2-Hexanone	50	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Dibromochloromethane	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Chlorobenzene	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Ethylbenzene	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
m,p-Xylenes	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
o-Xylene	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Styrene	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Bromoform	50	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
1,1,2,2-Tetrachloroethane	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
2-Chlorotoluene	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
4-Chlorotoluene	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
1,3-Dichlorobenzene	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
1,4-Dichlorobenzene	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
1,2-Dichlorobenzene	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
1,2,4-Trichlorobenzene	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
1,2,3-Trichlorobenzene	5	<1000	<10	<10	<10	<10	<1000	<10	<100	<10
Total VOCs		**220 D**	**BDL**	**150**	**BDL**	**11040 E**	**2100 D**	**1412 E**	**490 D**	**397 E**

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.

NS: Not sampled.
ND: Not detected above method detection limit.
Bold : Concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		ITDGW-26	ITDGW-26*D10	ITDGW-26	ITDGW-27	ITDGW-27	ITDGW-27	ITDGW-27	ITDGW-27	ITDGW-28	ITDGW-28
Sample Depth (ft.):		42-38	42-38	22-18	200-197	185-182	160-157	140-137	120-117	200-197	185-182
Sample Date:		8/29/01	8/29/01	8/29/01	11/27/01	11/27/01	11/27/01	11/27/01	11/27/01	11/27/01	11/27/01
Units:		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	**NYSDEC GW Standard**										
Dichlorodifluoromethane	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Chloromethane	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl Chloride	0.3	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Chloroethane	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	0.7	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Carbon Disulfide	NR	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Acetone	50	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Methylene Chloride	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
methyl-tert butyl ether	10	<10	<100	<10	<10	<10	<10	<10	**12**	<10	<10
trans 1, 2 Dichloroethene	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl Acetate	NR	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
cis 1, 2-Dichloroethene	5	**14**	<100	<10	<10	<10	<10	<10	<10	<10	<10
2-Butanone	50	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform	7	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	1	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Carbon Tetrachloride	0.4	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Benzene	1	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	0.6	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Trichloroethene	1	**5J**	<100	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloropropane	1	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Bromodichloromethane	50	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
cis 1, 3-Dichloropropene	0.4	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
4-Methyl-2-pentanone	NR	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Toluene	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
trans-1, 3-Dichloropropene	NR	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2-Trichloroethane	1	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Tetrachloroethene	0.7	**4,500E**	**78JD**	**9J**	<10	<10	<10	<10	**130**	**6J**	**16**
2-Hexanone	50	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Dibromochloromethane	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
m,p-Xylenes	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
o-Xylene	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Styrene	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	50	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
2-Chlorotoluene	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
4-Chlorotoluene	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
1,2,3-Trichlorobenzene	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10
Total VOCs		**4519 EJ**	**78 JD**	**9 J**	**BDL**	**BDL**	**BDL**	**BDL**	**142**	**6 J**	**16**

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.

NS: Not sampled.
ND: Not detected above method detection limit.
Bold : Concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		**ITDGW-28**	**ITDGW-28**	**ITDGW-28*D10**	**ITDGW-28**	**ITDGW-28*D10**	**ITDGW-29**	**ITDGW-29**	**ITDGW-29**	**ITDGW-29**	**ITDGW-29**
Sample Depth (ft.):		160-157	140-137	140-137	120-117	120-117	100-96	79-75	62-58	42-38	22-18
Sample Date:		11/27/01	11/27/01	11/27/01	11/27/01	11/27/01					
Units:		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	**NYSDEC GW Standard**										
Dichlorodifluoromethane	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Chloromethane	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Vinyl Chloride	0.3	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Bromomethane	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Chloroethane	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	0.7	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Carbon Disulfide	NR	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Acetone	50	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Methylene Chloride	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
methyl-tert butyl ether	10	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
trans 1, 2 Dichloroethene	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Vinyl Acetate	NR	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
cis 1, 2-Dichloroethene	5	<10	**6J**	<100	**18**	<10	<10	<10	<10	<10	<10
2-Butanone	50	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Chloroform	7	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	1	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Carbon Tetrachloride	0.4	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Benzene	1	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	0.6	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Trichloroethene	1	<10	**4J**	<100	**8J**	<10	<10	**8J**	<10	<10	<10
1,2-Dichloropropane	1	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Bromodichloromethane	50	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
cis 1, 3-Dichloropropene	0.4	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
4-Methyl-2-pentanone	NR	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Toluene	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
trans-1, 3-Dichloropropene	NR	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
1,1,2-Trichloroethane	1	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Tetrachloroethene	0.7	**7J**	**1900E**	**540D**	**6,500E**	**710D**	**35**	**210E**	**40**	**2J**	<10
2-Hexanone	50	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Dibromochloromethane	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
m,p-Xylenes	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
o-Xylene	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Styrene	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Bromoform	50	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
2-Chlorotoluene	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
4-Chlorotoluene	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
1,2,3-Trichlorobenzene	5	<10	<10	<100	<10	<10	<10	<10	<10	<10	<10
Total VOCs		**7 J**	**1910 EJ**	**540 D**	**6526 EJ**	**710 D**	**35**	**218EJ**	**40**	**2J**	**BDL**

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.

NS: Not sampled.
ND: Not detected above method detection limit.
Bold : Concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		**ITDGW-30**	**ITDGW-30**	**ITDGW-30**	**ITDGW-30**	**ITDGW-30**	**ITDGW-30**	**ITDGW-30**	**ITDGW-30**	**ITDGW-31**	**ITDGW-31**	**ITDGW-32**
Sample Depth (ft.):		200-197	185-182	160-157	140-137	120-117	100-97	80-77	60-57	38-42	22-18	58-62
Sample Date:		11/21/01	11/21/01	11/21/01	11/21/01	11/21/01	11/21/01	11/21/01	11/21/01	3/6/02	3/6/02	3/6/02
Units:		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	**NYSDEC GW Standard**											
Dichlorodifluoromethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloromethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl Chloride	0.3	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	0.7	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon Disulfide	NR	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Acetone	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methylene Chloride	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
methyl-tert butyl ether	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	2J
trans 1, 2 Dichloroethene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl Acetate	NR	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
cis 1, 2-Dichloroethene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	**16**
2-Butanone	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform	7	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	1	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon Tetrachloride	0.4	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzene	1	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	0.6	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichloroethene	1	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	**13**
1,2-Dichloropropane	1	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromodichloromethane	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
cis 1, 3-Dichloropropene	0.4	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Methyl-2-pentanone	NR	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Toluene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
trans-1, 3-Dichloropropene	NR	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2-Trichloroethane	1	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Tetrachloroethene	0.7	<10	<10	<10	<10	<10	<10	2J	<10	**14**	<10	**270E**
2-Hexanone	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibromochloromethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
m,p-Xylenes	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
o-Xylene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Styrene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	50	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chlorotoluene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Chlorotoluene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2,3-Trichlorobenzene	5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Total VOCs		**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**2 J**	**BDL**	**14**	**BDL**	**301 EJ**

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.

NS: Not sampled.
ND: Not detected above method detection limit.
Bold : Concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		ITDGW-32*D10	ITDGW-32	ITDGW-32	ITDGW-33	ITDGW-33*D10	ITDGW-33	ITDGW-34	ITDGW-34*D10	ITDGW-34
Sample Depth (ft.):		58-62	38-42	22-18	55-59	55-59	38-42	56-60	56-60	38-42
Sample Date:		3/6/02	3/6/02	3/6/02	3/6/02	3/6/02	3/6/02	3/6/02	3/6/02	3/6/02
Units:		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	NYSDEC GW Standard									
Dichlorodifluoromethane	5	<100	<10	<10	<10	<100	<10	<10	<100	<10
Chloromethane	5	<100	<10	<10	<10	<100	<10	<10	<100	<10
Vinyl Chloride	0.3	<100	<10	<10	<10	<100	<10	<10	<100	<10
Bromomethane	5	<100	<10	<10	<10	<100	<10	<10	<100	<10
Chloroethane	5	<100	<10	<10	<10	<100	<10	<10	<100	<10
Trichlorofluoromethane	5	<100	<10	<10	<10	<100	<10	<10	<100	<10
1,1-Dichloroethene	0.7	<100	<10	<10	<10	<100	<10	<10	<100	<10
Carbon Disulfide	NR	<100	<10	<10	<10	<100	<10	<10	<100	<10
Acetone	50	<100	<10	<10	<10	<100	<10	<10	<100	<10
Methylene Chloride	5	<100	<10	<10	<10	<100	<10	<10	<100	<10
methyl-tert butyl ether	10	<100	<10	<10	<10	<100	<10	**100**	<100	**3J**
trans 1, 2 Dichloroethene	5	<100	<10	<10	<10	<100	<10	**2J**	<100	<10
1,1-Dichloroethane	5	<100	<10	<10	<10	<100	<10	<10	<100	<10
Vinyl Acetate	NR	<100	<10	<10	<10	<100	<10	<10	<100	<10
cis 1, 2-Dichloroethene	5	<100	<10	<10	**10**	<100	<10	**15**	<100	**2J**
2-Butanone	50	<100	<10	<10	<10	<100	<10	<10	<100	<10
Chloroform	7	<100	<10	<10	<10	<100	<10	<10	<100	<10
1,1,1-Trichloroethane	1	<100	<10	<10	<10	<100	<10	<10	<100	<10
Carbon Tetrachloride	0.4	<100	<10	<10	<10	<100	<10	<10	<100	<10
Benzene	1	<100	<10	<10	<10	<100	<10	<10	<100	<10
1,2-Dichloroethane	0.6	<100	<10	<10	<10	<100	<10	<10	<100	<10
Trichloroethene	1	<100	<10	<10	**5J**	<100	<10	**19**	<100	**3J**
1,2-Dichloropropane	1	<100	<10	<10	<10	<100	<10	<10	<100	<10
Bromodichloromethane	50	<100	<10	<10	<10	<100	<10	<10	<100	<10
cis 1, 3-Dichloropropene	0.4	<100	<10	<10	<10	<100	<10	<10	<100	<10
4-Methyl-2-pentanone	NR	<100	<10	<10	<10	<100	<10	<10	<100	<10
Toluene	5	<100	<10	<10	0.7J	<100	<10	0.7J	<100	**0.5J**
trans-1, 3-Dichloropropene	NR	<100	<10	<10	<10	<100	<10	<10	<100	<10
1,1,2-Trichloroethane	1	<100	<10	<10	<10	<100	<10	<10	<100	<10
Tetrachloroethene	0.7	**150D**	**19**	**2J**	**220E**	**170D**	**5J**	**530E**	**820D**	**26**
2-Hexanone	50	<100	<10	<10	<10	<100	<10	<10	<100	<10
Dibromochloromethane	5	<100	<10	<10	<10	<100	<10	<10	<100	<10
Chlorobenzene	5	<100	<10	<10	<10	<100	<10	<10	<100	<10
Ethylbenzene	5	<100	<10	<10	<10	<100	<10	<10	<100	<10
m,p-Xylenes	5	<100	<10	<10	<10	<100	<10	**0.5J**	<100	<10
o-Xylene	5	<100	<10	<10	<10	<100	<10	<10	<100	<10
Styrene	5	<100	<10	<10	<10	<100	<10	<10	<100	<10
Bromoform	50	<100	<10	<10	<10	<100	<10	<10	<100	<10
1,1,2,2-Tetrachloroethane	5	<100	<10	<10	<10	<100	<10	<10	<100	<10
2-Chlorotoluene	5	<100	<10	<10	<10	<100	<10	<10	<100	<10
4-Chlorotoluene	5	<100	<10	<10	<10	<100	<10	<10	<100	<10
1,3-Dichlorobenzene	5	<100	<10	<10	<10	<100	<10	<10	<100	<10
1,4-Dichlorobenzene	5	<100	<10	<10	<10	<100	<10	<10	<100	<10
1,2-Dichlorobenzene	5	<100	<10	<10	<10	<100	<10	<10	<100	<10
1,2,4-Trichlorobenzene	5	<100	<10	<10	<10	<100	<10	<10	<100	<10
1,2,3-Trichlorobenzene	5	<100	<10	<10	<10	<100	<10	<10	<100	<10
Total VOCs		**150 D**	**19**	**2 J**	**235.7 JE**	**170 D**	**5 J**	**667.2 JE**	**820 D**	**34.5 J**

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.

NS: Not sampled.
ND: Not detected above method detection limit.
Bold : Concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		ITDGW-35	ITDGW-35*D10	ITDGW-35	ITDGW-36	ITDGW-36	ITDGW-36	ITSB5GW*D100	PZ -1	PZ -1*D100	PZ-2	PZ-3
Sample Depth (ft.):		56-60	56-60	38-42	58-62	38-42	22-18					
Sample Date:		3/6/02	3/6/02	3/6/02	3/7/02	3/7/02	3/7/02	8/16/01	8/29/01	8/29/01	8/29/01	8/29/01
Units:		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	**NYSDEC GW Standard**											
Dichlorodifluoromethane	5	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Chloromethane	5	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Vinyl Chloride	0.3	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Bromomethane	5	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Chloroethane	5	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Trichlorofluoromethane	5	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
1,1-Dichloroethene	0.7	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Carbon Disulfide	NR	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Acetone	50	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Methylene Chloride	5	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
methyl-tert butyl ether	10	230E	<100	170	<10	<10	<10	<10	<10	<1000	<10	<10
trans 1, 2 Dichloroethene	5	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
1,1-Dichloroethane	5	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Vinyl Acetate	NR	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
cis 1, 2-Dichloroethene	5	3J	<100	1J	1J	<10	<10	<10	<10	<1000	<10	<10
2-Butanone	50	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Chloroform	7	<10	<100	<10	0.8J	<10	<10	<10	<10	<1000	<10	<10
1,1,1-Trichloroethane	1	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Carbon Tetrachloride	0.4	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Benzene	1	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
1,2-Dichloroethane	0.6	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Trichloroethene	1	4J	<100	1J	0.8J	<10	<10	<10	9J	<1000	<10	<10
1,2-Dichloropropane	1	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Bromodichloromethane	50	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
cis 1, 3-Dichloropropene	0.4	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
4-Methyl-2-pentanone	NR	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Toluene	5	2J	<100	3J	0.7J	0.5J	<10	<10	<10	<1000	<10	<10
trans-1, 3-Dichloropropene	NR	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
1,1,2-Trichloroethane	1	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Tetrachloroethene	0.7	244E	160D	63	48	8J	<10	450,000ED	28,000E	15,000D	8J	<10
2-Hexanone	50	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Dibromochloromethane	5	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Chlorobenzene	5	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Ethylbenzene	5	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
m,p-Xylenes	5	<10	<100	1J	<10	<10	<10	<10	<10	<1000	<10	<10
o-Xylene	5	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Styrene	5	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
Bromoform	50	<10	<100	<10	<10	<10	<10	<10	<10	<1000	<10	<10
1,1,2,2-Tetrachloroethane	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chlorotoluene	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Chlorotoluene	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2,3-Trichlorobenzene	5	<10	<100	<10	<10	<10	<10	<10	<10	<10	<10	<10
		479 EJ	160 D	239 J	51.3 J	8.5 J	BDL	450000 ED	28009 EJ	15000 D	8 J	BDL

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.

NS: Not sampled.
ND: Not detected above method detection limit.
Bold : Concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		ITMW-1S	ITMW-1S*D100	ITMW-1D	ITMW-1D*D2	ITMW-2S	ITMW-2S*D100	ITMW-2D	ITMW-2D*D10
Screen Interval (ft.bgs):		55-65	55-65	95-105	95-105	40.5-50.5	40.5-50.5	91.5-101.5	91.5-101.5
Sample Date:									
Units:		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	NYSDEC								
	GW Standard								
Dichlorodifluoromethane	5	<10	<1000	<10	<20	<10	<1000	<10	<100
Chloromethane	5	<10	<1000	<10	<20	<10	<1000	<10	<100
Vinyl Chloride	0.3	<10	<1000	<10	<20	<10	<1000	<10	<100
Bromomethane	5	<10	<1000	<10	<10	<10	<1000	<10	<100
Chloroethane	5	<10	<1000	<10	<20	<10	<1000	<10	<100
Trichlorofluoromethane	5	<10	<1000	<10	<20	<10	<1000	<10	<100
1,1-Dichloroethene	0.7	<10	<1000	<10	<20	<10	<1000	<10	<100
Carbon Disulfide	NR	<10	<1000	<10	<20	<10	<1000	<10	<100
Acetone	50	<10	<1000	<10	<20	<10	<1000	<10	<100
Methylene Chloride	5	<10	<1000	<10	<20	<10	<1000	<10	<100
methyl-tert butyl ether	10	<10	<1000	<10	<20	<10	<1000	<10	<100
trans 1, 2 Dichloroethene	5	<10	<1000	<10	<20	<10	<1000	<10	<100
1,1-Dichloroethane	5	6J	<1000	4J	<20	<10	<1000	<10	<100
Vinyl Acetate	NR	<10	<1000	<10	<20	<10	<1000	<10	<100
cis 1, 2-Dichloroethene	5	<10	<1000	3J	<20	15	<1000	17	<100
2-Butanone	50	<10	<1000	<10	<20	<10	<1000	<10	<100
Chloroform	7	<10	<1000	<10	<20	<10	<1000	<10	<100
1,1,1-Trichloroethane	1	4J	<1000	4J	<20	<10	<1000	<10	<100
Carbon Tetrachloride	0.4	<10	<1000	<10	<20	<10	<1000	<10	<100
Benzene	1	<10	<1000	<10	<20	<10	<1000	<10	<100
1,2-Dichloroethane	0.6	<10	<1000	<10	<20	<10	<1000	<10	<100
Trichloroethene	1	6J	<1000	3J	<20	15	<1000	7J	<100
1,2-Dichloropropane	1	<10	<1000	<10	<20	<10	<1000	<10	<100
Bromodichloromethane	50	<10	<1000	<10	<20	<10	<1000	<10	<100
cis 1, 3-Dichloropropene	0.4	<10	<1000	<10	<20	<10	<1000	<10	<100
4-Methyl-2-pentanone	NR	<10	<1000	<10	<20	<10	<1000	<10	<100
Toluene	5	<10	<1000	<10	<20	<10	<1000	<10	<100
trans-1, 3-Dichloropropene	NR	<10	<1000	<10	<20	<10	<1000	<10	<100
1,1,2-Trichloroethane	1	<10	<1000	<10	<20	<10	<1000	<10	<100
Tetrachloroethene	0.7	6200E	23000ED	190E	200D	1300E	2600D	630E	980D
2-Hexanone	50	<10	<1000	<10	<20	<10	<1000	<10	<100
Dibromochloromethane	5	<10	<1000	<10	<20	<10	<1000	<10	<100
Chlorobenzene	5	<10	<1000	<10	<20	<10	<1000	<10	<100
Ethylbenzene	5	<10	<1000	<10	<20	<10	<1000	<10	<100
m,p-Xylenes	5	<10	<1000	<10	<20	<10	<1000	<10	<100
o-Xylene	5	<10	<1000	<10	<20	<10	<1000	<10	<100
Styrene	5	<10	<1000	<10	<20	<10	<1000	<10	<100
Bromoform	50	<10	<1000	<10	<20	<10	<1000	<10	<100
1,1,2,2-Tetrachloroethane	5	<10	<1000	<10	<20	<10	<1000	<10	<100
2-Chlorotoluene	5	<10	<1000	<10	<20	<10	<1000	<10	<100
4-Chlorotoluene	5	<10	<1000	<10	<20	<10	<1000	<10	<100
1,3-Dichlorobenzene	5	<10	<1000	<10	<20	<10	<1000	<10	<100
1,4-Dichlorobenzene	5	<10	<1000	<10	<20	<10	<1000	<10	<100
1,2-Dichlorobenzene	5	<10	<1000	<10	<20	<10	<1000	<10	<100
1,2,4-Trichlorobenzene	5	<10	<1000	<10	<20	<10	<1000	<10	<100
1,2,3-Trichlorobenzene	5	<10	<1000	<10	<20	<10	<1000	<10	<100
Total VOCs		6216 EJ	23000 ED	204 EJ	200 D	1330 E	2600 D	654 EJ	980 D

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.
NS: Not sampled.
ND: not detected above method detection limit.
Bold : concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 1-4
Groundwater Analytical Data
NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Sample ID:		**ITMW-3S**	**ITMW-3D**	**ITMW-4S**	**ITMW-4D**
Screen Interval (ft.bgs):		55-65	80-90	55-65	95-105
Sample Date:					
Units:		ug/L	ug/L	ug/L	ug/L
Volatile Organic Compounds	**NYSDEC GW Standard**				
Dichlorodifluoromethane	5	<10	<10	<10	<10
Chloromethane	5	<10	<10	<10	<10
Vinyl Chloride	0.3	<10	<10	<10	<10
Bromomethane	5	<10	<10	<10	<10
Chloroethane	5	<10	<10	<10	<10
Trichlorofluoromethane	5	<10	<10	<10	<10
1,1-Dichloroethene	0.7	<10	<10	<10	<10
Carbon Disulfide	NR	<10	<10	<10	<10
Acetone	50	<10	<10	<10	<10
Methylene Chloride	5	<10	<10	<10	<10
methyl-tert butyl ether	10	<10	<10	<10	<10
trans 1, 2 Dichloroethene	5	<10	<10	<10	<10
1,1-Dichloroethane	5	<10	<10	<10	<10
Vinyl Acetate	NR	<10	<10	<10	<10
cis 1, 2-Dichloroethene	5	<10	<10	<10	<10
2-Butanone	50	<10	<10	<10	<10
Chloroform	7	<10	<10	<10	<10
1,1,1-Trichloroethane	5	<10	<10	<10	<10
Carbon Tetrachloride	0.7	<10	<10	<10	<10
Benzene	NR	<10	<10	<10	<10
1,2-Dichloroethane	50	<10	<10	<10	<10
Trichloroethene	5	<10	<10	<10	<10
1,2-Dichloropropane	10	<10	<10	<10	<10
Bromodichloromethane	5	<10	<10	<10	<10
cis 1, 3-Dichloropropene	5	<10	<10	<10	<10
4-Methyl-2-pentanone	NR	<10	<10	<10	<10
Toluene	5	<10	<10	<10	<10
trans-1, 3-Dichloropropene	50	<10	<10	<10	<10
1,1,2-Trichloroethane	1	<10	**<10**	<10	<10
Tetrachloroethene	0.7	<10	**10 J**	<10	<10
2-Hexanone	50	<10	**<10**	<10	<10
Dibromochloromethane	5	<10	<10	<10	<10
Chlorobenzene	5	<10	<10	<10	<10
Ethylbenzene	5	<10	<10	<10	<10
m,p-Xylenes	5	<10	<10	<10	<10
o-Xylene	5	<10	<10	<10	<10
Styrene	5	<10	<10	<10	<10
Bromoform	50	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	5	<10	<10	<10	<10
2-Chlorotoluene	5	<10	<10	<10	<10
4-Chlorotoluene	5	<10	<10	<10	<10
1,3-Dichlorobenzene	5	<10	<10	<10	<10
1,4-Dichlorobenzene	5	<10	<10	<10	<10
1,2-Dichlorobenzene	5	<10	<10	<10	<10
1,2,4-Trichlorobenzene	5	<10	<10	<10	<10
1,2,3-Trichlorobenzene	5	<10	<10	<10	<10
Total VOCs		**BDL**	**10 J**	**BDL**	**BDL**

Notes: All concentration in ug/L (ppb).
(1): Liquid collected from the dry well.
(2): NYSDEC Division of Water Technical and Operation Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998.
(3): Based on information provided by NYSDEC.
NS: Not sampled.
ND: not detected above method detection limit.
Bold : concentrations above detection limit.
Shaded : Concentrations above guidance values.
J : Estimated Concentration.

Table 2-1

Preliminary Clean-up Criteria for Groundwater

NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Chemicals of Potential Concern (COPC)	US EPA Primary MCL (µg/l)	US EPA Secondary MCL (µg/l)	US EPA Suggested No Adverse Response Levels (SNARL) (µg/l)	National Academy of Sciences (NAS) Suggested No Adverse Response Levels (µg/l)	NYS Water Quality Standards 6 NYCRR 703.5 (µg/l)
Tetrachloroethene	5	NA	2000 (10 day)	NA	5

NA – Not Available

Table 2-2

Preliminary Clean-up Criteria for Soil

NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Chemicals of Potential Concern (COPC)	US EPA Health Based Carcinogen (mg/kg)	US EPA Health Based Systemic Toxicants (mg/kg)	NYSDEC TAGM 4046 Recommended Cleanup Objective (mg/kg)
Tetrachloroethene	14	800	1.4

Table 2-3

Preliminary Clean-up Criteria for Indoor Air

NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Chemicals of Potential Concern (COPC)	USEPA Region III Ambient Air Risk-Based Concentrations ($\mu g/m^3$)	NYS Department of Health Indoor Air Criterion ($\mu g/m^3$)
Tetrachloroethene	3.1	10

Table 2-4

Off-Gas Discharge Criteria

NYSDEC - Jimmy's Dry Cleaner
Roosevelt, New York

Chemical of Potential Concern (COPC)	SGC Short Term Guideline Concentrations ($\mu g/m^3$)	AGC Annual Guideline Concentrations ($\mu g/m^3$)
Hydrogen Chloride	150	20
Tetrachloroethene	1,000	1.0
Methylene Chloride	22,000	770
Vinyl Chloride	180,000	2.0E-2

Off-gas discharge criteria from New York State Department of Environmental Conservataion DAR-1.

TABLE 3-1
SUMMARY OF TECHNOLOGY TYPES AND PROCESS OPTIONS
NYSDEC - JIMMY'S DRY CLEANER
ROOSEVELT, NEW YORK

Media	General Response Action	Remedial Technology	Representative Process Options	Description	Screening Comment
All Media	No Action	No Action	No Action		Potentially Viable. This option has been retained for comparison analysis as required by the NCP.
	Institutional Controls	Access Restrictions	Fence	A security fence place around the perimeter of the site, to control access to the site.	Potentially Viable. This option has been retained for further analysis.
			Security Measures	Security cameras and guards to control access to the site.	Potentially Viable. This option has been retained for further analysis.
		Environmental Easements	Environmental Easements	A legal means of restricting future activities at the site.	Potentially Viable. This option has been retained for further analysis.
		Zoning Restrictions	Zoning Restrictions	A legal means of restricting future activities at the site.	Potentially Viable. This option has been retained for further analysis.
Groundwater	Containment	Capping	Soil Cover	A 6-inch soil cover is placed over the site and planted with vegetation. This type of cap allows infiltration, but prevents direct contact with the contaminated media.	Not viable. Direct contact with the groundwater is not an exposure route at OU1.
			Asphalt/Concrete	An asphalt/concrete cap barrier designed for low permeability and supporting traffic loads	Potentially Viable. A portion of OU1 is currently covered with asphaltic pavement.
			Reinforced Concrete	A reinforced concrete single barrier cap to prevent infiltration.	Potentially viable. Because only a portion of OU1 is currently covered with asphaltic pavement, an additional barrier may be necessary.
			Multimedia	A multimedia cap constructed of a flexible membrane liner beneath a layer of compacted clay covered with a drainage and vegetated soil. Highly effective in minimizing infiltration and conforms to RCRA closure guidance.	Potentially viable. Because only a portion of OU1 is currently covered with asphaltic pavement, an additional barrier may be necessary.
		Vertical Barriers	Sheet Piles	Interlocking sheets of steel, concrete, or wood that are driven into the ground to form a groundwater flow barrier. The joints between the sheet pilings are filled to further restrict flow. Generally considered to have a short life span.	Not Viable. Subsurface barriers are typically limited to depths less than 50-feet. To improve effectiveness, subsurface barriers are typically keyed into a low permeability layer such as clay or bedrock. Since the underlying clay is located at approximately 200 feet below grade, this technology is not appropriate for this site.
			Slurry Walls	A slurry wall constructed by filling a vertical trench with cement-bentonite or soil-bentonite slurry.	Not Viable. See above.
			Grout Curtains	Grout curtains are formed by injecting a liquid, slurry, or emulsion grout into pipes arranged in rows beneath the ground surface. The injected material fills the soil pore space, creating a low permeability barrier.	Not Viable. See above.
			Hydraulic Controls	Hydraulic barriers are created by pumping/extraction to minimize the horizontal gradient through a contaminated area. Upgradient extraction and downgradient reinjection may also be used to keep the plume contained.	Not Viable. Because complete containment of the groundwater plume is not required, this option will not be retained.
	In-situ Treatment	Physical/Chemical	Permanganate Injection	Permanganate is injected into the aquifer, where the permanganate ion reacts with organics and oxidizes them into inert compounds. Permanganate reacts quickly with doubled bonded ethenes such as TCE, PCE, and DCE.	Potentially Viable. Permanganate is a viable option for the treatment of VOCs in groundwater, this option will be retained for further analysis.
			Air Sparging/soil Vapor Extraction	Air is injected into the saturated soil to remove volatile organic contaminants through volatilization. Used in conjunction with soil vapor extraction. Soil vapor extraction uses an induced vacuum to pull contaminated vapor from the vadose zone through subsurface wells. The vapors are then either treated or directly discharged.	Potentially Viable. This option is retained, although the depth of contamination may make air sparging difficult to implement and control.
			Density-Driven Air Stripping	Induces an in-well pressure gradient by injecting air at the bottom of a well to draw contaminated groundwater into the lower well screen, strip volatile organics from the groundwater via the injected air, and push stripped water out through the upper well screen. A network of such wells are utilized to address the area of concern	Potentially Viable. This option is retained, although the depth of contamination may make density-driven air stripping difficult to implement and control.
			Passive Wall (Zero-valent Iron)	A reactive metal (usually iron) is used to degrade dissolved halogenated organic compounds. By inducing redox conditions, halogen atoms are substituted with hydrogen atoms, thereby dehalogenating the organic compounds. A permeable reactive is installed in-situ, thus letting the groundwater flow through it and react with the metal. This technology is limited to approximately 40-50 ft bgs due to contruction limitations	Not Viable. Because the depth of groundwater contamination is greater than 50-feet, a reactive wall would be impractical to implement.
			Nano-scale Zero-valent Iron	A nano-scale size metal (usually iron) is used to degrade dissolved halogenated organic compounds. By inducing redox conditions, halogen atoms are substituted with hydrogen atoms, thereby dehalogenating the organic compounds. A permeable reactive is installed in-situ, thus letting the groundwater flow through it and react with the metal. Unlike a traditional zero-valent iron barrier, this technology is not limited by depth below ground surface, as it is installed using injection wells versus excavation.	Potentially Viable. This option is retained for further analysis.
			Hydrogen Peroxide Injection	Hydrogen peroxide is used with an iron catalyst to produce a highly reactive hydroxide radical. The hydroxyl radical degrades most organic compounds by breaking the carbon-hydrogen bonds of the organic molecules.	Potentially viable. This option is retained for further analysis.
			Ozonation	Ozone is injected into the subsurface via sparging wells and oxidizes contaminants directly or through hydroxyl radical formation	Potentially viable. This option is retained for further analysis.
		Biological	Anaerobic Bioremediation	Biodegrades contaminants anaerobically by the addition of an electron donor to stimulate indigenous microorganisms. Microbial activity is supported by the addition of an external carbon source such as lactate.	Potentially viable. This option is retained for further analysis.
			Aerobic Bioremediation	Biodegrades contaminants aerobically by the addition of an electron acceptor to stimulate indigenous microorganisms. Typically utilizes an increased dissolved oxygen concentration in the subsurface to stimulate microorganisms.	Potentially viable. This option is retained for further analysis.

TABLE 3-1
SUMMARY OF TECHNOLOGY TYPES AND PROCESS OPTIONS
NYSDEC - JIMMY'S DRY CLEANER
ROOSEVELT, NEW YORK

Media	General Response Action	Remedial Technology	Representative Process Options		Description	Screening Comment
Groundwater Cont.	Extraction	Extraction	Extraction Well Points		Closely spaced shallow wells, each connected to a main pipe line (header) that is connected to a centrally located pump.	Not Viable. Extraction well points have a depth limitation of 20-feet.
			Extraction Wells		Most commonly used method of groundwater extraction at depths greater than 20 feet.	Potentially viable. This option may be used to extract groundwater from the contaminated aquifer.
		Subsurface Drains	French Tile Drains		Shallow drains lined with French tiles that essentially function like a line of extraction wells to collect contaminated groundwater.	Not Viable. Groundwater at OU1 is too deep.
			Dual Media Drains		Drains consisting of a porous layer between two impermeable layers, usually to remove water at a shallow depth.	Not Viable. See Above.
			Interceptor Trenches		Drains with a perforated pipe at a bottom of a trench that is backfilled with a porous medium to collect contaminated groundwater. Can also be used to collect soil vapors.	Not Viable. See above.
	On-Site Extracted Groundwater Treatment	Physical/Chemical Treatment	Precipitation		The addition of a chemical additive that reacts with dissolved inorganic contaminants to form insoluble solids that can easily be removed from the waste stream.	Potentially Viable. This option is retained as a potentially viable option for the treatment of metals in extracted groundwater.
			Dehalogenation		A process that uses a chemical reaction to remove halogens from the halogenated molecule, creating a new, less toxic compound	Not applicable. Dehalogenation is generally used to chemically alter PCBs in dielectric fluids.
			Sedimentation		Suspended particles are separated from aqueous solution by gravity settling. Generally proceeded by chemical precipitation and/or coagulation/flocculation.	Potentially Viable. This option may be used in conjunction with chemical precipitation.
			Filtration		The removal of fine suspended particles from the aqueous solution by passing the aqueous stream through a filter medium. Typical filter media include sand, anthracite, diatomite, natural or synthetic fabric, and wire cloth.	Potentially Viable. This option is retained as a potentially viable option for the treatment of metals in extracted groundwater.
			Centrifugation		Centrifugal force is used to separate fine particles from the aqueous stream.	Potentially Viable. This option is retained as a potentially viable option for the treatment of metals in extracted groundwater.
			Oxidation	Chlorination	Oxidation of contaminants by redox process using a chlorine oxidizer.	Not Viable. This option is not an economically viable alternative for the treatment of the extracted groundwater.
				Hydrogen Peroxide Oxidation	Oxidation of contaminants by free-radicals using H2O2 as the oxidizer.	Not Viable. This option is not an economically viable alternative for the treatment of the extracted groundwater.
				Ultrox (UV/H2O2/Ozone	Oxidation of organic contaminants using ultraviolet (UV) radiation and ozone and or hydrogen peroxide.	Not Viable. This option is not an economically viable alternative for the treatment of the extracted groundwater.
			Liquid-Phase Separation		Two immiscible liquid layers separated by gravity. Pretreatment may be required for dissolved or emulsified layers.	Not applicable. Liquid-phase separation is used to separate two immiscible layers. The extracted groundwater will not contain immiscible layers.
			Phase Transfer	Air Stripping	A mass transfer unit operation that uses counter-current air and liquid flow through a packed tower or trays to volatilize organic compounds in the liquid stream.	Potentially Viable. This option is retained as an option for treating extracted groundwater.
				Steam Stripping	Same as air stripping unit operation, with the exception that steam is used instead of ambient air to enhance volatilization of organic compounds in the liquid stream.	Not Viable. This option is not retained, since it is an enhancement of air stripping and not necessary.
				Evaporation	Evaporation of liquid from a solution or slurry to concentrate organic compounds in the gas stream. Used in conjunction with condensation units or other remedial technologies.	Not viable. This option is not retained, as it is an inappropriate technology for VOC contaminated water.
				GAC Adsorption	Adsorption of organic compounds to granular activated carbon.	Not Viable. This option is not retained, as it is cost prohibitive.
		Biological	Rotating Biological Contactors		A series of honeycombed or corrugated disks, which act as a support medium for microbial growth, are immersed half-way in the wastewater tank and rotated throughout. The rotation allows for aerobic microbial growth.	Not viable. This option is not retained because the organic substrate in the groundwater is insufficient to sustain biological growth. It is also difficult to develop a biomass culture that is amenable to all constituents in the extracted groundwater and the process is sensitive to variations in the influent quality and quantity.
			Activated Sludge		A suspended aerobic microbial culture (slurry), which is agitated and aerated, used to treat soluble and colloidal organic matter. The microbial slurry is separated from the treated water and recycled.	Not viable. This option is not retained because the organic substrate in the groundwater is insufficient to sustain biological growth. It is also difficult to develop a biomass culture that is amenable to all constituents in the extracted groundwater and the process is sensitive to variations in the influent quality and quantity.
			Aerobic		A mixed culture of organisms used to oxidize waste in an aerobic environment.	Not viable. The organic substrate of the extracted groundwater is not amenable to aerobic bioremediation.
			Trickling Filter		A coarse bed of material (rocks, slates, or plastic) with an adhesion of microbial growth. Water is passed over the bed while the microbes degrade the organic material.	Not viable. The organic substrate of the extracted groundwater is not amenable to aerobic bioremediation.
			Sequencing Batch Reactor		An aerobic process that uses a suspended growth to remove organic compounds. All steps are carried out in one tank.	Not viable. The organic substrate of the extracted groundwater is not amenable to aerobic bioremediation.
	Disposal Groundwater	On-site	Reinjection		On-site reinjection of treated groundwater through reinjection wells	Potentially Viable.
		Off-site	Surface water Discharge		Discharge of treated groundwater to a nearby surface water.	Potentially Viable.
			Retention Basin Discharge		Discharge of treated groundwater to a nearby Town Highway Department recharge basin.	Potentially Viable.
			Reinjection		Off-site reinjection of treated groundwater through reinjection wells.	Potentially Viable.
			Wastewater Treatment Plant		Discharge of pre-treated groundwater to a municipal wastewater treatment plant.	Not Viable. Local municipal wastewater treatment plants do not have the capacity to handle the volume of extracted groundwater.

TABLE 3-1
SUMMARY OF TECHNOLOGY TYPES AND PROCESS OPTIONS
NYSDEC - JIMMY'S DRY CLEANER
ROOSEVELT, NEW YORK

Media	General Response Action	Remedial Technology	Representative Process Options	Description	Screening Comment
	Residual Management	Sludge	Gravity Phase	Traditional sludge thickening. Water is removed from the sludge by gravity in thickening tanks.	Potentially viable. This option is retained as an option for treating sludge from a chemical precipitation process.
			Sludge Dewatering	Mechanical dewatering of sludge by application of pressure or vacuum to reduce moisture content to 20-40% solids.	Potentially viable. This option is retained as an option for treating sludge from a chemical precipitation process.
			Off-site Disposal	Disposal of sludge at an off-site approved landfill.	Potentially viable. This option is retained as an option for treating sludge from a chemical precipitation process.
Groundwater Cont.	Residual Management Cont.	Off-Gas Treatment	GAC Adsorption	Gas-phase organic contaminants are adsorbed to activated carbon.	Potentially Viable. This option may be used to remove organic contaminants from the off-gas stream from air stripping, unit process vents, soil vapor extraction and other treatment processes.
			Resin Adsorption	Gas-phase contaminants are adsorbed to resin materials.	Potentially Viable. This option may be used to remove organic contaminants from the off-gas stream from air stripping, unit process vents, soil vapor extraction, and other treatment processes.
			Biofiltration	Gas-phase contaminants are adsorbed to sorbent material bed where they are biodegraded by microorganisms present in the bed.	Not Viable. This option is not retained, because it will not remove halogenated hydrocarbons such as those present at OU1.
			Catalytic Oxidation	Organic contaminants in the off-gas are destroyed through catalytic oxidation.	Potentially viable. This option is retained.
			Incineration	Off-gas combustion at high temperatures.	Not Viable. This option is not retained because it is impractical to incinerate gas streams with extremely low BTUs.
		Spent GAC	Off-Site Regeneration	Spent GAC/resin is transported to an off-site facility for regeneration at a permitted facility.	Potentially Viable. This option may be used to regenerate spent GAC or resin.
			Off-Site Disposal	Spent GAC/resin is transported off-site and disposed of at a permitted facility.	Not Viable. This option is not retained, because off-site regeneration is more practical than disposal.
Soil	Containment	Capping	Soil Cover	A 6-inch soil cover is placed over the site and planted with vegetation. This type of cap allows infiltration, but prevents direct contact with the contaminated media.	Not viable. Direct contact with the groundwater is not an exposure route at OU1.
			Asphalt/Concrete	An asphalt/concrete cap barrier designed for low permeability and supporting traffic loads	Potentially Viable. A portion of OU1 is currently covered with asphaltic pavement.
			Reinforced Concrete	A reinforced concrete single barrier cap to prevent infiltration.	Potentially viable. Because only a portion of OU1 is currently covered with asphaltic pavement, an additional barrier may be necessary.
			Multimedia	A multimedia cap constructed of a flexible membrane liner beneath a layer of compacted clay covered with a drainage and vegetated soil. Highly effective in minimizing infiltration and conforms to RCRA closure guidance.	Potentially viable. Because only a portion of OU1 is currently covered with asphaltic pavement, an additional barrier may be necessary.
	Source Removal	Excavation	Excavation	Excavation refers to activities in which impacted soil is removed from the Site	Potentially Viable. This option is retained for further analysis.
	Stabilization/Solidification	Stabilization/Solidification	Stabilization/Solidification	Solidification/stabilization is the process of adding binders to the soil to either convert the contaminants into less soluble forms or to encapsulate them in a solid material.	Not Viable. This option is not retained for further consideration, because it is not applicable to organic contamination.
	In-Situ	Physical/Chemical	Permanganate	Permanganate is injected into the subsurface, where the permanganate ion chemically reacts with the organics present oxidizing the organics into inert compounds.	Potential Viable. This option is retained as potentially viable treatment of PCE in the vadose zone.
	In-situ/Ex-situ	Physical/Chemical	Soil Vapor Extraction	Extraction of vadose zone soil vapors using a vacuum extraction well.	Potentially Viable. This option is retained, because of the volatilization rate of PCE at OU1.
		Off-Gas Treatment	GAC Adsorption	Gas-phase organic contaminants are adsorbed to activated carbon.	Potentially Viable. This option may be used to remove organic contaminants from the off-gas stream from air stripping, unit process vents, soil vapor extraction, and other treatment processes.
			Resin Adsorption	Gas-phase contaminants are adsorbed to resin materials.	Potentially Viable. This option may be used to remove organic contaminants from the off-gas stream from air stripping, unit process vents, soil vapor extraction, and other treatment processes.
			Biofiltration	Gas-phase contaminants are adsorbed to sorbent material bed where they are biodegraded by microorganisms present in the bed.	Not Viable. This option is not retained, because it will not remove halogenated hydrocarbons such as those present at OU1.
			Catalytic Oxidation	Organic contaminants in the off-gas are destroyed through catalytic oxidation.	Potentially viable. This option is retained for further analysis.
			Incineration	Off-gas combustion at high temperatures.	Not Viable. This option is not retained because it is impractical to incinerate gas streams with extremely low BTUs.

Table 3-2
Technology Screening Summary
NYSDEC - Jimmy's Dry Cleaners
Roosevelt, New York

Media	General Response Actions	Remedial Technology Type	Process Options	Effectiveness	Implementability	Cost
All Media	No Action	None	Not Applicable	Does not achieve remedial action objectives	Readily implementable	Negligible
	Institutional Controls	Access Restrictions	Access Restrictions	Depends upon continued future implementation.	Readily implementable	Negligible
		Notice of Covenant on Deed Transfers	Notice of Covenant on Deed Transfers	Depends upon continued future implementation.	Appropriate legal actions required	Negligible
		Zoning Restrictions	Zoning Restrictions	Depends upon continued future implementation.	Approval of local government required	Negligible
Groundwater	In-Situ Treatment	Physiochemical Processes	Permanganate Injection	Highly Effective	Highly implementable	Moderate capital, low maintenance
			Hydrogen Peroxide Injection	Effective	Difficult to implement due to depth of injection and potential for fugitive VOC emissions	Moderate to high
			Ozonation	Effective	Difficult to implement due to depth of injection and corosive nature of oxidant	High capital
			Nano-scale Zero-Valent Iron	Effective	Implementable	Moderate to high
		Biological	Anaerobic Bioremediation	Effective	Implementable	Moderate
			Aerobic Bioremediation	Effective	Diffcult to implement due to depth of contamination	High capital and maintenance
	In-situ/Ex-situ Treatment	Physiochemical Processes	Air Sparging/Soil Vapor Extraction	Not effective	Implementable	High maintenance
			In-situ Density-Driven Air Stripping	Not effective	Difficult to implement due to limited suppliers	Moderate to high
	Source Removal	Extraction	Pump and Treat	Effective	Implementable	High capital and maintenance
Soil	Containment	Capping	Asphalt/Concrete	Highly effective	Highly implementable	Low capital and maintenance
	Source Removal	Excavation	Off-site Disposal as Hazardous	Effective, requires	Highly implementable	High transportation and disposal
	In-situ/Ex-situ Treatment	Physical/Chemical	Soil Vapor Extraction	Effective	Highly implementable	Moderate to high

FIGURES

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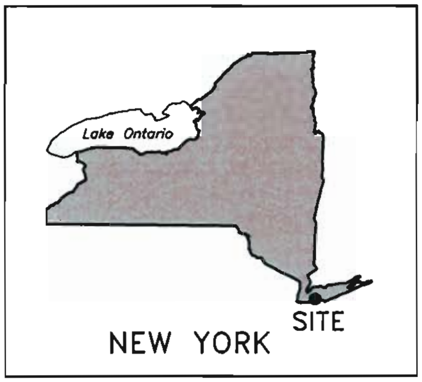

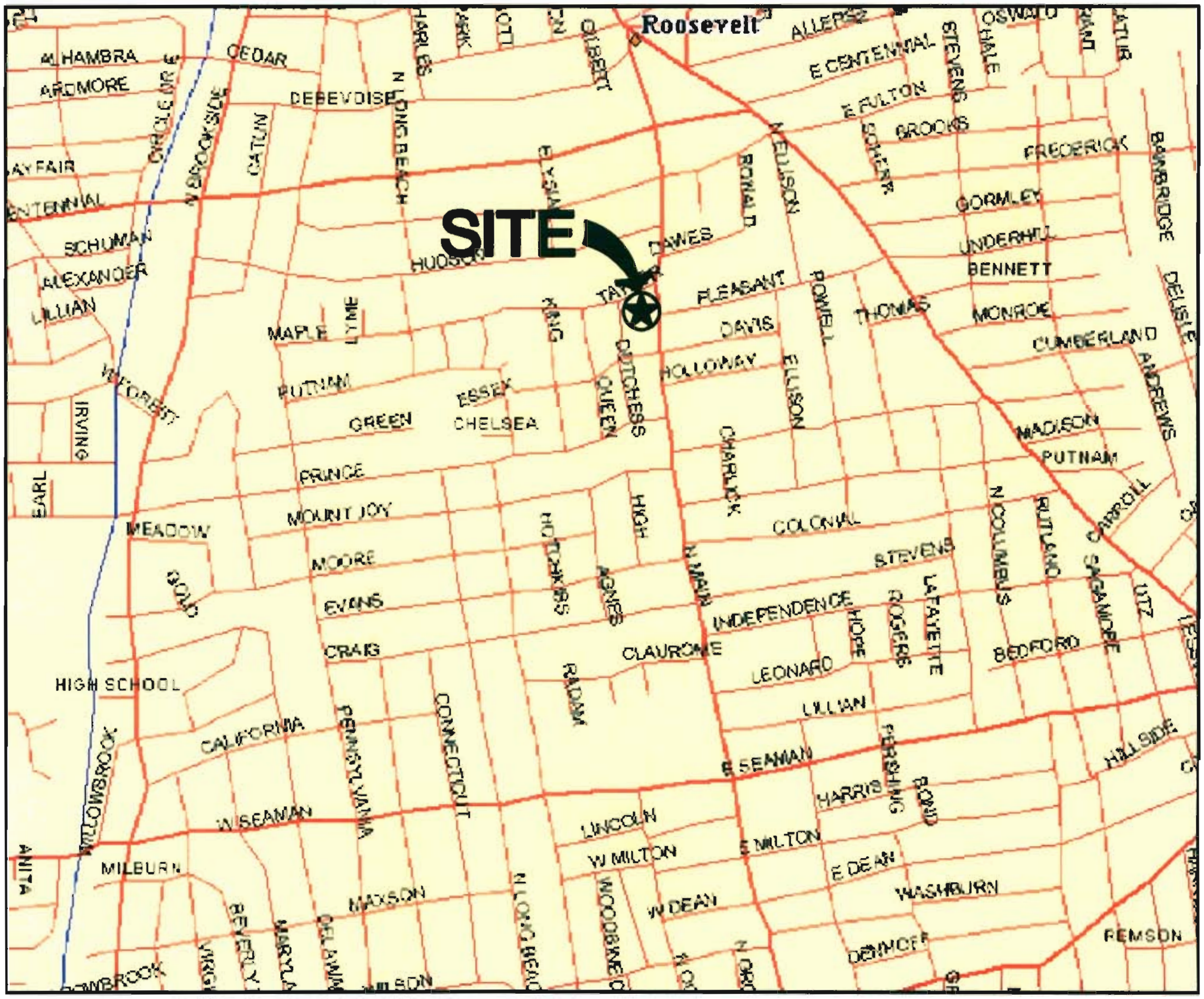

NOT TO SCALE

REFERENCE:
MAP FROM DELORME'S MAP EXPERT, FREEPORT, MAINE.

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FIGURE 1-1
SITE LOCATION MAP
OU1
JIMMY'S DRY CLEANER
ROOSEVELT, NEW YORK

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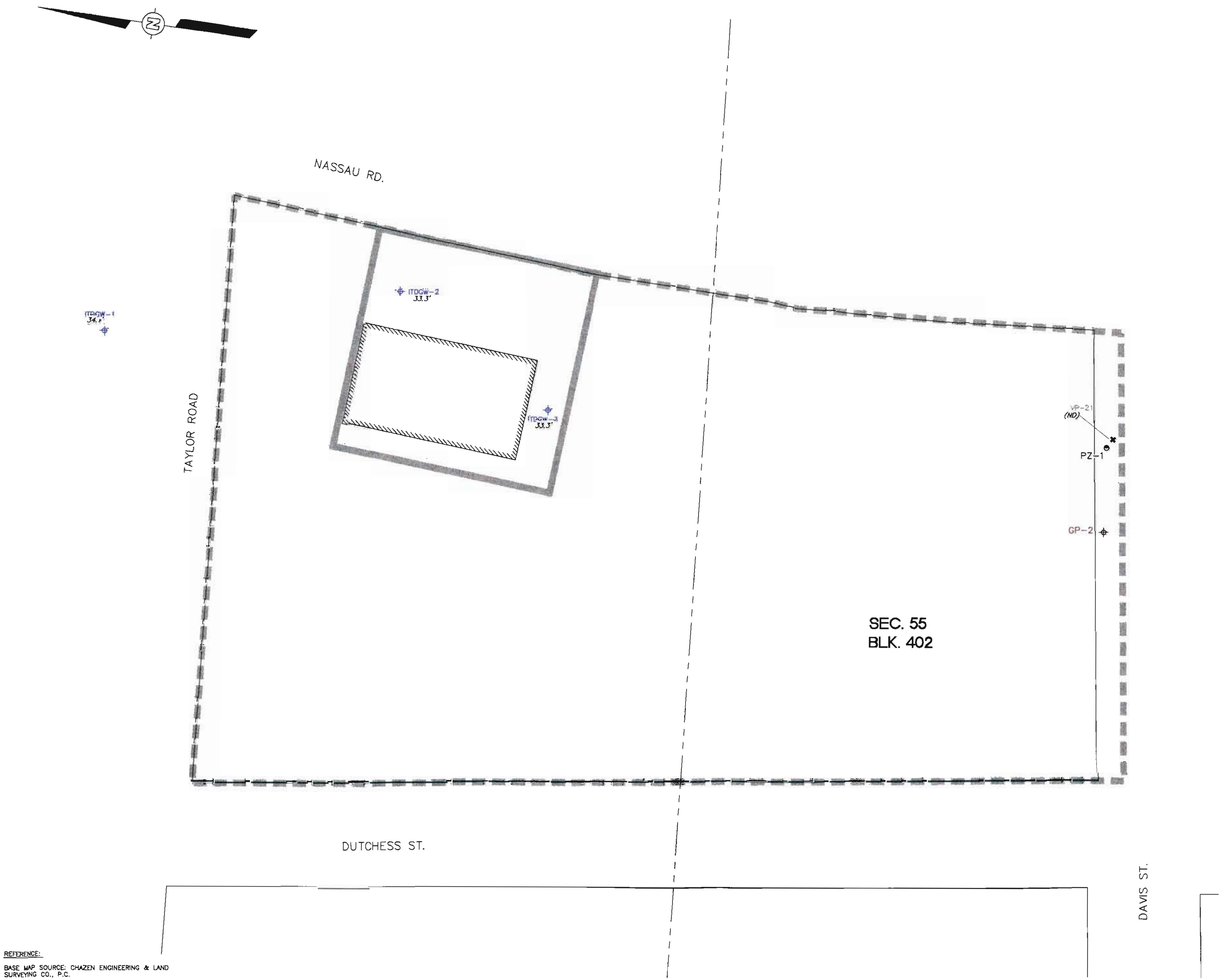

LEGEND:

——	TAX MAP PROPERTY LINES
VP-21 (ND) ✖	EXISTING SOIL VAPOR SAMPLING LOCATION (CONCENTRATION OF PCE, mg/m)
GP-1 ⌖	HISTORIC SAMPLING LOCATIONS
ITDGW-2 33.3' ⌖	GROUNDWATER SAMPLING LOCATION (GROUND ELEVATION)
PZ-1 ●	PEIZOMETER LOCATION
⌖	MONITORING WELL
▬▬	SITE PERIMETER
▬ ▬ ▬	OU1 BOUNDARY
▨	BUILDING BOUNDARY

SCALE
0 20 40 60 FEET

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FIGURE 1–2
OU1 SITE MAP

JIMMY'S DRY CLEANER
ROOSEVELT, NEW YORK

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
ALBANY, NY	S.SHKOLNIK 11-13-03			82-324D52

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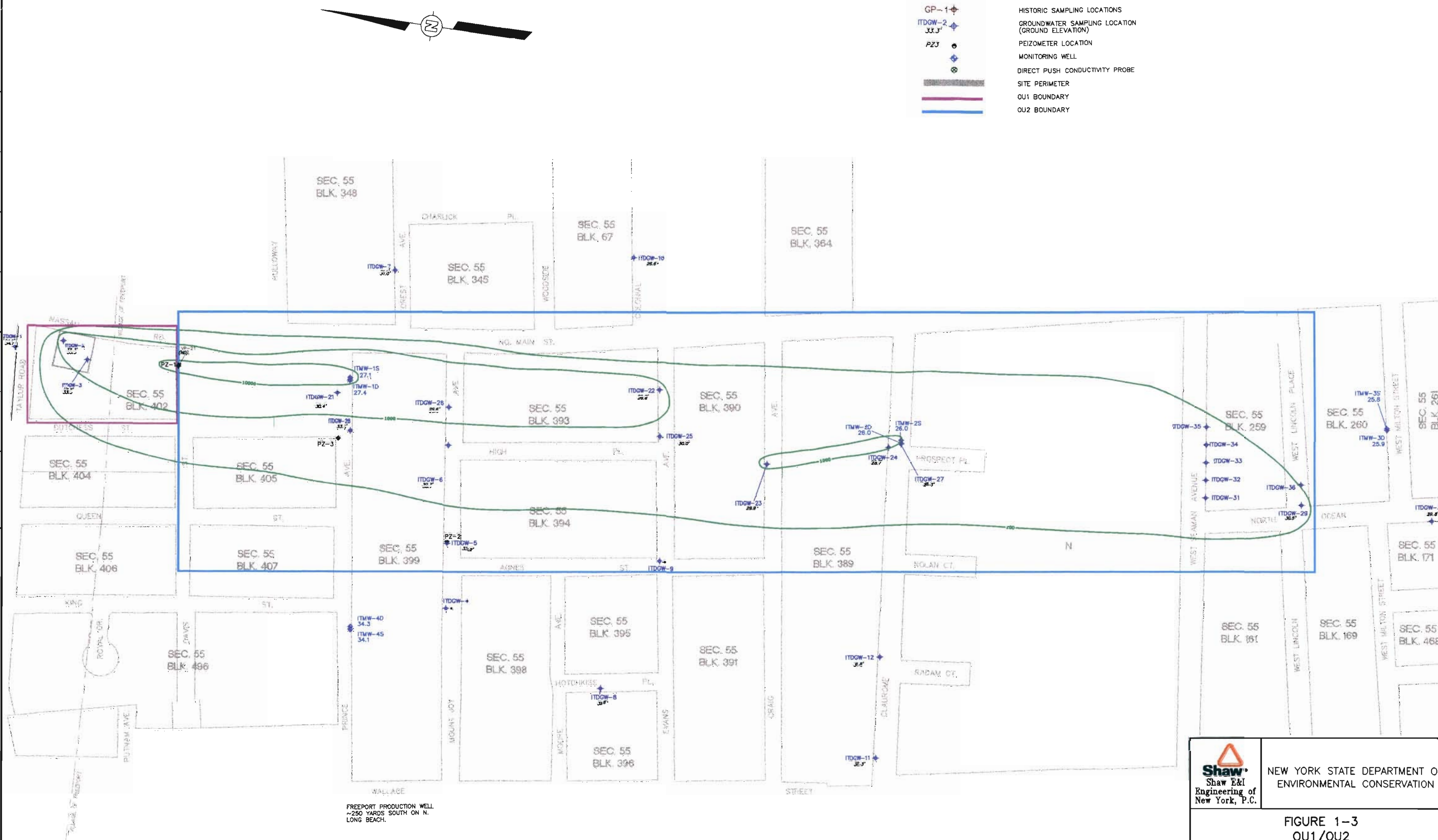
Format Revised: 12/15/...
Image: Xref:

LEGEND:

VP-15 (413.9J)	EXISTING SOIL VAPOR SAMPLING LOCATION (CONCENTRATION OF PCE, mg/m³)
	TAX MAP PROPERTY LINES
GP-1	HISTORIC SAMPLING LOCATIONS
ITDGW-2 33.3'	GROUNDWATER SAMPLING LOCATION (GROUND ELEVATION)
PZ3	PEIZOMETER LOCATION
	MONITORING WELL
	DIRECT PUSH CONDUCTIVITY PROBE
	SITE PERIMETER
	OU1 BOUNDARY
	OU2 BOUNDARY
—10000—	CONCENTRATION OF PCE IN GROUNDWATER (ug/L)



SCALE 0 120 240 360 FEET

REFERENCE:

BASE MAP SOURCE: CHAZEN ENGINEERING & LAND SURVEYING CO., P.C.

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FIGURE 1-3
OU1/OU2
DESIGNATION MAP
JIMMY'S DRY CLEANER
ROOSEVELT, NEW YORK

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
ALBANY, NY	S.SHKOLNIK 12-01-03			82[illegible]24D61

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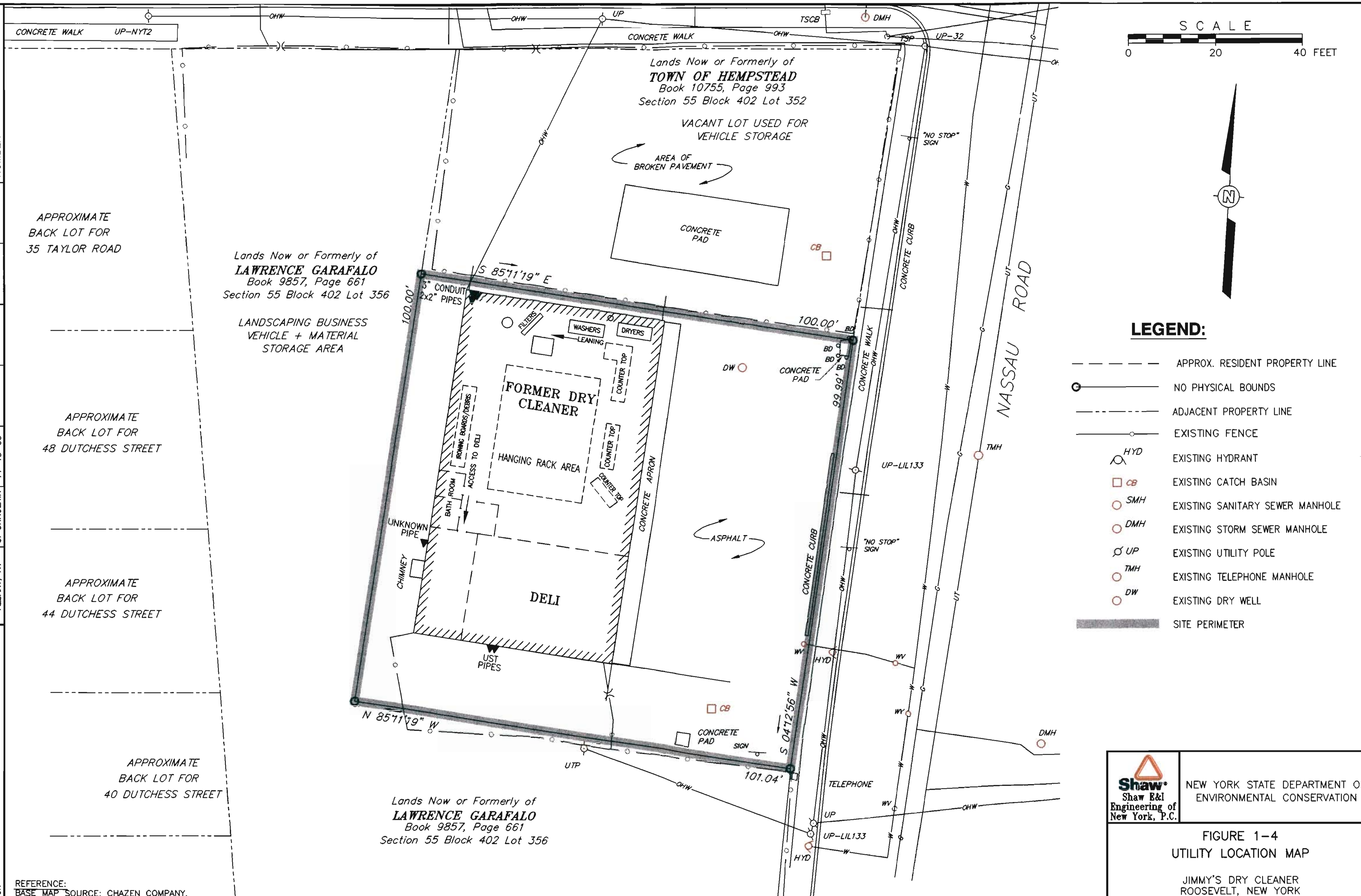

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FIGURE 1-4
UTILITY LOCATION MAP

JIMMY'S DRY CLEANER
ROOSEVELT, NEW YORK

OFFICE	DRAWN BY		CHECKED BY	APPROVED BY	DRAWING NUMBER
ALBANY, NY	S. SHKOLNIK	11-13-03			824324B22

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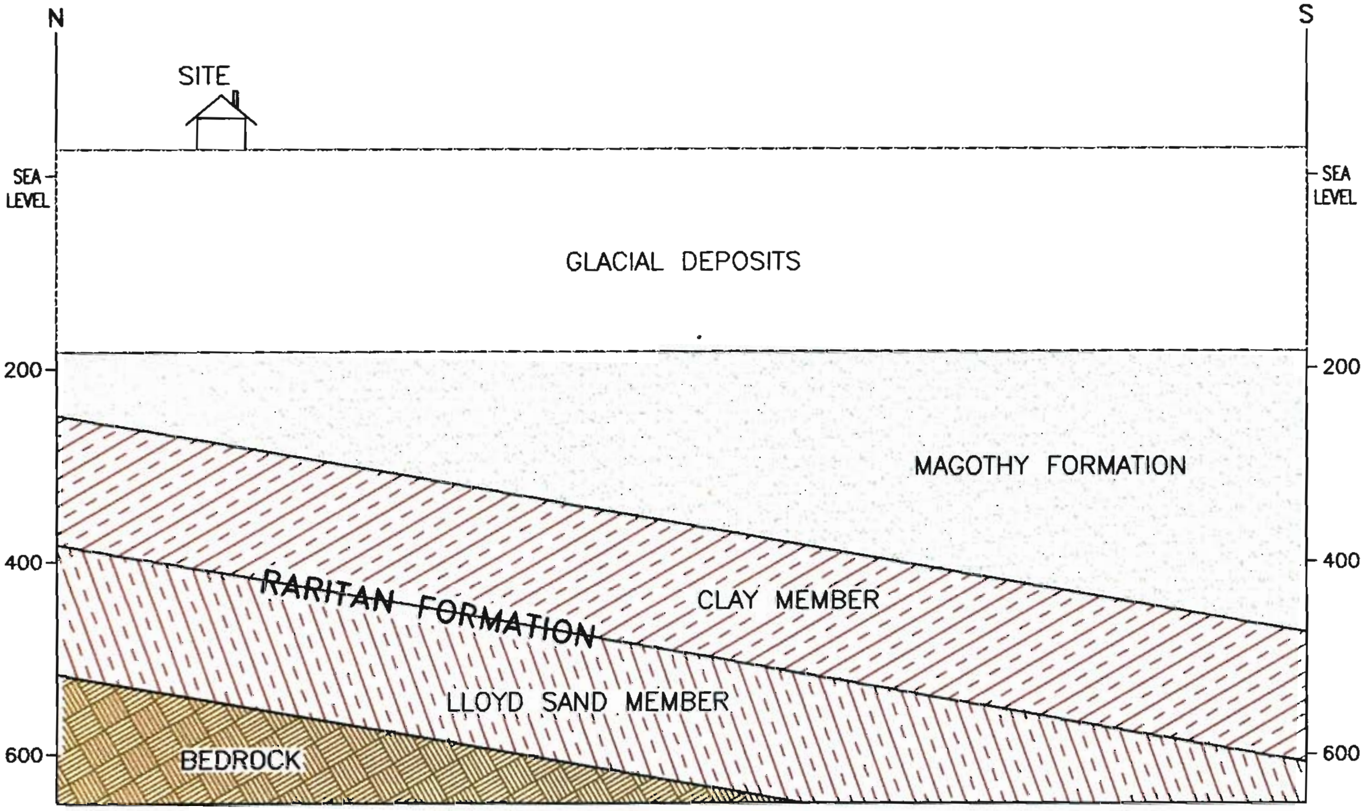

VERTICAL SCALE EXAGGERATED

REFERENCE: USGS PROFESSIONAL PAPER 627-F, 59P.

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FIGURE 1-5
GEOLOGIC CROSS SECTION

JIMMY'S DRY CLEANER
ROOSEVELT, NEW YORK

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
ALBANY, NY	S. SHKOLNIK 11-13-03			824324A32

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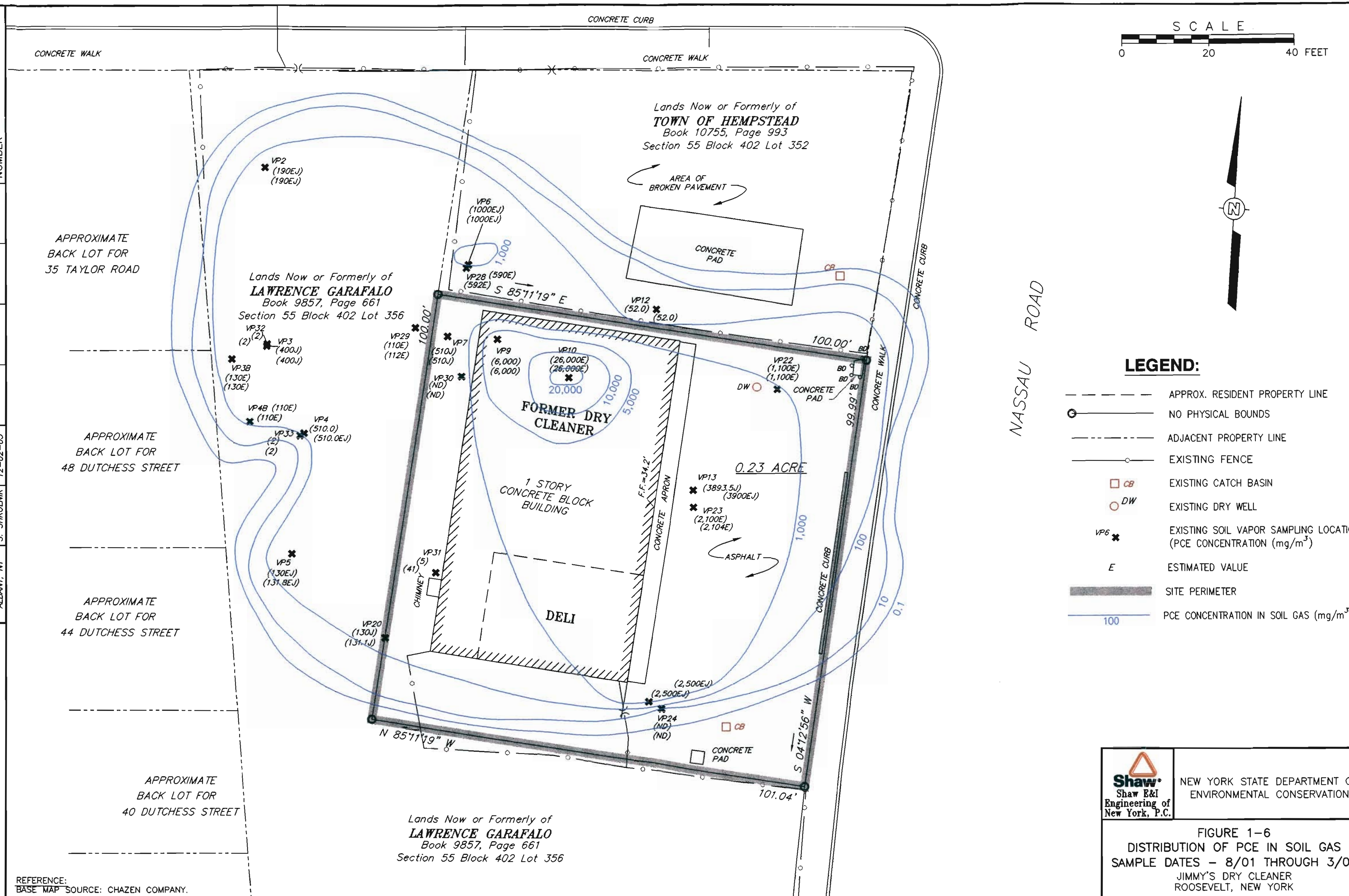

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FIGURE 1-6
DISTRIBUTION OF PCE IN SOIL GAS
SAMPLE DATES – 8/01 THROUGH 3/02
JIMMY'S DRY CLEANER
ROOSEVELT, NEW YORK

OFFICE	DRAWN BY		CHECKED BY	APPROVED BY	DRAWING NUMBER
ALBANY, NY	S. SHKOLNIK	12-02-03			824324B29

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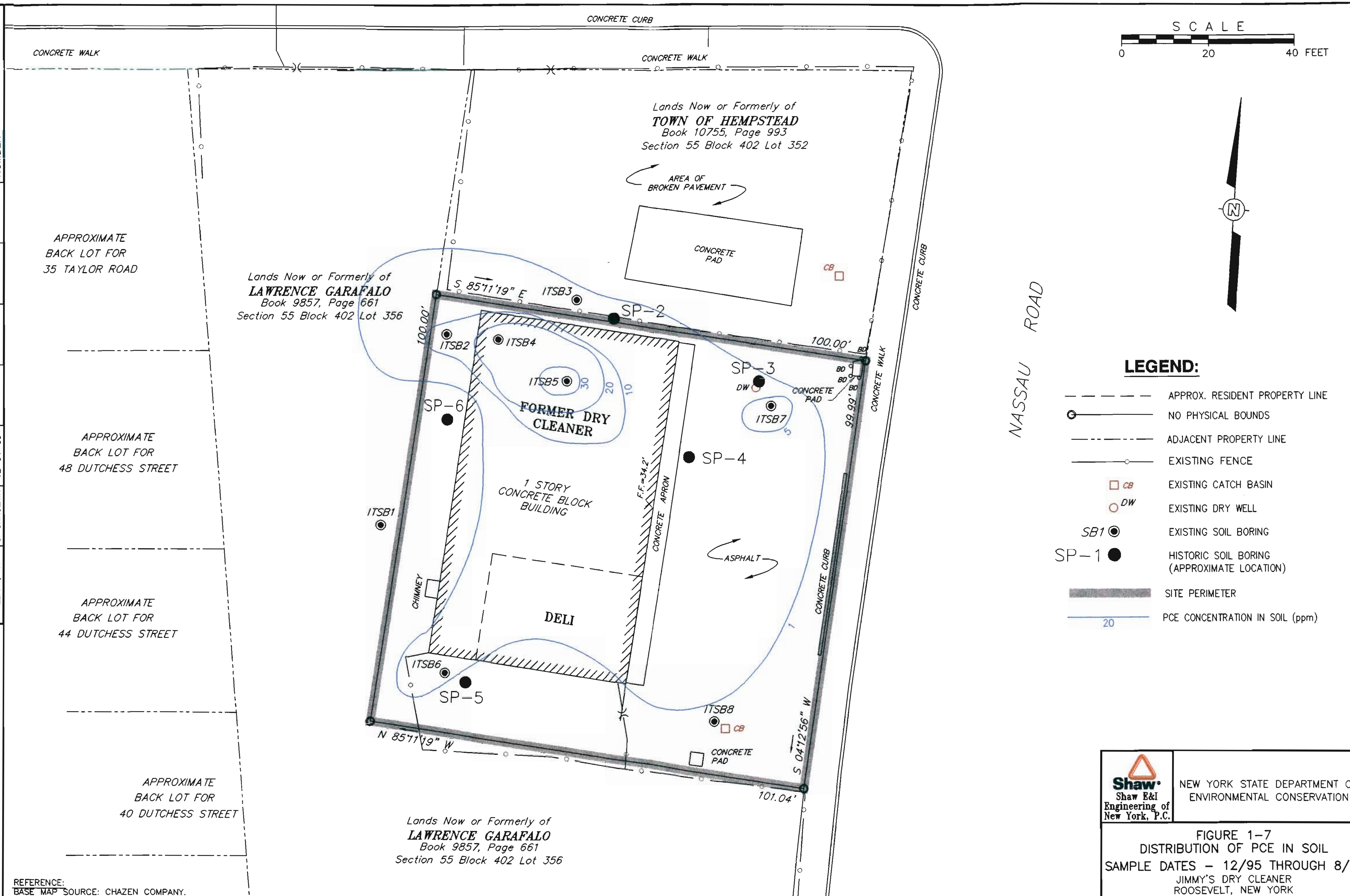

REFERENCE:
BASE MAP SOURCE: CHAZEN COMPANY.

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FIGURE 1-7
DISTRIBUTION OF PCE IN SOIL
SAMPLE DATES – 12/95 THROUGH 8/01
JIMMY'S DRY CLEANER
ROOSEVELT, NEW YORK

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER	
ALBANY, NY	S. SHKOLNIK	12-04-03					824324B30	

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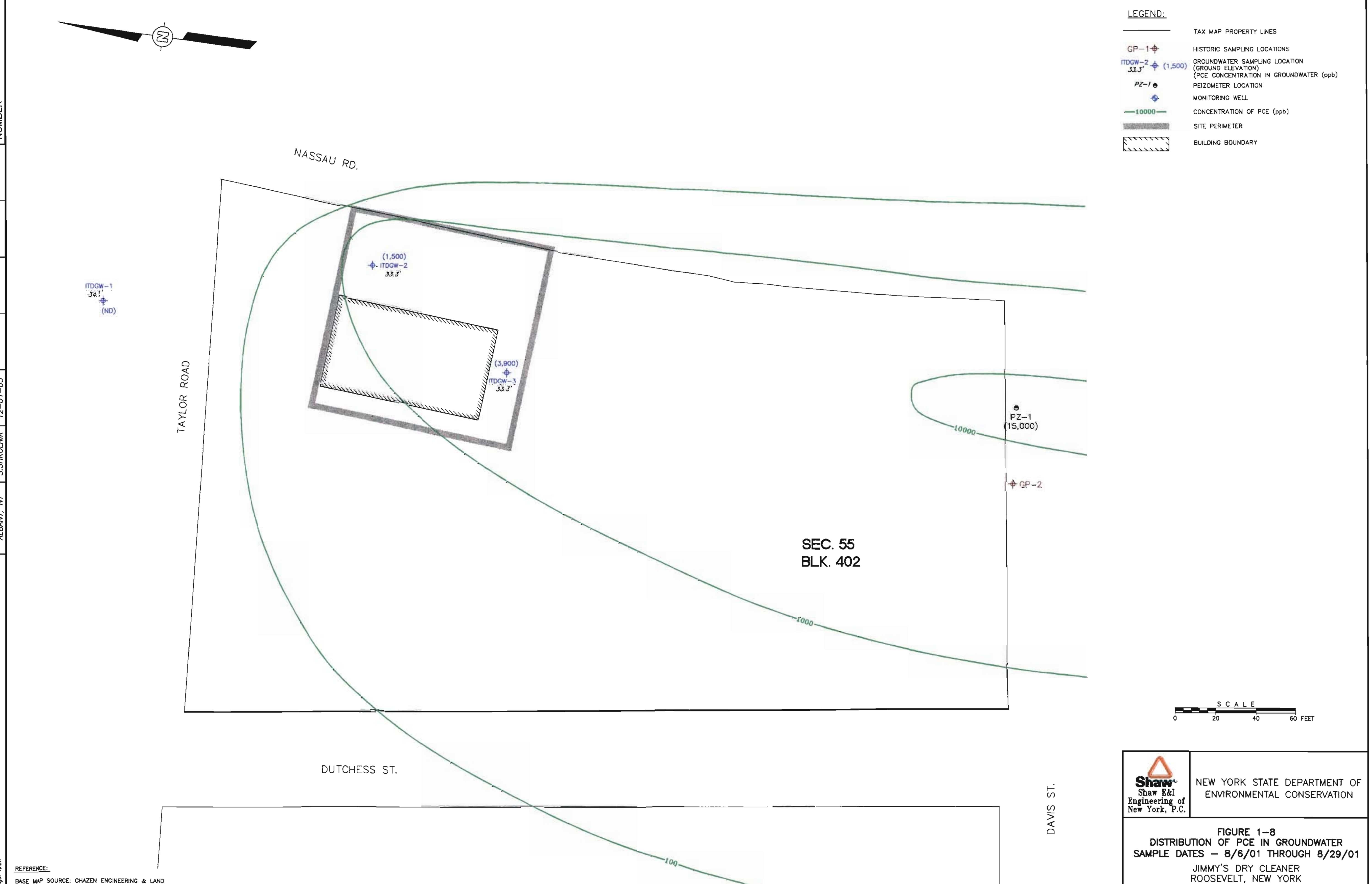

REFERENCE:
BASE MAP SOURCE: CHAZEN ENGINEERING & LAND SURVEYING CO., P.C.

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FIGURE 1-8
DISTRIBUTION OF PCE IN GROUNDWATER
SAMPLE DATES – 8/6/01 THROUGH 8/29/01
JIMMY'S DRY CLEANER
ROOSEVELT, NEW YORK

OFFICE	DRAWN BY		CHECKED BY	APPROVED BY	DRAWING NUMBER
ALBANY, NY	S.SHKOLNIK	12-01-03			824324D53

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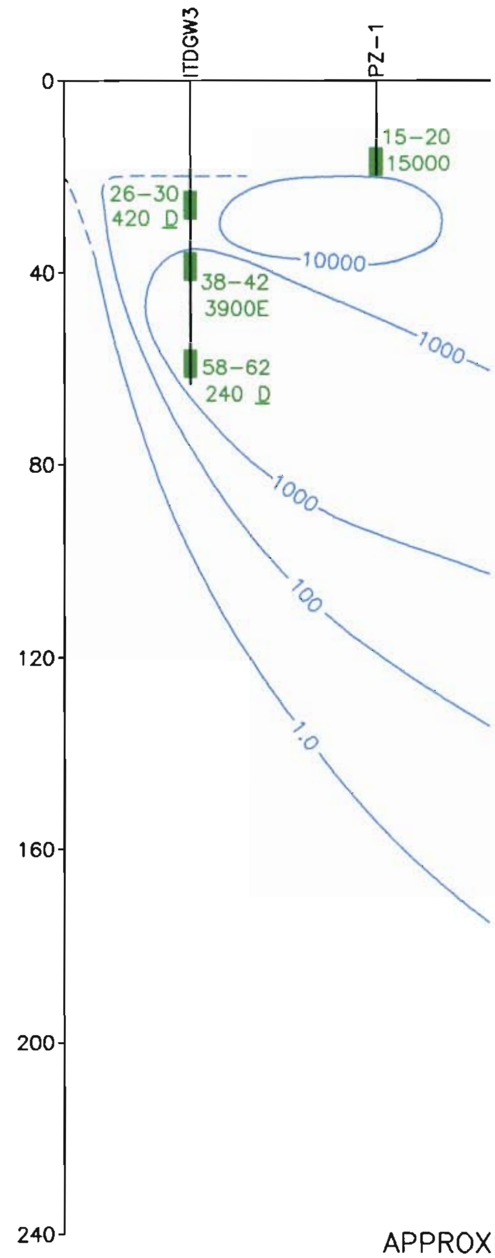

APPROXIMATE HORIZONTAL SCALE

0 250 500 FEET

APPROXIMATE VERTICAL SCALE

0 40 80 FEET

LEGEND

15-20 15000	FEET BELOW GROUND SURFACE CONCENTRATION OF TETRACHLOROETHENE (PERC) ug/L
D	RESULT WAS OBTAINED FROM DILUTION
E	ESTIMATED VALUE
—100—	CONCENTRATION OF PERC IN GROUNDWATER (ug/L)

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FIGURE 1-9

DISTRIBUTION OF PCE IN GROUNDWATER, CROSS-SECTION

SAMPLE DATES 8/07/01 - 8/29/01

JIMMY'S DRY CLEANER, ROOSEVELT, NEW YORK

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
ALBANY, NY	S. SHKOLNIK 12-02-03			824324A33

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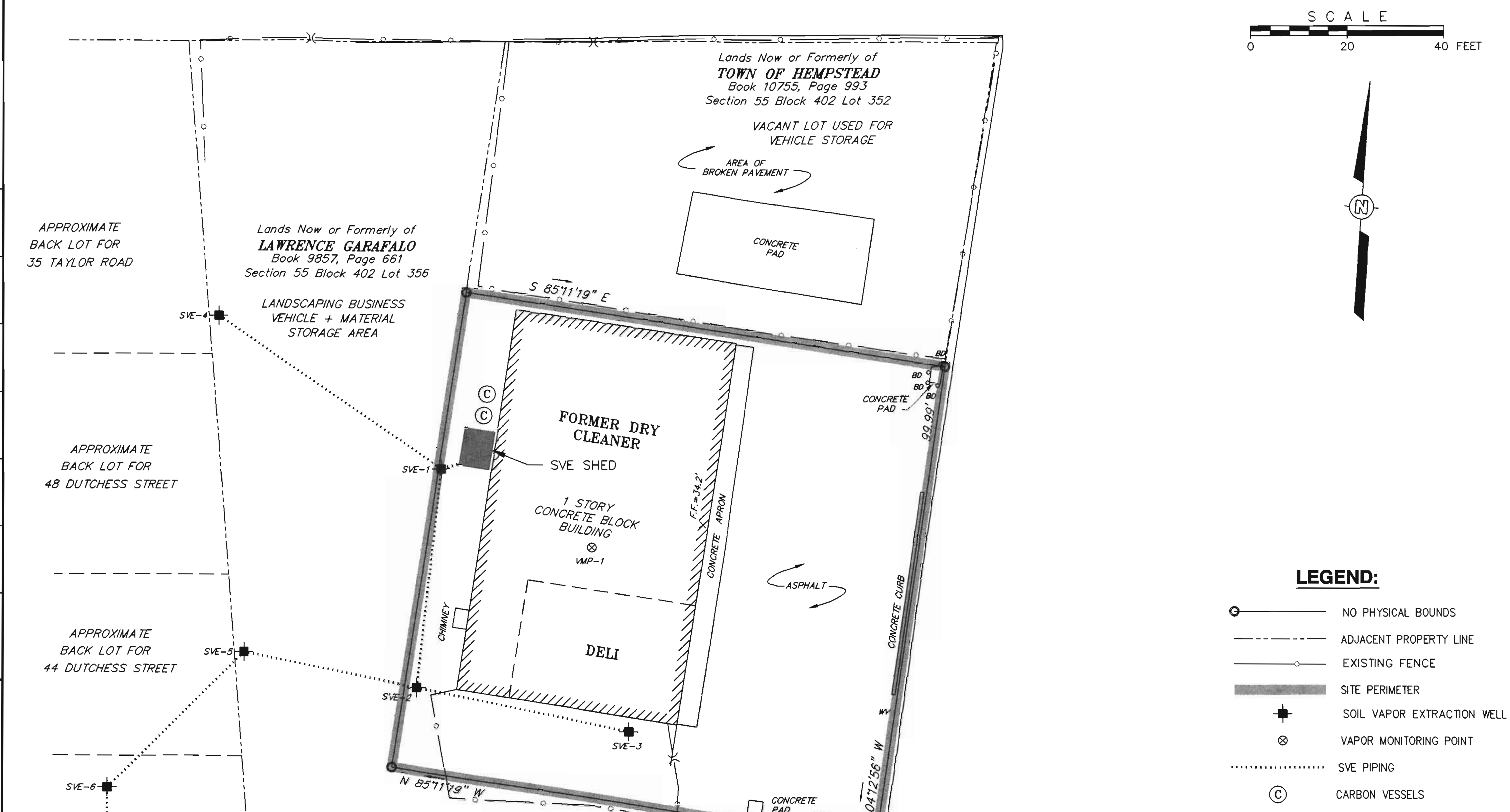

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FIGURE 1-10
IRM-SVE PLAN

JIMMY'S DRY CLEANER
ROOSEVELT, NEW YORK

REFERENCE:
BASE MAP SOURCE: CHAZEN COMPANY.

OFFICE	DRAWN BY		CHECKED BY	APPROVED BY	DRAWING NUMBER
ALBANY, NY	S. SHKOLNIK	01-27-04			824324B25

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Format Revised: 7/18/00
Image:
Xref:

	GENERAL RESPONSE ACTIONS						
ENVIRONMENTAL MEDIA	NO FURTHER ACTION	INSTITUTIONAL CONTROLS	CONTAINMENT	REMOVAL AND DISPOSAL	*IN-SITU* TREATMENT	*EX-SITU*-TREATMENT AND DISPOSAL	*IN-SITU/EX-SITU* TREATMENT
GROUNDWATER	○	○	○		○	○	○
SOIL/SOIL GAS/INDOOR AIR	○	○	○	○	○	○	○

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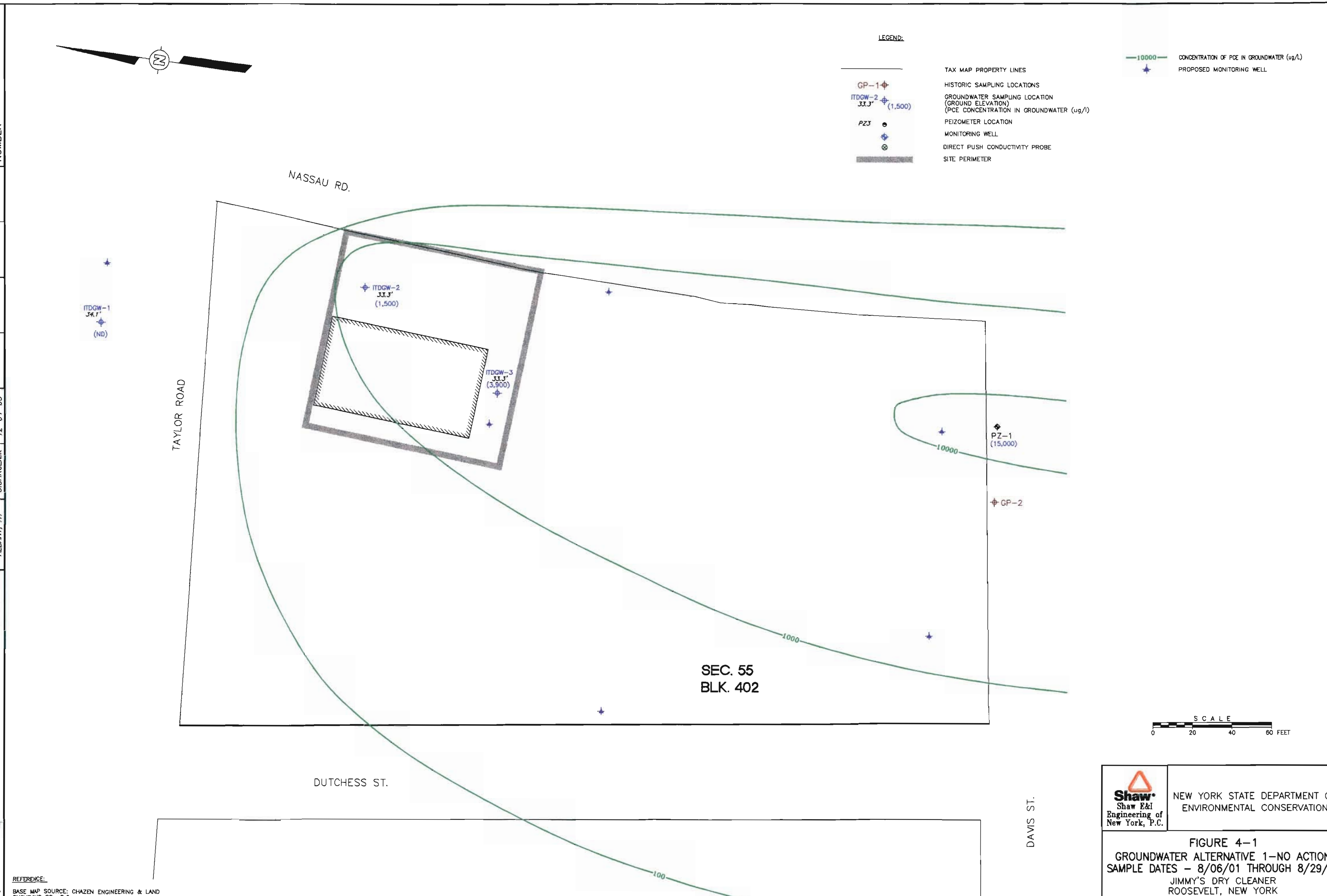
New York State Department of Environmental Conservation

FIGURE 2-1
GENERAL RESPONSE ACTION MATRIX

Jimmy's Dry Cleaner
Roosevelt, New York



REFERENCE:
BASE MAP SOURCE: CHAZEN ENGINEERING & LAND SURVEYING CO., P.C.

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FIGURE 4-1
GROUNDWATER ALTERNATIVE 1-NO ACTION
SAMPLE DATES - 8/06/01 THROUGH 8/29/01
JIMMY'S DRY CLEANER
ROOSEVELT, NEW YORK

OFFICE	...N BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
ALBANY, NY	S.SHKOLNIK 12-04-03			82...24D47

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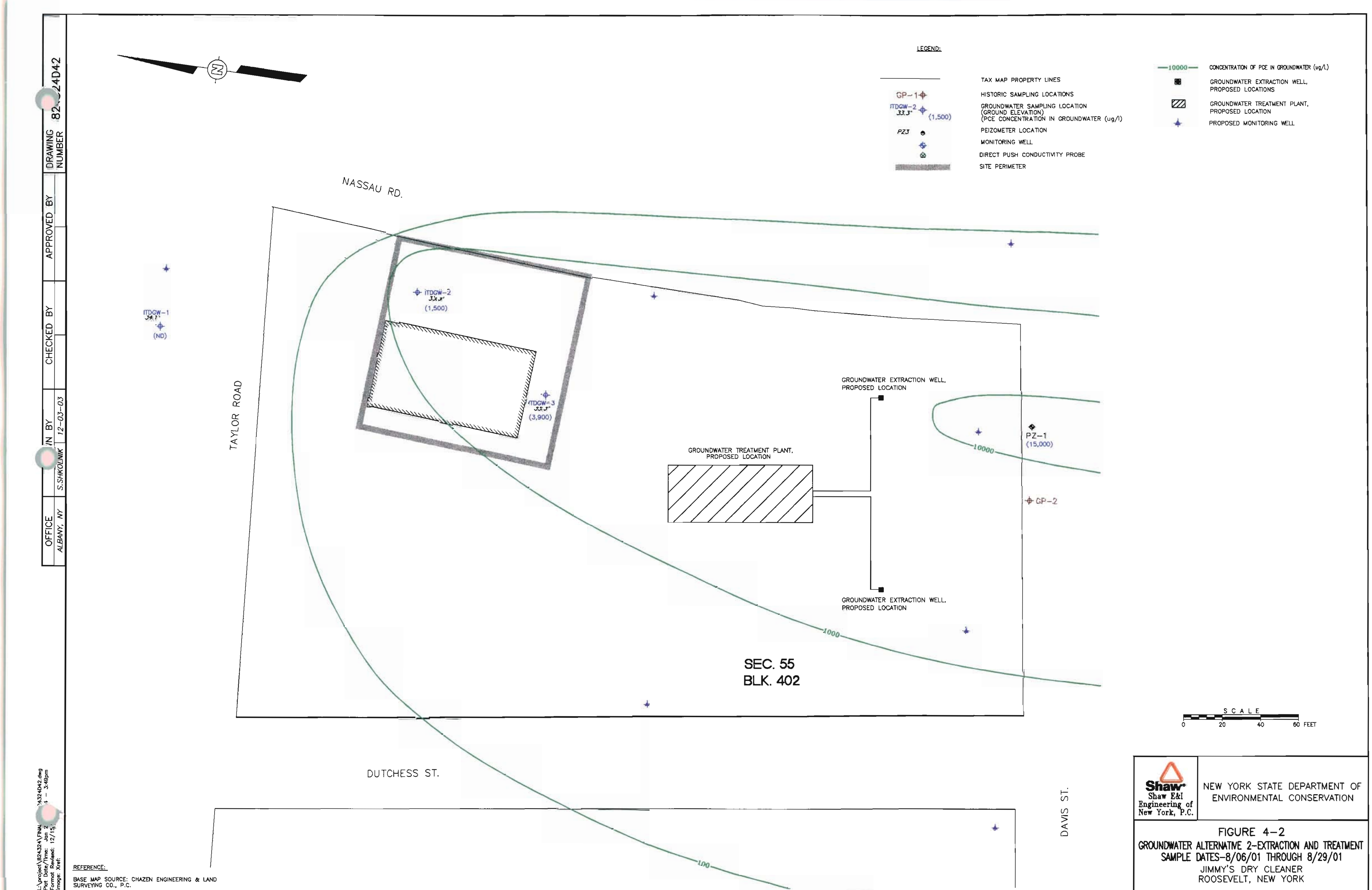
LEGEND:
TAX MAP PROPERTY LINES
GP-1
HISTORIC SAMPLING LOCATIONS
ITDGW-2
33.3'
(1,500)
GROUNDWATER SAMPLING LOCATION (GROUND ELEVATION) (PCE CONCENTRATION IN GROUNDWATER (ug/l)
PZ3
PEIZOMETER LOCATION
MONITORING WELL
DIRECT PUSH CONDUCTIVITY PROBE
SITE PERIMETER
10000
CONCENTRATION OF PCE IN GROUNDWATER (ug/L)
GROUNDWATER EXTRACTION WELL, PROPOSED LOCATIONS
GROUNDWATER TREATMENT PLANT, PROPOSED LOCATION
PROPOSED MONITORING WELL
N
NASSAU RD.
TAYLOR ROAD
DUTCHESS ST.
DAVIS ST.
ITDGW-1
(ND)
ITDGW-2
33.3'
(1,500)
ITDGW-3
(3,900)
GROUNDWATER TREATMENT PLANT, PROPOSED LOCATION
GROUNDWATER EXTRACTION WELL, PROPOSED LOCATION
GROUNDWATER EXTRACTION WELL, PROPOSED LOCATION
PZ-1
(15,000)
GP-2
10000
1000
100
SEC. 55
BLK. 402
SCALE
0
20
40
60 FEET
Shaw
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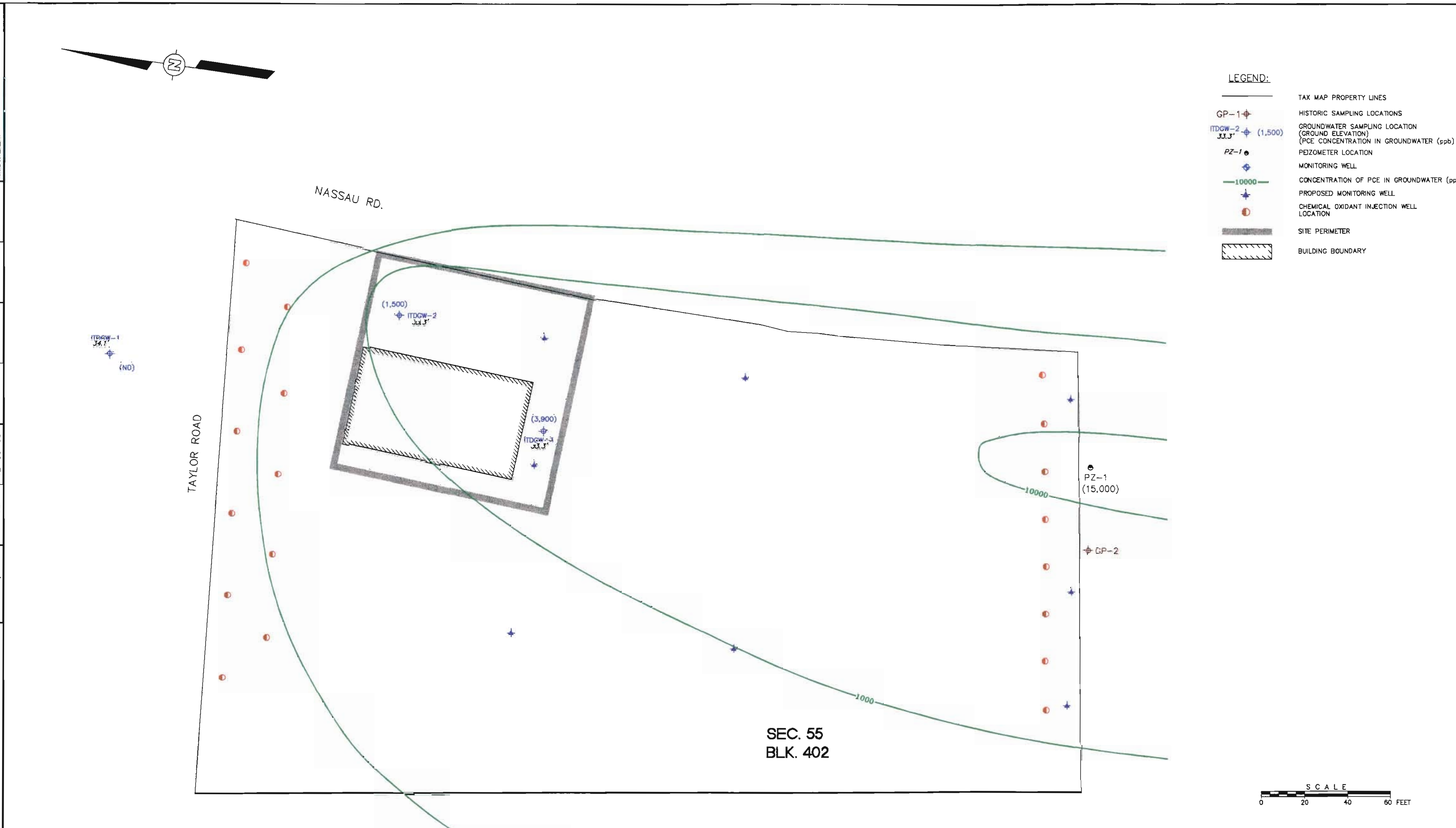
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
FIGURE 4-2
GROUNDWATER ALTERNATIVE 2-EXTRACTION AND TREATMENT
SAMPLE DATES-8/06/01 THROUGH 8/29/01
JIMMY'S DRY CLEANER
ROOSEVELT, NEW YORK
REFERENCE:
BASE MAP SOURCE: CHAZEN ENGINEERING & LAND SURVEYING CO., P.C.
OFFICE
ALBANY, NY
S.SHKOLNIK
12-03-03
CHECKED BY
APPROVED BY
DRAWING NUMBER



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NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FIGURE 4-3
GROUNDWATER ALTERNATIVE 3-CHEMICAL OXIDATION
SAMPLE DATES – 8/6/01 THROUGH 8/29/01
JIMMY'S DRY CLEANER
ROOSEVELT, NEW YORK

REFERENCE:
BASE MAP SOURCE: CHAZEN ENGINEERING & LAND SURVEYING CO., P.C.

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
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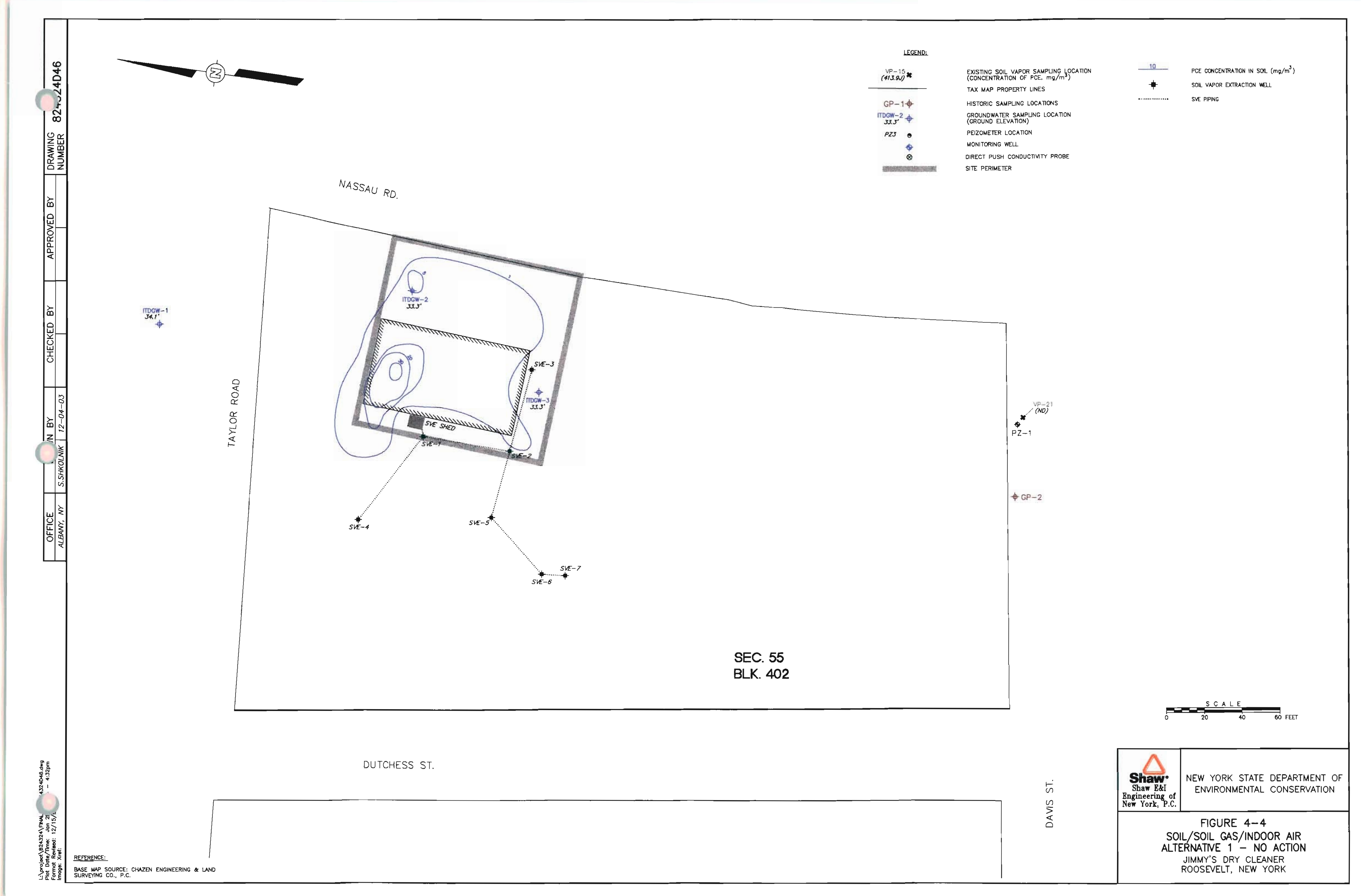
LEGEND:
VP-15 (413.9J)
EXISTING SOIL VAPOR SAMPLING LOCATION (CONCENTRATION OF PCE, mg/m3)
TAX MAP PROPERTY LINES
GP-1
HISTORIC SAMPLING LOCATIONS
ITDGW-2 33.3'
GROUNDWATER SAMPLING LOCATION (GROUND ELEVATION)
PZ3
PEIZOMETER LOCATION
MONITORING WELL
DIRECT PUSH CONDUCTIVITY PROBE
SITE PERIMETER
10
PCE CONCENTRATION IN SOIL (mg/m3)
SOIL VAPOR EXTRACTION WELL
SVE PIPING
NASSAU RD.
TAYLOR ROAD
DUTCHESS ST.
DAVIS ST.
ITDGW-1 34.1'
ITDGW-2 33.3'
ITDGW-3 33.3'
SVE SHED
SVE-1
SVE-2
SVE-3
SVE-4
SVE-5
SVE-6
SVE-7
VP-21 (ND)
PZ-1
GP-2
SEC. 55
BLK. 402
SCALE
0 20 40 60 FEET
Shaw
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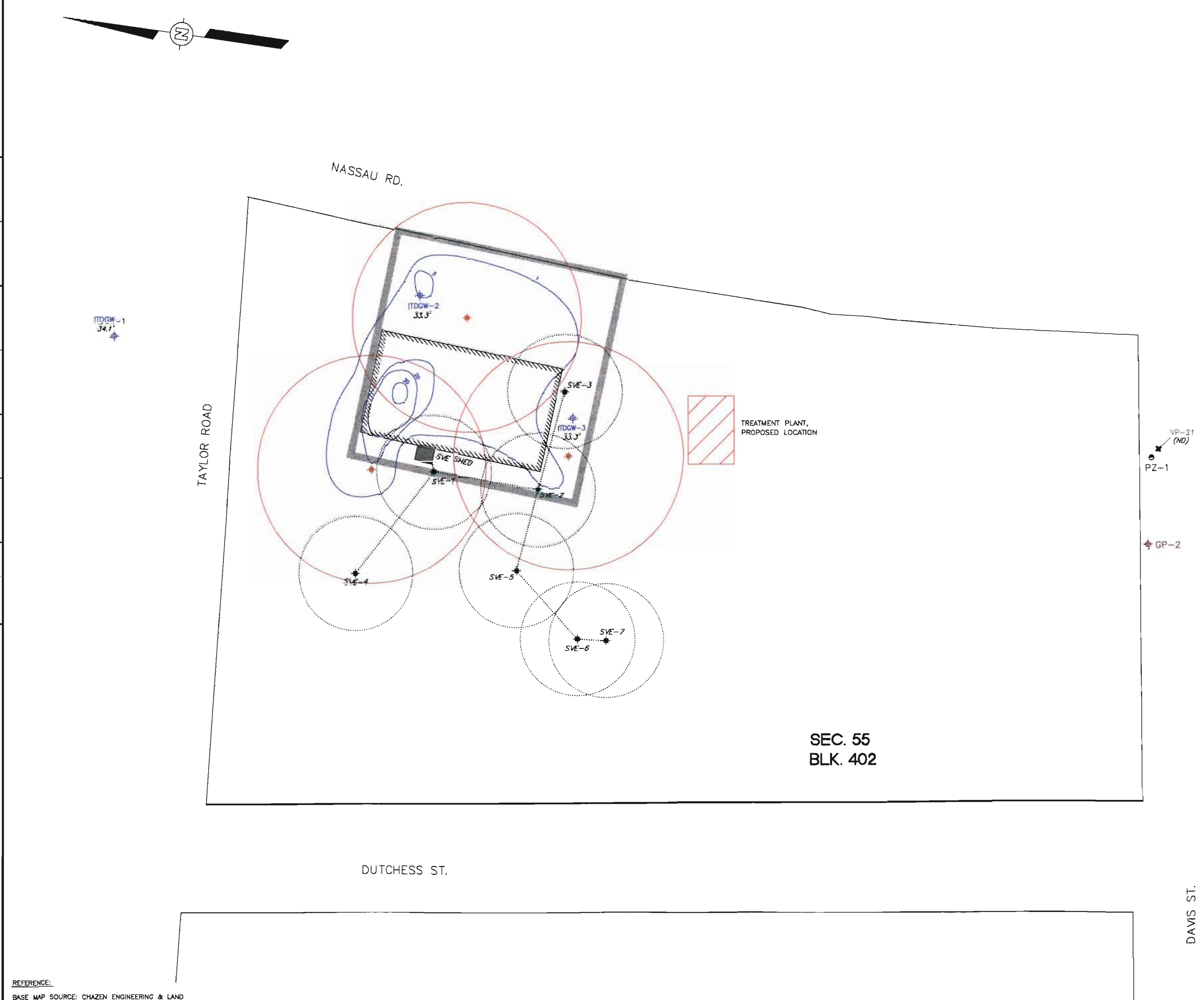
FIGURE 4-4
SOIL/SOIL GAS/INDOOR AIR
ALTERNATIVE 1 - NO ACTION
JIMMY'S DRY CLEANER
ROOSEVELT, NEW YORK
REFERENCE:
BASE MAP SOURCE: CHAZEN ENGINEERING & LAND SURVEYING CO., P.C.
OFFICE
ALBANY, NY
N BY
S.SHKOLNIK
12-04-03
CHECKED BY
APPROVED BY
DRAWING NUMBER
824324D46



LEGEND:

- TAX MAP PROPERTY LINES
- VP-21 (ND) — EXISTING SOIL VAPOR SAMPLING LOCATION (CONCENTRATION OF PCE, mg/m)
- GP-1 — HISTORIC SAMPLING LOCATIONS
- ITDGW-2 33.3' — GROUNDWATER SAMPLING LOCATION (GROUND ELEVATION)
- PZ-1 — PEIZOMETER LOCATION
- MONITORING WELL
- 10 — PCE CONCENTRATION IN SOIL (ppm)
- SOIL VAPOR EXTRACTION WELL, PROPOSED LOCATIONS
- TREATMENT PLANT, PROPOSED LOCATION
- IRM SOIL VAPOR EXTRACTION WELL
- IRM SVE PIPING
- EXPECTED RADIUS OF INFLUENCE OF SOIL VAPOR EXTRACTION WELLS
- SITE PERIMETER
- BUILDING BOUNDARY

SCALE 0 20 40 60 FEET

REFERENCE:
BASE MAP SOURCE: CHAZEN ENGINEERING & LAND SURVEYING CO., P.C.

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FIGURE 4-5
SOIL/SOIL GAS/INDOOR AIR
ALTERNATIVE 2 – SVE
JIMMY'S DRY CLEANER
ROOSEVELT, NEW YORK

OFFICE	N BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
ALBANY, NY	S.SHKOLNIK 01-12-04			824324D51

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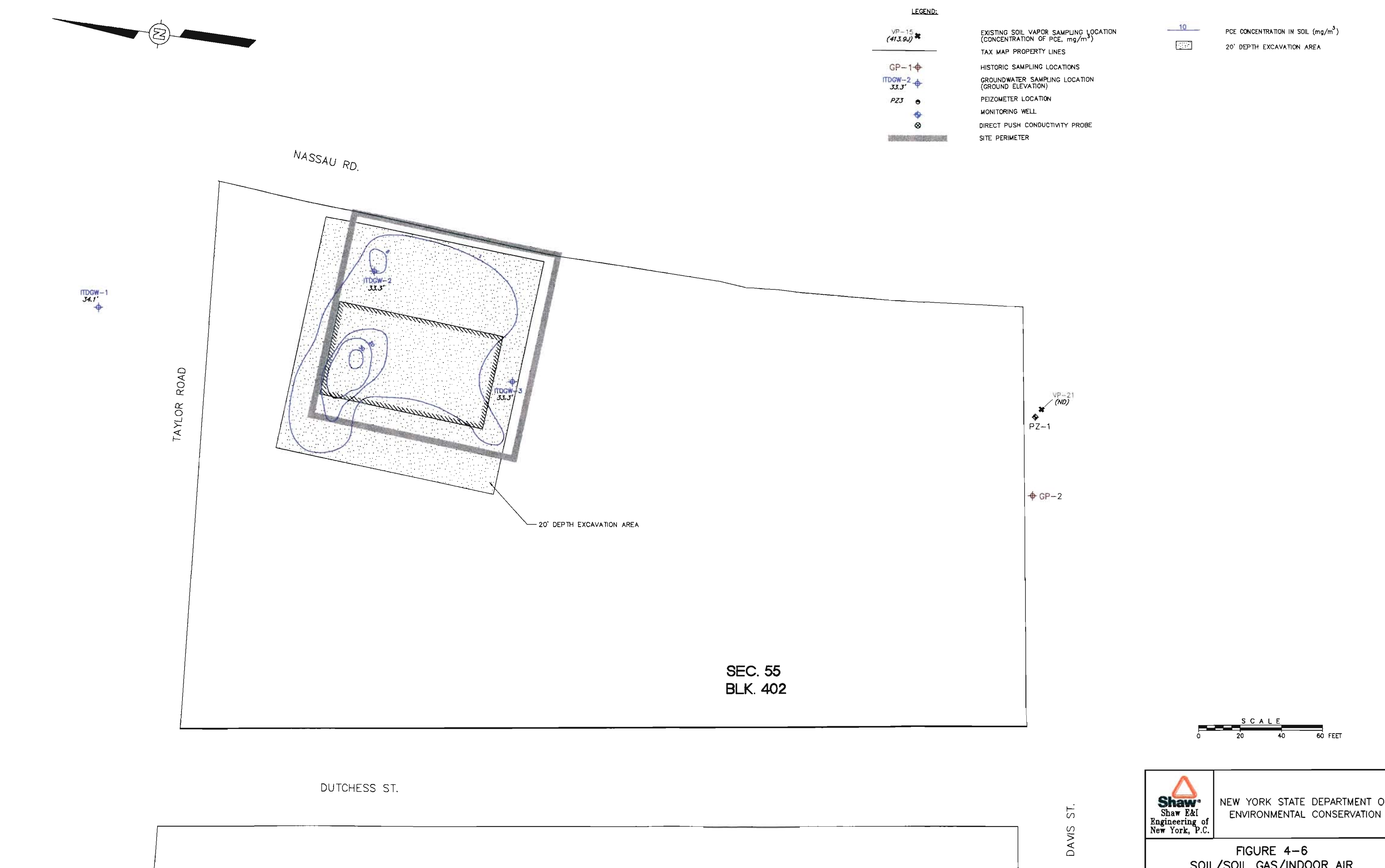

REFERENCE:
BASE MAP SOURCE: CHAZEN ENGINEERING & LAND SURVEYING CO., P.C.

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FIGURE 4-6
SOIL/SOIL GAS/INDOOR AIR
ALTERNATIVE 3-EXCAVATION AND OFF-SITE DISPOSAL
JIMMY'S DRY CLEANER
ROOSEVELT, NEW YORK

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
ALBANY, NY	S.SHKOLNIK 12-03-03			824324D44

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Plot Date/Time: Jan 2... - 4:35pm
Format Revised: 12/15/...
Image: Xref:

APPENDIX A

REMEDIAL ALTERNATIVE COST ESTIMATES

Table A-1
REMEDIAL ALTERNATIVE COST SUMMARY

Groundwater Alternative 1 - No Action

COST ESTIMATE SUMMARY

Site: Jimmy's Dry Cleaner
Location: 61 Nassau Road, Roosevelt, New York
Phase: Feasibility Study (-30% to + 50%)
Base Year: 2004
Date:

Description: Groundwater Alternative 1 consists of a semi-annual groundwater monitoring program. Annual O&M costs occur in Year 1 through 30.

PRESENT VALUE ANALYSIS

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR (7%)	PRESENT VALUE	NOTES
Capital Cost	0	$42,225	$42,225	1	$42,225	
Annual O&M Cost	1-30	$537,000	See Table	See Table	$222,119	See PVA Calculations Table for details
		$579,225			$264,344	
TOTAL PRESENT VALUE OF ALTERNATIVE					**$264,344**	

Table A-1
REMEDIAL ALTERNATIVE COST SUMMARY
Groundwater Alternative 1 - No Action

COST ESTIMATE SUMMARY

Site: Jimmys Dry Cleaner
Location: 61 Nassau Road, Roosevelt, New York
Phase: Feasibility Study (-30% to + 50%)
Base Year: 2004
Date:

Description: Groundwater Alternative 1 consists of a semi-annual groundwater monitoring program. Annual O&M costs occur in Year 1 through 30.

CAPITAL COSTS (one-time charge):

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Well Installation	6	EA	$3,000	$18,000	
Well Development	1	LS	$3,000	$3,000	
SUBTOTAL				**$18,000**	
Contingency	25	%	$4,500	$4,500	25% of Capital Costs
SUBTOTAL				$22,500	
Procurement	2	%		$450	
Project Management	5	%		$1,125	
Remedial Design	8	%		$1,800	
Construction Management	6	%		$1,350	
Institutional Controls					
Institutional Controls Plan	1	LS	$5,000	$5,000	
Groundwater Use Restriction	1	LS	$5,000	$5,000	Legal fees
Site Information Database	1	LS	$5,000	$5,000	Setup data management system
SUBTOTAL				**$15,000**	
TOTAL CAPITAL COST				**$42,225**	

O&M COSTS (YEAR 1-30)

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Semi-Annual Sampling Event	2	LS	$3,000	$6,000	Field work and laboratory analytical
Project Management	5	%		$300.00	
Technical Support	10	%		$600.00	
Groundwater Use Restriction	1	LS	$5,000	$5,000	Legal fees
Institutional Controls-Site Info Database	1	LS	$2,000	$2,000	Update and maintain database
Semi-Annual Reporting	2	ea	$2,000	$4,000	Reporting
TOTAL ANNUAL O&M COSTS (YEAR 1-30)				**$17,900**	

Table A-1 ADDENDUM
REMEDIAL ALTERNATIVE COST SUMMARY
Groundwater Alternative 1 - No Action

PVA CALCULATIONS

YEAR	Annual O&M	Discount Factor at 7%	Present Value	CUMMULATIVE DISCOUNTED	CUMMULATIVE UNDISCOUNTED
1	17,900	0.935	16,737	16,737	17,900
2	17,900	0.873	15,627	32,363	35,800
3	17,900	0.816	14,606	46,970	53,700
4	17,900	0.763	13,656	60,626	71,600
5	17,900	0.713	12,763	73,388	89,500
6	17,900	0.666	11,921	85,310	107,400
7	17,900	0.623	11,152	96,461	125,300
8	17,900	0.582	10,418	106,879	143,200
9	17,900	0.544	9,738	116,617	161,100
10	17,900	0.508	9,093	125,710	179,000
11	17,900	0.475	8,503	134,212	196,900
12	17,900	0.444	7,948	142,160	214,800
13	17,900	0.415	7,429	149,589	232,700
14	17,900	0.388	6,945	156,534	250,600
15	17,900	0.362	6,480	163,014	268,500
16	17,900	0.339	6,068	169,082	286,400
17	17,900	0.317	5,674	174,756	304,300
18	17,900	0.296	5,298	180,054	322,200
19	17,900	0.277	4,958	185,013	340,100
20	17,900	0.258	4,618	189,631	358,000
21	17,900	0.242	4,332	193,963	375,900
22	17,900	0.226	4,045	198,008	393,800
23	17,900	0.211	3,777	201,785	411,700
24	17,900	0.197	3,526	205,311	429,600
25	17,900	0.184	3,294	208,605	447,500
26	17,900	0.172	3,079	211,684	465,400
27	17,900	0.161	2,882	214,566	483,300
28	17,900	0.150	2,685	217,251	501,200
29	17,900	0.141	2,524	219,774	519,100
30	17,900	0.131	2,345	222,119	537,000

Table A-2
REMEDIAL ALTERNATIVE COST SUMMARY
Groundwater Alternative 2 - Extraction and Treatment

COST ESTIMATE SUMMARY

Site: Jimmy's Dry Cleaner
Location: 61 Nassau Road
Roosevelt, New York
Phase: Feasibility Study (-30% to + 50%)
Base Year: 2004

Description: Groundwater Alternative 2 consists of a groundwater extraction system (100 gpm) to treat water in the source area. Capital costs occur in Year 0. Annual O&M costs occur in Year 1 through 30. System demobilization/site closure costs occur in Year 31.

PRESENT VALUE ANALYSIS

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR (7%)	PRESENT VALUE	NOTES
Capital Cost	0	$1,951,750	$1,951,750	1	$1,951,750	See PVA Calculations Table for details
Annual O&M Cost	1-30	$23,723,330	See Table	See Table	$9,842,013	See PVA Calculations Table for details
Site Closure Cost	31	$76,756	See Table	See Table	$9,441	
		$25,675,081			$11,803,204	

TOTAL PRESENT VALUE OF ALTERNATIVE **$11,803,204**

Table A-2
REMEDIAL ALTERNATIVE COST SUMMARY
Groundwater Alternative 2 - Extraction and Treatment

COST ESTIMATE SUMMARY

Site: Jimmy's Dry Cleaner
Location: 61 Nassau Road
Roosevelt, New York
Phase: Feasibility Study (-30% to + 50%)
Base Year: 2004

Description: Groundwater Alternative 2 consists of a groundwater extraction system (100 gpm) to treat water in the source area. Capital costs occur in Year 0. Annual O&M costs occur in Year 1 through 30.

CAPITAL COSTS (one-time charge):

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Mobilization/Demobilization					
Mobilization, Waste Handling, Demobilization	1	LS	$113,100	$113,100	
SUBTOTAL				**$113,100**	
Building/Foundation					
Mechanical	1	LS	$16,350	$16,350	Work Area
Electrical	1	LS	$15,850	$15,850	
General (including Foundation)	1	LS	$51,200	$51,200	
SUBTOTAL				**$83,400**	
Groundwater Treatment					
Equipment and Installation	1	LS	$923,500	$923,500	
Extraction Well Installation	2	EA	$15,000	$30,000	
Monitoring Well Installation	8	EA	$7,500	$60,000	Compliance Monitoring Wells
Monitoring Well Development	1	LS	$3,500	$3,500	
SUBTOTAL				**$1,017,000**	
Groundwater Treatment					
Startup & Testing	12	DAY	$5,583	$66,996	
SUBTOTAL				**$66,996**	
SUBTOTAL				**$1,280,496**	
Contingency	25	%		$320,124	Based on 25% of Capital Cost Subtotal
SUBTOTAL				**$1,600,620**	
Procurement	2	%		$32,012	
Project Management	5	%		$80,031	
Remedial Design	8	%		$128,050	
Construction Management	6	%		$96,037	
Institutional Controls					
Institutional Controls Plan	1	LS	$5,000	$5,000	
Groundwater Use Restriction	1	LS	$5,000	$5,000	Legal fees
Site Information Database	1	LS	$5,000	$5,000	Setup data management system
SUBTOTAL				**$15,000**	
TOTAL CAPITAL COST				**$1,951,750**	

Table A-2
REMEDIAL ALTERNATIVE COST SUMMARY
Groundwater Alternative 2 - Extraction and Treatment

COST ESTIMATE SUMMARY

Site: Jimmy's Dry Cleaner
Location: 61 Nassau Road
Roosevelt, New York
Phase: Feasibility Study (-30% to + 50%)
Base Year: 2004

Description: Groundwater Alternative 2 consists of a groundwater extraction system (100 gpm) to treat water in the source area. Capital costs occur in Year 0. Annual O&M costs occur in Year 1 through 30.

O&M COSTS (YEAR 1)

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Operation & Maintenance	12	MO	$58,708	$704,496	Operation, Maintenance, Performance Testing
Semi-Annual Compliance Well Sampling	4	EA	$1,800	$7,200	
SUBTOTAL				$711,696	
Project Management	5	%		$35,584.80	
Technical Support	10	%		$71,169.60	
Institutional Controls-Site Info Database	1	LS	$5,000	$5,000	Update and Maintain Database
Quarterly Reporting	4	ea	$1,000	$4,000	Quarterly Reports
TOTAL ANNUAL O&M COSTS (YEAR 1)				**$827,450**	

ANNUAL O&M COSTS (YEARS 2-10)

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Operation & Maintenance	12	MO	$56,200	$674,400	Operation, Maintenance, Performance Testing
Semi-Annual Compliance Well Sampling	4	EA	$1,800	$7,200	
SUBTOTAL				**$681,600**	
Project Management	5	%		$34,080.00	
Technical Support	10	%		$67,440.00	
Institutional Controls-Site Info Database	1	LS	$5,000	$5,000	Update and Maintain Database
Quarterly Reporting	4	ea	$1,000	$4,000	Quarterly reports
TOTAL ANNUAL O&M COSTS (YEARS 2-10)				**$792,120**	

ANNUAL O&M COSTS (YEARS 11-30)

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Operation & Maintenance	12	MO	$56,200	$674,400	Operation, Maintenance, Performance Testing
Semi-Annual Compliance Well Sampling	2	EA	$1,800	$3,600	
SUBTOTAL				**$678,000**	
Project Management	5	%		$33,900.00	
Technical Support	10	%		$67,440.00	
Institutional Controls-Site Info Database	1	LS	$5,000	$5,000	Update and Maintain Database
Quarterly Reporting	4	ea	$1,000	$4,000	Quarterly reports
TOTAL ANNUAL O&M COSTS (YEARS 11-30)				**$788,340**	

O&M COSTS (YEAR 31)

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Well Abandonment	2	LS	$500	$1,000	2 Extraction Wells
Demobilize system	1	LS	$50,000	$50,000	Remove Equipm't & Piping
Contingency (% of Sum)	25	%	$12,625	$12,625	% of construction activities
Project Mgt (% of Sum + Cont.)	5	%	$3,131	$3,131	% of construction + contingency
Remedial Action Report	1	ea	$10,000	$10,000	
YEAR 31 SUBTOTAL				**$76,756**	

Table A-2 ADDENDUM REMEDIAL ALTERNATIVE COST SUMMARY Groundwater Alternative 2 Groundwater Treatment System	PVA CALCULATIONS

YEAR	Annual O&M	Discount Factor 7%	Present Value	CUMMULATIVE DISCOUNTED	CUMMULATIVE UNDISCOUNTED
1	827,450	0.9350	773,666	773,666	827,450
2	792,120	0.8730	691,521	1,465,187	1,619,570
3	792,120	0.8160	646,370	2,111,557	2,411,690
4	792,120	0.7629	604,308	2,715,865	3,203,810
5	792,120	0.7130	564,782	3,280,647	3,995,930
6	792,120	0.666	527551.9	3,808,199	4,788,050
7	792,120	0.623	493490.8	4,301,689	5,580,170
8	792,120	0.582	461013.8	4,762,703	6,372,290
9	792,120	0.544	430913.3	5,193,617	7,164,410
10	792,120	0.508	402397	5,596,013	7,956,530
11	788,340	0.475	374461.5	5,970,475	8,744,870
12	788,340	0.444	350023	6,320,498	9,533,210
13	788,340	0.415	327161.1	6,647,659	10,321,550
14	788,340	0.388	305875.9	6,953,535	11,109,890
15	788,340	0.362	285379.1	7,238,914	11,898,230
16	788,340	0.339	267247.3	7,506,161	12,686,570
17	788,340	0.317	249903.8	7,756,065	13,474,910
18	788,340	0.296	233348.6	7,989,414	14,263,250
19	788,340	0.277	218370.2	8,207,784	15,051,590
20	788,340	0.258	203391.7	8,411,176	15,839,930
21	788,340	0.242	190778.3	8,601,954	16,628,270
22	788,340	0.226	178164.8	8,780,119	17,416,610
23	788,340	0.211	166339.7	8,946,458	18,204,950
24	788,340	0.197	155303	9,101,761	18,993,290
25	788,340	0.184	145054.6	9,246,816	19,781,630
26	788340	0.172	135594.5	9,382,410	20,569,970
27	788340	0.161	126922.7	9,509,333	21,358,310
28	788340	0.150	118251	9,627,584	22,146,650
29	788340	0.141	111155.9	9,738,740	22,934,990
30	788340	0.131	103272.5	9,842,013	23,723,330
31	76756.25	0.123	9441.019	9,851,454	23,800,087

Table A-3
REMEDIAL ALTERNATIVE COST SUMMARY
Groundwater Alternative 3 - Chemical Oxidation

COST ESTIMATE SUMMARY

Site: Jimmy's Dry Cleaner
Location: 61 Nassau Road
Roosevelt, New York
Phase: Feasibility Study (-30% to + 50%)
Base Year: 2004

Description: GW Alternative 3 consists of chemical oxidant injection at the source followed by 2 years of groundwater monitoring. Capital costs occur in Year 0. Annual O&M costs occur in Years 1-2.

PRESENT VALUE ANALYSIS

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR (7%)	PRESENT VALUE	NOTES
Capital Cost	0	$2,615,445	$2,615,445	1	$2,615,445.00	
Annual O&M Cost	1	$39,120	$39,120	0.935	$36,577	
Annual O&M Cost	2	$39,120	$39,120	0.873	$34,152	
Periodic Cost	2	$15,250	$15,250	0.873	$13,313	Final Report, abandon wells, etc.
		$2,708,935			$2,699,487	

TOTAL PRESENT VALUE OF ALTERNATIVE **$2,699,487**

Table A-3
REMEDIAL ALTERNATIVE COST SUMMARY
Groundwater Alternative 3 - Chemical Oxidation

COST ESTIMATE SUMMARY

Site: Jimmy's Dry Cleaner
Location: 61 Nassau Road
Roosevelt, New York
Phase: Feasibility Study (-30% to + 50%)
Base Year: 2004

Description: GW Alternative 3 consists of chemical oxidant injection at the source followed by 2 years of groundwater monitoring. Capital costs occur in Year 0. Annual O&M costs occur in Years 1-2.

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Chemical Oxidation					
Pilot Test	1	LS		$180,000	
Work Plan Generation, Permit Applications and HASP	1	LS		$35,000	
KMnO4 Addition Equipment Setup	1	LS		$409,000	
Pre-Addition Sampling, Analysis and Monitoring	1	LS		$182,000	
Labor	1	LS		$100,000	
KMnO4 Addition Activities	640,000	LB	$1.67	$1,068,800	
Secondary KMnO4 Addition with activities	100,000	LB	$1.67	$167,000	
Performance of Post-Addition Monitoring, Sampling and Analysis	1	LS		$100,000	
Meetings, Reports, and Presentation to Agencies	1	LS		$32,500	
SUBTOTAL				**$2,274,300**	
Contingency	15	%		$341,145	
CAPITAL COST FOR CHEMICAL OXIDATION				**$2,615,445**	

O&M COSTS FOR GROUNDWATER MONITORING (YEAR 1)

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Groundwater Sampling & Analysis	32	ea	$900	$28,800	8 wells on quarterly basis
SUBTOTAL				**$28,800**	
Project Management	5	%		$1,440	
Technical Support	10	%		$2,880	
Quarterly Reports	4	ea	$1,500	$6,000	Interim reports
TOTAL ANNUAL O&M COST				**$39,120**	

PERIODIC O&M COSTS (YEAR 2)

DESCRIPTION	YEAR	QTY	UNIT	UNIT COST	TOTAL	NOTES
Well Abandonment	2	8	EA	$500	$4,000	
Contingency (% of Sum)		25	%		$1,000	% of construction activities
Project Mgt. (% Sum + Contingency)		5	%		$250	% of constr. +contingency
Remedial Action Report	2	1	ea	$10,000	$10,000	
SUBTOTAL					**$15,250**	

Table A-4
REMEDIAL ALTERNATIVE COST SUMMARY
Soil/Soil Gas/Indoor Air Alternative 1 - No Action

COST ESTIMATE SUMMARY

Site: Jimmy's Dry Cleaner
Location: 61 Nassau Road
Roosevelt, New York
Phase: Feasibility Study (-30% to + 50%)
Base Year: 2004

Description: Soil/Soil Gas/Indoor Air Alternative 1 consists of the continued operation of the IRM SVE system. Annual O&M costs occur in Year 1 through 30.

PRESENT VALUE ANALYSIS

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR (7%)	PRESENT VALUE	NOTES
Capital Cost	0	$0	$0	1	$0	
Annual O&M Cost	1-30	$1,886,031	See Table	See Table	$780,119	See PVA Calculations Table for details
		$1,886,031			$780,119	

TOTAL PRESENT VALUE OF ALTERNATIVE **$780,119**

Table A-4
REMEDIAL ALTERNATIVE COST SUMMARY
Soil/Soil Gas/Indoor Air Alternative 1 - No Action

COST ESTIMATE SUMMARY

Site: Jimmy's Dry Cleaner
Location: 61 Nassau Road
Roosevelt, New York
Phase: Feasibility Study (-30% to + 50%)
Base Year: 2004

Description: Soil/Soil Gas/Indoor Air Alternative 1 consists of the continued operation of the IRM SVE system. Annual O&M costs occur in Year 1 through 30.

Annual O&M COSTS (YEAR 1-30)

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
SVE Equipment					
Carbon Change Out and Freight (4 drums/event)	5	LS	$2,010	$10,050	
Disposal and Haul of Spent Drums (3 drums/event)	5	LS	$2,000	$10,000	
SVE Blower	12	LS	$300	$3,600	
SUBTOTAL				**$23,650**	
O&M Activities	12	MO	$1,500	$18,000	
SUBTOTAL				**$18,000**	
Indoor Air Monitoring (4 events)	4	LS	$2,181	$8,724	
SUBTOTAL				**$8,724**	
O&M Report (Quarterly)	4	LS	$735	$2,940	
Indoor Air Monitoring Report	4	LS	$625	$2,500	
SUBTOTAL				**$2,500**	
Institutional Controls					
Groundwater Use Restriction	1	LS	$5,000	$5,000	Legal fees
Site Information Database	1	LS	$2,000	$2,000	Update and maintain database
SUBTOTAL				**$7,000**	
Project Management	5	%		$2,994	
SUBTOTAL				$2,994	
TOTAL O&M COST				**$62,868**	

Table A-4 ADDENDUM
REMEDIAL ALTERNATIVE COST SUMMARY
Soil/Soil Gas/Indoor Air Alternative 1
No Action

PVA CALCULATIONS

YEAR	O&M	Discount Factor at 7%		CUMMULATIVE DISCOUNTED	CUMMULATIVE UNDISCOUNTED
1	62,868	0.9350	58,781	58,781	62,868
2	62,868	0.8730	54,884	113,665	125,735
3	62,868	0.8160	51,300	164,965	188,603
4	62,868	0.7629	47,962	212,927	251,471
5	62,868	0.7130	44,825	257,751	314,339
6	62,868	0.666	41,870	299,621	377,206
7	62,868	0.623	39,167	338,788	440,074
8	62,868	0.582	36,589	375,377	502,942
9	62,868	0.544	34,200	409,577	565,809
10	62,868	0.508	31,937	441,514	628,677
11	62,868	0.475	29,862	471,376	691,545
12	62,868	0.444	27,913	499,289	754,412
13	62,868	0.415	26,090	525,379	817,280
14	62,868	0.388	24,393	549,772	880,148
15	62,868	0.362	22,758	572,530	943,016
16	62,868	0.339	21,312	593,842	1,005,883
17	62,868	0.317	19,929	613,771	1,068,751
18	62,868	0.296	18,609	632,380	1,131,619
19	62,868	0.277	17,414	649,794	1,194,486
20	62,868	0.258	16,220	666,014	1,257,354
21	62,868	0.242	15,214	681,228	1,320,222
22	62,868	0.226	14,208	695,436	1,383,089
23	62,868	0.211	13,265	708,701	1,445,957
24	62,868	0.197	12,385	721,086	1,508,825
25	62,868	0.184	11,568	732,654	1,571,693
26	62,868	0.172	10,813	743,467	1,634,560
27	62,868	0.161	10,122	753,589	1,697,428
28	62,868	0.150	9,430	763,019	1,760,296
29	62,868	0.141	8,864	771,883	1,823,163
30	62,868	0.131	8,236	780,119	1,886,031

Table A-5
REMEDIAL ALTERNATIVE COST SUMMARY
Soil/Soil Gas/Indoor Air Alternative 2 - SVE

COST ESTIMATE SUMMARY

Site: Jimmy's Dry Cleaner
Location: 61 Nassau Road
Roosevelt, New York
Phase: Feasibility Study (-30% to + 50%)
Base Year: 2004

Description: Soil/Soil Gas/Indoor Air Alternative 2 consists of a soil vapor extraction system (250 CFM) to treat soil in the source area. Capital costs occur in Year 0. Annual O&M costs occur in Year 1 through 5. Due to phasing out CATOX system and substituting it with carbon system in Year 3, O&M costs for Years 3, 4 and 5 are calculated separately to account for diminishing carbon usage and monitoring requirements.

PRESENT VALUE ANALYSIS

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR (7%)	PRESENT VALUE	NOTES
Capital Cost	0	$882,041	$882,041	1	$882,041	See PVA Calculations Table for details
Annual O&M Cost	1-5	$666,331	See Table	See Table	$578,141	
		$1,548,372			$1,460,181	

TOTAL PRESENT VALUE OF ALTERNATIVE **$1,460,181**

Table A-5
REMEDIAL ALTERNATIVE COST SUMMARY
Soil/Soil Gas/Indoor Air Alternative 2 - SVE

COST ESTIMATE SUMMARY

Site: Jimmy's Dry Cleaner
Location: 61 Nassau Road
Roosevelt, New York
Phase: Feasibility Study (-30% to + 50%)
Base Year: 2004

Description: Soil/Soil Gas/Indoor Air Alternative 2 consists of a soil vapor extraction system (250 CFM) to treat soil in the source area. Capital costs occur in Year 0. Annual O&M costs occur in Years 1-5. Due to phasing out CATOX unit with Vapor Phase Carbon in Year 3, O&M costs in Years 3, 4 and 5 are calculated separately to account for diminishing carbon usage and monitoring requirements.

CAPITAL COSTS (one-time charge):

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Mobilization/Demobilization					
Construction Equipment	1	LS	$3,000	$3,000	Excavation equipment, etc.
Submittals/Implementation Plans	1	LS	$25,000	$25,000	QAPP, SSHP, permits, etc.
Temporary Facilities & Utilities	1	LS	$5,000	$5,000	Fence, roads, signs, trailers, etc.
Post-construction Submittals	1	LS	$25,000	$25,000	Post-construction reports
SUBTOTAL				**$58,000**	
Soil Vapor Extraction (Equipment and Installation)					
SVE Extraction Wells	3	EA	$2,500	$7,500	
SVE System	1	LS	$30,000	$30,000	250 cfm unit w/75"H2O blower
Pre-Fab Building	1	LS	$5,000	$5,000	
SVE Piping, Trenching, Yardwork	1	LS	$30,000	$30,000	Piping, valves, fittings, etc.
Electrical Hookup	1	LS	$5,000	$5,000	
Startup and Testing	1	LS	$15,000	$15,000	
Vapor Treatment (Carbon)				$0	Carbon vessel will be used after 2 yrs of CATOX operation
CATOX				$172,500	CATOX unit to be used for first 2 yrs of operation then off-gas to be treated with carbon
Scrubber system	1	LS	$60,000	$60,000	
50% Sodium Hydroxide	14,250	gal	$13.00	$185,250	
SUBTOTAL				**$510,250**	
Off-Site Disposal (Pre-Construction)					
Off-Site Transport of Soil Cuttings	1	LS	$1,000	$1,000	Transport of drums for off-site disposal
Disposal of Soil Cuttings	1	LS	$4,000	$4,000	Drum disposal fee
SUBTOTAL				**$5,000**	
SUBTOTAL				**$573,250**	
Contingency	25	%		$143,313	Based on 25% of Capital Cost Subtotal
SUBTOTAL				**$716,563**	
Procurement	2	%		$14,331	
Project Management	5	%		$35,828	
Remedial Design	8	%		$57,325	
Construction Management	6	%		$42,994	
Institutional Controls					
Institutional Controls Plan	1	LS	$5,000	$5,000	
Groundwater Use Restriction	1	LS	$5,000	$5,000	Legal fees
Site Information Database	1	LS	$5,000	$5,000	Setup data management system
SUBTOTAL				**$15,000**	
TOTAL CAPITAL COST				**$882,041**	

Table A-5
REMEDIAL ALTERNATIVE COST SUMMARY
Soil/Soil Gas/Indoor Air Alternative 2 - SVE

COST ESTIMATE SUMMARY

Site: Jimmy's Dry Cleaner
Location: 61 Nassau Road
Roosevelt, New York
Phase: Feasibility Study (-30% to + 50%)
Base Year: 2004

Description: Soil/Soil Gas/Indoor Air Alternative 2 consists of a soil vapor extraction system (250 CFM) to treat soil in the source area. Capital costs occur in Year 0. Annual O&M costs occur in Years 1-5. Due to phasing out CATOX unit with Vapor Phase Carbon in Year 3, O&M costs in Years 3, 4 and 5 are calculated separately to account for diminishing carbon usage and monitoring requirements.

O&M COSTS (YEAR 1 & 2)

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Performance Costs					
SVE Vapor Monitoring	36	EA	$132	$4,752	3 sample/month
CATOX Emissions Monitoring	12	EA	$500	$6,000	1 sample/month - CATOX exhaust
Chemicals	1	LS		$15,000	
Soil Vapor Extraction					
Operations Labor (OL)	12	MO	$1,000	$12,000	20 hrs/mo
Maintenance Labor (ML)	12	MO	$1,000	$12,000	20 hrs/mo
Equipment Repair (ER)	10	%		$51,025	10% of Equipment Cost
Utilities	12	MO	$422	$5,064	Electricity + fuel + phone
Contingency	15	%		$12,013	15% of OL+ML+ER
CATOX System					
Operations Labor	1	week	$800	$800	40 hrs for first week of operation
Operations Labor	1	LS		$1,280	40 hrs for 1st month of operation
Operations Labor (OL)	10	MO	$320	$3,200	8 hours per month - rest of the year
Maintenance Labor (ML)	12	MO	$1,000	$12,000	20 hrs/mo
Equipment Repair (ER)	10	%		$1,728	10% of Equipment Cost
Utilities	12	MO	$3,000	$36,000	Electricity + fuel
Contingency	15	%		$8,251	15% of OL+ML+ER
Off-Site Treatment/Disposal					
Wastewater Discharge/Testing	1	LS	$1	$1,000	Water from moisture separator
SUBTOTAL				**$156,362**	
Contingency	30	%		**$46,908**	10% scope + 20% bid
SUBTOTAL				**$203,270**	
Project Management	5	%		$10,164	
Technical Support	10	%		$20,327	
Legal Fees	1	LS	$5,000	$5,000	
Institutional Controls-Site Info Database	1	LS	$2,000	$2,000	Update and maintain database
Quarterly Reporting	4	EA	$1,000	$4,000	Quarterly reports
TOTAL ANNUAL O&M COSTS (YEAR 1 & 2)				**$244,761**	

Table A-5
REMEDIAL ALTERNATIVE COST SUMMARY
Soil/Soil Gas/Indoor Air Alternative 2 - SVE

COST ESTIMATE SUMMARY

Site: Jimmy's Dry Cleaner
Location: 61 Nassau Road
Roosevelt, New York
Phase: Feasibility Study (-30% to + 50%)
Base Year: 2004

Description: Soil/Soil Gas/Indoor Air Alternative 2 consists of a soil vapor extraction system (250 CFM) to treat soil in the source area. Capital costs occur in Year 0. Annual O&M costs occur in Years 1-5. Due to phasing out CATOX unit with Vapor Phase Carbon in Year 3, O&M costs in Years 3, 4 and 5 are calculated separately to account for diminishing carbon usage and monitoring requirements.

O&M COSTS (YEAR 3) - phasing out CATOX and substituting it with Vapor Phase Carbon System

Performance Costs					
SVE Vapor Monitoring	12	EA	$132	$1,584	1 sample/month
Carbon Off-Gas Sampling	12	EA	$132	$1,584	1 sample/month
Soil Vapor Extraction					
Operations Labor (OL)	12	MO	$1,000	$12,000	20 hours per month
Maintenance Labor (ML)	12	MO	$1,000	$12,000	20 hrs per month
Equipment Repair (ER)	10	%		$2,400	10% of Equipment Cost
Utilities	12	MO	$422	$5,064	Electricity + fuel + phone
Vapor Phase Carbon System					
Carbon replacement	1	LS		$15,000	10,000 lbs @ $1.50/lb
SUBTOTAL				$49,632	
Project Management	5	%		$2,482	
Technical Support	10	%		$4,963	
Legal Fees	1	LS	$5,000	$5,000	
Institutional Controls-Site Info Database	1	LS	$2,000	$2,000	Update and maintain database
Quarterly Reporting	4	EA	$1,000	$4,000	Quarterly reports
YEAR 3 SUBTOTAL				**$68,077**	

O&M COSTS (YEAR 4)

Performance Costs					
SVE Vapor Monitoring	12	EA	$132	$1,584	1 sample/month
Carbon Off-Gas Monitoring	12	EA	$132	$1,584	1 sample/month
Soil Vapor Extraction					
Operations Labor (OL)	12	MO	$1,000	$12,000	20 hours per month
Maintenance Labor (ML)	12	MO	$1,000	$12,000	20 hrs per month
Equipment Repair (ER)	10	%		$2,400	10% of Equipment Cost
Utilities	12	MO	$422	$5,064	Electricity + fuel
SUBTOTAL				$34,632	
Project Management	5	%		$1,732	
Technical Support	10	%		$3,463	
Legal Fees	1	LS	$5,000	$5,000	
Institutional Controls-Site Info Database	1	LS	$2,000	$2,000	Update and maintain database
Quarterly Reporting	4	EA	$1,000	$4,000	Quarterly reports
YEAR 4 SUBTOTAL				**$50,827**	

O&M COSTS (YEAR 5)

Demobilize SVE System	1	LS	$10,000	$10,000	Remove Equipm't & Piping
Well Abandonment	3	EA	$500	$1,500	3 SVE Wells
Demobilize CATOX system	1	LS	$25,000	$25,000	Remove Equipm't & Piping
Contingency (% of Sum)	25	%		$9,125	% of construction activities
Project Mgt (% of Sum + Cont.)	5	%		$2,281	% of construction + contingency
Remedial Action Report	1	EA	$10,000	$10,000	RA report
YEAR 5 SUBTOTAL				**$57,906**	

Table A-5 ADDENDUM REMEDIAL ALTERNATIVE COST SUMMARY Soil/Soil Gas/Indoor Air Alternative 2 SOIL VAPOR EXTRACTION	PVA CALCULATIONS

YEAR	Annual O&M	Discount Factor at 7%	Present Value	CUMMULATIVE DISCOUNTED	CUMMULATIVE UNDISCOUNTED
1	244,761	0.9350	228,851	228,851	244,761
2	244,761	0.8730	213,676	442,527	489,521
3	68,077	0.8160	55,551	498,078	557,598
4	50,827	0.7629	38,776	536,853	608,425
5	57,906	0.7130	41,287	578,141	666,331

Table A-6
REMEDIAL ALTERNATIVE COST SUMMARY

Soil/Soil Gas/Indoor Air Alternative 3 - Excavation and Off-site Disposal

COST ESTIMATE SUMMARY

Site: Jimmy's Dry Cleaner
Location: 61 Nassau Road
Roosevelt, New York
Phase: Feasibility Study (-30% to + 50%)
Base Year: 2004

Description: Soil/Soil Gas/Indoor Air Alternative 3 consists of the excavation and off-site disposal of PCE-impacted soils to a depth of 20-ft bgs.

PRESENT VALUE ANALYSIS

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR (7%)	PRESENT VALUE	NOTES
Capital Cost	0	$7,983,089	$7,983,089	1	$7,983,089	
TOTAL PRESENT VALUE OF ALTERNATIVE					**$7,983,089**	

Table A-6
REMEDIAL ALTERNATIVE COST SUMMARY
Soil/Soil Gas/Indoor Air Alternative 3 - Excavation and Off-site Disposa

COST ESTIMATE SUMMARY

Site: Jimmy's Dry Cleaner
Location: 61 Nassau Road
Roosevelt, New York
Phase: Feasibility Study (-30% to + 50%)
Base Year: 2004

Description: Soil/Soil Gas/Indoor Air Alternative 3 consists of the excavation and off-site disposal of PCE-impacted soils to a depth of 20-ft bgs.

CAPITAL COSTS (one-time charge):

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Mobilization/Demobilization					
Mobilization, Waste Handling, Demobilization	1	LS	$50,000	$50,000	Excavation, loaders, etc. QAPP, SSHP, permits, etc.
Building Demolition	1	LS	$100,000	$100,000	
Asphalt Stripping/Disposal	520	SY	$23	$11,742	
SUBTOTAL				**$161,742**	
Excavation and Backfill					
Sheeting, Installation and Removal	22,000	SF	$22	$484,000	
Excavation (to 20-ft)	8,963	CY	$15	$138,700	
Backfill	8,963	CY	$24	$218,787	
Decontamination of Sheeting	1	LS	$9,036	$9,036	
SUBTOTAL				**$850,522**	
Soil Transportation and Disposal					
Testing of Excavated Soils	40	EA	$300	$11,951	
Transportation	12,100	TON	$177	$2,141,700	
Disposal	12,100	TON	$175	$2,117,500	
SUBTOTAL				**$4,259,200**	
SUBTOTAL				**$5,271,464**	
Contingency	25	%		$1,317,866	Based on 25% of Capital Cost Subtotal
SUBTOTAL				**$6,589,330**	
Procurement	2	%		$131,787	
Project Management	5	%		$329,467	
Remedial Design	8	%		$527,146	
Construction Management	6	%		$395,360	
Remedial Action Report	1	ea	$10,000	$10,000	RA report
SUBTOTAL				**$10,000**	
TOTAL				**$7,983,089**	