Voluntary Cleanup Program

Remedial Investigation Report
At American Cleaners Middletown

Caldor Lloyds Mall, 340 Route 211 East
Middletown, NY 10940
Site No: V-00461-3
Index No: W3-0997-01-06

For Submittal to

New York State Department of Environmental Conservation
Division of Environmental Remediation
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1. Introduction

This Remedial Investigation Report presents the results and findings of the Remedial Investigation (RI) conducted at and near the American Cleaners site at Caldor-Lloyds Mall, 360 Route 211E, Middletown, NY 10940, as a participant in the Voluntary Cleanup Program (Site Number V-00461-3, Index Number W3-0887-01-06) administered by the New York State Department of Environmental Conservation (NYSDEC). In December 2001, a Voluntary Cleanup Agreement was executed between NYSDEC Division of Environmental Remediation (DER) and American Cleaners, Inc. (Middletown), the Volunteer. The Remedial Investigation work has been carried out in compliance with the Draft DER-10 Technical Guidance for Site Investigation and Remediation (December 25, 2002). The remedial investigation has been conducted from 2003 until 2009 with several work plans, revisions, interim reports of findings, and proposed supplemental investigations written and carried out by the staff of Berninger Environmental, Inc.

In March of 2009, Mid-Hudson Geosciences took over the consulting work for American Cleaners and has prepared this report from documents and information provided by Walter Berninger and his staff at Berninger Environmental, Inc. of 90-B Knickerbocker Avenue, Bohemia, NY 11716 (Telephone 613-589-6521).

1.1. Purpose of Report

This Remedial Investigation Report is prepared for the purpose of summarizing and interpreting the field and laboratory work to

- Delineate the area and vertical extent and mass of contaminants in all media at or emanating from the site;
- Determine the surface and subsurface characteristics of the site, including topography and depth to groundwater;
- Identify and characterize the source(s) of contamination from dry-cleaning chemicals, the migration paths, and actual or potential receptors of contaminants on or through air soil bedrock, sediment, groundwater, surface water, utilities and structures at the site, without regard to property boundaries;
- Describe the concentrations, fate and transport, material phase and state(s), locations, and other significant properties of the contamination present from dry cleaning activities;
- Define hydrogeological factors and conditions on the site and potential transport pathways;
- Evaluate actual and potential threats to public health and the environment, including potential public health exposure pathways and potential impacts to fish and wildlife;
- Collect field data needed for selection and design of remedial alternatives; and
- Identify remedial action objectives.

By documenting the nature and extent of contamination on and near American Cleaners, this RI Report will provide a basis to develop an effective and reliable remediation strategy.

1.2. Report Organization

This Report is organized as follows:

- Section 1: Introduction – Discusses the Site setting and history
- Section 2: Summary of Previous Investigations – Summarizes the results and

findings of the Site Characterization Study (SC), indoor air quality study, and soil gas survey that were completed for the Site
- Section 3: Investigation Activities – Describes the investigation activities, sampling locations, and sampling and analytical methods of the RI
- Section 4: Field Observations and Findings – Discusses the Site hydrogeology and the distribution of observed Site contamination and environmental impacts
- Section 5: Analytical Results – Presents and interprets the results of the soil, groundwater, indoor air, and soil vapor testing conducted as part of the RI and the observed distribution of volatile organic compounds detected on and off site
- Section 6. Qualitative Human Health Exposure Assessment- Identifies the Compounds of Potential Concern (COPCs) encountered during the RI, potential receptors on and near the site, and potential exposure pathways
- Section 7. Conceptual Site Model – Discusses the nature and extent of volatile organic compounds in air, vapors, soil and groundwater across the site and on neighboring properties
- Section 8. Conclusions and Recommendations – Presents a summary of the findings and conclusions drawn, and identifies potential data gaps and recommendations to address potential data gaps
- Section 9. References – Lists the references used in preparing the RI Report

This Report also includes a significant number of attached tables, figures, boring logs and appendices. The compact disk (in pdf format) included with this Report contains additional documentation, including previous investigation reports, laboratory data reports, and data usability reports. A complete list of these items can be found in the Table of Contents.

■ 1.3. Site Description

American Cleaners of Middletown is actually located in the Town of Wallkill, about 0.4 miles east of the Middletown City Boundary at 360 Route 211E at the Caldor-Lloyds Mall (Figure 1-1). The Town of Wallkill is the shopping center for central and western Orange County because most of the shopping and commercial development in the 1980s to present has occurred in the Town, which geographically wraps around the northern, northwestern and northeastern area of the City of Middletown.

The Section Block and Lot (SBL) number designated for the Caldor Mall property is Section 50, Block 2, Lot 2 in the Town of Wallkill, Orange County, NY. The American Cleaners building is located on the Caldor-Lloyds Mall in the northwest corner of the Mall property. The mall area is on the south side of Route 211 East and is accessible via Schleman Road. At Route 211, Schleman Road on the south side becomes Silver Lake-Scotchtown Road on the north side. Upon entering the Mall on Schleman Road, American Cleaners is to the right (west). The Caldor Mall and American Cleaners is also accessible from Carpenter Avenue.

The Caldor-Lloyds Mall lies on land with a slope to the north toward Route 211, so that the major buildings for Caldor and Lloyds were overlooking the main road and parking areas were in front of the buildings on land sloping to the north. At the time in 1982 when the American Cleaners building was constructed, Lloyd’s Store was located less than 0.02 miles from the northwest corner. Lloyds was an original all-in-one grocery store and department store under one roof with gasoline and an automotive service department built in the early 1960s. Lloyds went out of business and by 1994 is not shown on the air photos for the area. The main Caldor Building is located south and east of American Cleaners facing north toward the mail road, NYS Route 211. Friendly's Ice Cream and Restaurant is located to the east directly in front of the Caldor Building. Caldor went out of business several years ago and the majority of the building has been vacant for sometime. Neighboring properties include MHV Credit Union to the northeast within the Caldor Mall. Cheeseburger Paradise, and a former Video Store, (now vacant) were constructed in the 1990s in what was Lloyd's parking lot. The location of the original Lloyd's store is now mostly parking lot with another Bank Building on the west end and a Shop Rite grocery store farther to the west.

During construction of Cheeseburger Paradise and the Video Store, additional fill was used to raise the elevation of the land surface where the buildings and parking lots are located. Consequently, the slope between those two buildings and Route 211 is steeper than before and considerable storm drainage infrastructure was installed to collect sheet runoff from the roof drains and parking lots. The stormwater comes out of a large opening next to Route 211 and the northeast corner of the Cheesebuger Paradise parking lot and the northwest corner of the MHV Credit Union parking lot. Another drainage pipe conducts subsurface drainage from American Cleaners beneath a gully between the parking lots. When the drainage emerges at the surface, the water flows as a steam a few hundred feet east and then goes under Route 211 and joins a stream flowing northeast toward Silver Lake. The elevation of Silver Lake is shown as 516 feet above mean sea level on the USGS Middletown 7.5 minute quadrangle. The elevation ground at the Caldor building is approximately 580 feet and at the American Cleaners building is about 550 feet.

■ 1.4. American Cleaners Site History

In 1982, Mr Halevh designed and constructed a one-story building, specifically for operation of a dry-cleaning establishment (Figures 1-2 and 1-3). From 1982 to date, the building has been in continuous operation for dry-cleaning, customer drop-off, and customer pick-up. The design for dry-cleaning services was planned with a customer counter across the front of the store and five 4-foot by 4-foot wide trenches running from the front of the store to the rear. Cleaning, washing, drying, steaming and pressing equipment is placed around the perimeter of the store. The trenches are designed to provide maximum hanging capacity on three tiers of clothes rods running from front to back. The clothes-hanger rods can be reached by the employees to store and retrieve customers' garments.

The chemical of concern, Tetrachloroethylene (or tetrachloroethene or perchlorethylene and know in the vernacular as "perc" or "PCE"), has been used at the site since 1982. Unintentional and unregulated releases of PCE began in 1982 when PCE-saturated filters were placed in the dumpster outside the back of the building for disposal with trash and garbage. The dry-cleaning processing equipment was updated periodically on the following schedule:

1982-1992 First Generation Equipment
1992-1997 Third Generation Equipment
1997-Present Fourth Generation Equipment

Starting in 1982, the PCE used in dry-cleaning operations was delivered in 55-gallon drums. The PCE would be pumped from the drums into the "washers." At sometime in the 1980s, delivery of PCE changed to delivery by truck with a hose transferring PCE from the truck to the dry-cleaning machines. Truck delivery of PCE is similar to that of fuel oil and the driver sets up the hose and monitors the operation from the truck. On one delivery occasion, the hose nozzle broke and an unknown quantity of PCE was spilled near the back door of the building. The spilled PCE flowed downslope on the parking lot and pooled at the northern curb of the parking lot about 35 feet away from and parallel to the north wall of the building. The use of PCE was approximately 75 to 100 gallons per week from 1982 until 1997. Since 1997, American Cleaners at Middletown has used less than 200 gallons of PCE per year because “fourth-generation” technology has greatly reduced the use. At some time, the PCE delivery method changed from tank trucks back to 55-gallon drums, probably coincident with the installation of “fourth-generation” equipment.

In 1999 the underground storage tank (UST) for fuel oil storage at the back of the building was replaced with a new tank closer to the north end of the building (for locations see Figures 1-2 and 5-1). A site investigation and post-excavation sampling indicated the presence of petroleum contamination, resulting in a spill reported to NYSDEC Region 3 (Spill No. 9912516).

■ 1.5. American Cleaners Construction and Site Plan

The construction of the building (Figure 1-2) and use for the past 28 years has involved the following elements:

- One large open room.
- Underground water supply line installed under the parking lot from the vicinity of the Mall Entrance on Schleman Road.
- Underground sewer line also installed under the parking lot from the vicinity of the Mall Entrance on Schleman Road.
- Underground 3000-gallon double-wall heating oil storage tank to the right as one goes out the back door, in front of the double doors to the boiler room. The tank was removed and replaced with a 1000-gallong double-wall tank sometime in 1999.
- Removal of contaminated soil from within and around the first tank excavation.
- Peripheral foundation drainage line around the building with discharge to the stormwater drainage system shown by a grate about 30 feet from the northeast corner of the building. Another storm grate is located on the southeast corner of the building.
- Front parking lot provides for cars to park perpendicular to the front of the building.
- Electric wires are overhead from poles at the street entering the building at the northwest corner. In November 2009, the telephone lines were installed underground entering the building at the northwest corner.
- The building was designed and constructed with 5 parallel 5-foot wide and 4-foot deep trenches in the floor running from front to back of the store. The trenches allow for storage of clothing on three tiers of hanger racks, which the employees can reach from the floor without a ladder or step stool.
- Near the back of the trenches, pipes lead from the bottom of the trenches laterally to the peripheral foundation (orangeburg) drain-pipe. The pipes are sealed closed in the bottom of the trenches. The design was planned to allow for the potential need to drain floodwaters, if necessary.
- A similar arrangement of lateral pipes connecting the bottoms of the front of the trenches to the peripheral foundation drain in the center front of the building. These pipes are also sealed in the bottom of the trenches.

• The boiler room is located in the southeast corner of the building with double doors opening on the back of the building.
• Two bathrooms are located on the west wall near the back of the building close to the back door.
• The building has another special design of a shallow trench about two feet wide and three feet deep along the south, west and north walls of the building. These trenches house pipes to supply water, steam, and air to any of the cleaning, washing, drying, steaming, and pressing machines around the inside of the building walls.
• In 1997, a shed was constructed on the back southwest corner of the building for storage.

2. Summary of Previous Investigations

Original investigations were conducted at the site by HRP while replacing an underground storage tank and excavating soil from the old tank location and installing a tank in a new location. Both heating oil tank locations were at the back of the American Cleaners building. The old tank was closer to the back door and the new tank is closer to the northwest corner of the building. Shortly after the tank replacement, Anson Environmental conducted a study of the extent of PCE contamination in a report:

• Environmental Investigation, American Cleaners, Caldor/Lloyd Mall Plaza, Route 211, Middletown, NY (Anson Environmental Ltd, April 18, 2001)

This remedial investigation report is based on previous work documented in the following workplans and reports prepared by Berninger Environmental:

• Site-Specific Health and Safety Plan (Berninger, September 2002)
• Voluntary Investigation Work Plan (Berninger, March 2003)
• Voluntary Cleanup Program Interim Report (Berninger, Nov 2003)
• Voluntary Cleanup Program Report (Berninger, April 2006)
• Supplemental Investigation Work Plan (Berninger, May 2008)
• Proposed Supplemental Investigation Work Plan (Berninger, Sep. 2008)

Earlier reports for the site were prepared as follows:
• Phase I Environmental Site Assessment for Caldor Shopping Center, by HRP Associates (October 1999, 3 monitoring wells during UST removal)
• Phase II Environmental Investigation Report by Anson Environmental (April 18, 2001, 9 soil borings and 4 monitoring wells)

The majority of the work proposed in the May 2008 work plan was completed by Berninger prior to the takeover of consulting tasks by Mid-Hudson Geosciences. At Berninger's soil boring locations, soil sampling and installation of monitoring wells were not completed. Mid-Hudson Geosciences reviewed the work plan and prepared an alternative workplan for NYSDEC review dated July 22, 2009. The plan was approved and the fieldwork conducted in November 2009. Eight new monitoring wells were installed at the soil boring locations. A complete round of ground water samples were taken in January 2010 as well as soil and sediment samples from the stormwater drainage system next to Route 211.

To date, the investigative work has consisted of collection of soil samples, groundwater samples and soil gas samples around the American Cleaners building and in the parking lots between American Cleaners and the Cheeseburger Paradise Restaurant and between American Cleaners and the MHV Credit Union Building. Ambient air samples and sub-slab gas sample were taken at the HMV Credit Union Bank, the Cheeseburger Paradise Restaurant and the vacant Video Store Building This report provides summaries and interpretations of that data for use in selecting appropriate remedial actions for on site and off site.

3. Remedial Investigation Activities

The following activities were described in the RI Work Plan and Supplemental Investigation Work Plans to address the purposes of this RI Report listed above in section 1. The specific RI activities are generally defined as underground utility clearance, soil investigation, groundwater investigation, soil vapor and air sampling, data usability assessment, and survey elevations of monitoring wells.

The majority of site work was conducted by staff members of Berninger Environmental, Inc of 90-B Knickerbocker Avenue, Bohemia, NY 11716 (Telephone 631-589-6521). All samples collected by Berninger employees were analyzed by H2M Labs, Inc of 575 Broad Hollow Road, Melville, NY 11747 (Telephone 631-694-3040). In November 2009, Mid-Hudson Geosciences contracted with Todd K. Syska, Inc. to conduct Geoprobe® work including continuous coring of soil borings and installation of eight additional monitoring wells. In January 2010, a complete round of monitoring well sampling was conducted by Mid-Hudson Geosciences and analyses were conducted by York Analytical Laboratories, Inc. of 120 Research Drive, Stratford, CT 06615 (Telephone 203-325-1371).

All work conducted during the remedial investigation was completed in general conformance with the following documents:

- Draft DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC, 2002)
- Draft Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, 2002)
- Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, 2006)
- Remedial Investigation and Supplemental Investigation Work Plans for American Cleaners, Inc (Middletown) for NYSDEC Voluntary Cleanup Program prepared by Berninger Environmental, Inc.
- Health and Safety Plan for American Cleaners, Inc. Middletown prepared by Mid-Hudson Geosciences (November 2009)
- Quality Assurance/Quality Control Project Plan stated in Work Plans by Berninger Environmental, Inc.
- Draft Voluntary Cleanup Program Guide (NYSDEC, DER, May 2003)
- Low Stess (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells (US EPA, Region 1, July 30, 1996 Revision 2)

3.1. Underground Utility Clearance

Prior to initiation of intrusive investigation activities, utility markouts were requested from the NY “call before you dig service.” Underground utility lines for water, sewer and, stormwater drainage were marked out for the American Cleaners, MHV Credit Union and Cheeseburger

Paradise Restaurant, parking lots and other adjacent areas at various times during the remedial investigations.

■ 3.2. Soil Investigation

Soil borings were advanced using a Geoprobe® (rotosonic or direct push method) to reach various depths and obtain samples. Samples were collected continuously to the bottom of borings using plastic sleeves in the core barrel. A total of 34 soil samples were collected and sent for laboratory analyses of Volatile Organic Compounds (VOCs). The following table indicates the particular dates and identification of samples.

Sample Date	Soil Boring Identification	No Borings	No Soil Samples	QC Sampling
03/29/01	B1 to B10	10	7	
06/18/03	BEI-1 to BEI-9	9	7	1 FB
07/16/03	BEI-10 to BEI-12 BEI-13 to BEI-19	3 7	5 0	1 FB
Nov-Dec 2005	T1 to T9 resulting in 9 MWs	9	0	
11/9-10/2008	GP-1 to GP-7	7	0	
Nov 2009	11 Soil Borings (D1, D2, D3) resulting in 8 MWs: MW21,22,24,25,26,28,30,31	11	16	3 TB, 2 FB

Soil boring and sampling consisted of the following methodology;
- Soil samples were retrieved continuously from grade to the total boring depth using plastic lined core barrels (rotosonic drilling).
- Recovered soil samples were reviewed and screened for VOCs using a photoionization detector (PID).
- Selected samples were submitted for analyses at H2M Labs by US EPA Method 8260 for the complete list of analytes and tentatively identified compounds (TICs).
- Upon completion, bore holes were backfilled or grouted from bottom of the boring to grade.
- The NYSDEC ASP Category B Data Package was requested for all laboratory analyses.

A synopsis of all detected concentrations of Volatile Organic Compounds in soil and sediment samples are listed in Table 1.

■ 3.3. Groundwater and Surface Water Investigation

Groundwater samples were collected using two different techniques on the American Cleaners site and neighboring properties. A permanent monitoring well system was installed on site and on adjacent properties to be able to compare groundwater quality over the duration of remedial investigation and operation of selected remedial measures. Both on and offsite, groundwater samples were obtained from specific depth intervals using a Geoprobe® screen point sampler. Such samplers can be extended from a few to forty inches of vertical soil column.

▪ 3.3.1. Geoprobe® Sampling at Various Depths

As soil borings were advanced at selected locations, the unconsolidated sediments were scanned with a PID for VOCs, examined and described for continuous boring log, and degree of saturation observed and recorded using the adjectives dry, damp, moist, wet, and saturated.

The table below summarizes the dates, location, and levels of 9 groundwater samples collected from discrete intervals on and off the American Cleaners site.

Sampling Date	No & ID of Geoprobe Groundwater Samples	QC Samples
07/15-17/2003	7 BEI-GW--01,02,04,05,06,07,08	1TB, !FB
02/2005	2 GW6A, GW6B	1TB, 1FB

▪ 3.3.2. Monitoring Well Installation and Sampling

Groundwater monitoring wells were installed during the RI to characterize the groundwater quality and flow beneath the site. Specifically, 25 monitoring wells were installed on the American Cleaners Middletown site ranging in depth from 5 to 24 feet below ground surface.

Each monitoring well was installed and constructed in conformance with the following specifications:

- Wells were constructed with 2-inch-inside-diameter (ID), threaded, flush-joint, schedule 40 PVC casing and screen;
- Screens were 5 feet long with 10-slot (0.01-inch) openings;
- The annulus around the screens was backfilled with appropriately sized clean silica sand (e.g., Morie No. 1) to a minimum height of 2 feet above the top of the screen
- A bentonite pellet seal with a minimum thickness of 2 feet was placed above the sand pack. The bentonite seal was allowed to hydrate before placement of grout above the seal;
- The remainder of the annular space was filled with a cement-bentonite grout up to near the ground surface. The grout was allowed to set for a minimum of 24 hours before well development;
- Each monitoring well had a sealed cap (J-plug) and was contained in a flush-mount drive-over vault. The J-plug keeps surface water from infiltrating into the well during rain events and high water conditions;
- The concrete seal or pad was sloped slightly to channel water away from the well, and was deep enough to remain stable during freezing and thawing of the ground;
- The vaults and concrete pads were completed so that they would not pose a trip hazard.

Table 1 summarizes the monitoring well construction details for each well installed at the site. Monitoring well construction diagrams are shown on the boring logs for the 2009. No records of other well construction details are know, except what is stored in Table1.

No record of well development was found in the project transfer documents provided by Berninger. For that reason, all the wells were developed on during new well installation activities in November 2009. For the 1-inch diameter wells, a peristaltic pump with dedicated tubing was used and for the older 2-inch and 4-inch wells behind the building, a submersible Whale pump was used. The following points summarize the well development work.

- A one-inch diameter whale pump was lowered and raised thoughout the screened interval while pumping at a rate of 2 gallons per minute for 30 minutes or until the well went dry.

- Wells MW2, MW30, and T4 have limited yield and required more than one period of pumping after going dry.
- All purge water was passed through a gravity action 2-gallon activated carbon filter and discharged to the stormwater drainage system.

▪ 3.3.3. Groundwater Sampling from Monitoring Wells

Monitoring well sampling events were conducted by Berninger in 2003 and 2005 and byMid-Hudson Geosciences in January 2010 as shown in the following table:

Sampling Date	No & ID of Monitoring Wells	QC Samples
07/15-17/2003	7 MW1B,2,3,4,5,6,7	1FB,2TB
11/2005	2 SW Drain, SW well	2TB, 1FB
12/2005	7 T1,3,4,5,6,7,9	1TB, 1FB
01/2010	23 all MW wells, 8 T-series	1 Dup 1 MS, 1MSDup 1TB, 1EqB

Berninger used a traditional sampling method by removing three well volumes of water from the wells and then taking samples. Mid-Hudson Geosciences used the EPA Low Flow Sampling Protocol, which involves the following steps:

- At 3-5 minute intervals, depth to water is measured with a water level indicator
- Rate of flow and volume of water pumped is measured with a calibrated 1000-milliliter cylinder and a watch with second hand;
- Pumping rate of flow is established at 0.1 to 0.4 liters per minute using a variable speed peristaltic pump with dedicated ¼ inch tubing, pre-measured for each well;
- For the same time interval, water quality parameters are measured including pH, conductivity, turbidity, dissolved oxygen, temperature, and oxidation reduction potential,
- After about 20 minutes, when the water quality parameters usually stabilize, samples are collected in 40-milliliter glass vials with HCl preservative.
- After measuring the purge water was passed through a gravity action 2-gallon activated carbon filter and discharged to the stormwater drainage system.
- Quality Assurance samples were collected as follows: one trip blank originating from York Laboratories, one equipment blank passed through a dedicated ¼-in vinyl tubing, one duplicate sample (Dec 15, 2009 from MW5), matrix spike and matrix spike duplicate samples (Dec 15, 2009 from MW3).
- All samples were shipped with ice and chain of custody to York Analytical Laboratories for analyses by US EPA Method 8260 for the full list of analytes. The NYSDEC ASP Category B data package was requested.
- Water levels were measured at the completion of sampling.

Once the complete data valuation package is received from the lab, a data usability study will be conducted and sent to NYSDEC as a supplementary appendix to this report.

3.3.4. Surface Water and Sediment Sampling

As part of the sampling event in January 2010, surface water and sediment samples were collected in the stormwater drainage system at the bottom of the hill on the south side of Route 211. Samples SW1 and Sed1 were collected in the stream where the water exits the drainage system from beneath the northeastern corner of the Cheeseburger Paradise parking lot. Samples SW2 and Sed2 were collected in on the south edge of the stream where shallow groundwater flowing beneath the hillside slope would be likely to discharge from the ground and flow into the stream.

3.4. Soil Vapor and Air Sampling

Air sampling consisted of two methods of sampling for (1) soil vapor and (2) ambient air including building subslab locations, indoor building air, and nearby outdoor air. Both methods involve sample collection in a SUMMA® Canister for a specified period of time and analysis by EPA Method TO-15 full analyte list plus tentative identified compounds.

All gas samples were collected, analyzed and evaluated in accordance with the Draft Vapor Intrusion Guidance Document (New York State Department of Health, February 2005). Berninger used dedicated SUMMA® canisters provided by H2M Labs, Inc. Each sample was collected using a six-liter SUMMA® canister equipped with an attached pre-set flow regulator. Batch-certified clean canisters with an initial vacuum of approximately 26 inches of mercury were provided by the laboratory for sample collection. Flow regulators were pre-set by the laboratory to provide uniform sample collection over a 24-hour sampling period except where site conditions or constraints necessitated a shorter sampling period. The flow controller/ regulator on the SUMMA® canister, as well as with the vacuum in the canister, was used to collect the air samples directly from the subsurface sampling points. The valve on the SUMMA® canister was closed when a minimum of two inches of mercury vacuum remained in the canister, leaving a vacuum in the canister as a means for the laboratory to verify the canister did not leak while in transit.

A helium tracer gas was used as a QA/QC tool to assess the integrity of the soil vapor probe seal and to confirm that infiltration of air from above the slab did not occur. An inverted plastic bucket was used as an enclosure to keep the tracer gas in contact with the probe during integrity testing, as described in the NYSDOH guidance document. A portable helium-monitoring device was used to analyze a sample of soil vapor prior to and after sample collection.

Detailed information was gathered at the time of sampling to document conditions during sampling and to aid in interpreting the test results. The following information was recorded in the field book:

- Weather conditions (precipitation, temperature and wind direction) prior to and during the sampling activities
- Date and time (start and end time) each sample was collected
- Sample identification
- Identification of laboratory samplers/regulators/devices
- Purge volumes
- Volume of air/vapor extracted
- Vacuum pressure of canister (before and after sample was collected)

- Chain of custody identification
- Inventory of potential sources of VOCs in the area of the sampling

The SUMMA® canisters were delivered to H2M Labs with 24 hours of completion of sampling. Samples were submitted for laboratory analysis in accordance with the USEPA Compendium Method TO-15, entitled *Determination of VOCs in Air Collected in Specially Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)*. Analyses for the TO-15 Target List and Helium were specified as well as the NYSDEC ASP Category B Data Package.

▪ 3.4.1. Soil Vapor Sampling

Soil gas collected from a natural soil column outdoors was accomplished with a Geoprobe® equipped with a Post-Run Tubing System (PRT) and an expendable tip with Teflon tubing. The Geoprobe® PRT drilling system was used to selectively set a subsurface soil gas sampling interval. After setting up the sealed penetration using hydraulic cement around the top of the PRT, the area around the soil gas sample collection point was encompassed by a plastic container for the introduction of a tracer gas. Helium was used for the tracer gas in order to quantify any potential gas leak in the sampling system. After the introduction of the helium tracer gas, the annular space was purged a minimum of one volume of soil gas using a personal sampling pump. During purging and sampling, the flow rate was controlled not to exceed 0.2 liters per minute. After soil gas sample collection, the sample area on the ground surface was scanned with a PID to ascertain if there were any VOCs in the air above the sample area.

The following table summarizes the dates and locations of 32 soil gas samples collected at and near the American Cleaners Middletown site.

Date	Sample Identification	No Samples
06/16-17/2003	SG1 to 24 (no 17)	23
11/16-18/2005	SG1(dup), SG25 to 31, SSV-1	9

▪ 3.4.2. Air Sampling

For most building locations, a set of three air samples are collected with three separate SUMMA canisters, one each for sub-slab vapor, indoor air and outdoor or ambient air. The sub-slab samples are collected from beneath a first floor or basement slab floor similar to the method used for soil vapor sampling described above. The indoor and outdoor air sampling requires no additional probing or equipment beyond the SUMMA® canisters.

For concrete floors, a ½- to 1-inch diameter hole was drilled through the slab and a sample of the soil gas from beneath the slab was collected using a ¼-inch outside diameter stainless steel probe. The hole was sealed around the probe during sample collection using modeling clay. The probe was then installed into the sub-slab aggregate material (i.e., approximately 2 to 6 inches below the bottom of the slab, depending on conditions encountered). Teflon™-lined tubing was used to connect the sample point to the SUMMA® canister. After installation of the probes, one to three volumes of vapor (i.e., the volume of the sample probe and tube) was purged using the PID prior to collecting the samples. The flow rates for both purging and sample collection did not exceed 0.2 liters per minute. The temporary sample probes were installed and removed immediately after the samples were collected. Berninger confirmed with

NYSDOH that no helium is required for the sampling of sub-slab gas inside the building. At the completion of sampling, the floor was repaired using a similar material (e.g., Portland cement concrete patch).

For indoor air sampling, the SUMMA® canisters were deployed in the breathing zone on a counter, shelf or other object about 3 to 4 feet above the floor. For outdoor sampling, the canister location was usually on the ground because it should be located in an open area, but there is concern for potential vandalism of a shiny metallic instrument, which has to remain in place for 24 hours. Behind shrubs or fences proved to be secure fortuitous locations.

The following table summarizes the date and locations of 9 air samples collected for offsite buildings in the vicinity of American Cleaners Middletown.

Sampling Date	Building / Sample Location	Samples		
		SubSlab	Indoor Air	Outdoor Air
01/14/2009	MHF Credit Union	1	1	1
03/11/2009	Cheeseburger Paradise Restaurant	1	1	1
03/11/2009	Video Store (vacant)	1	1	1

■ 3.5. Data Usability Assessment

Berninger hired independent contractors to provide data validation services for all of the batches of samples analyzed by H2M Labs. Berninger sent the NYSDEC ASP Category B Data Package to the contractor after it was received from the laboratory. The data usability reports are summarized in section 5.7 and the actual summary reports are provided in extensive PDF files in Appendix D.

■ 3.6. Survey of Monitoring Well Elevations

Berninger measured relative elevations of the measuring point on the top of PVC riser inside the protective casing to the nearest hundredths of a foot for the seven original monitoring wells behind the building. The location or elevation of the benchmark used in this survey task is unknown. The known elevation of MW6 was used as a datum for surveying the newer wells. Mid-Hudson Geosciences measured elevations of tops of casing with a rotary laser and laser detector in January 2010 for the eight new monitoring wells and the T-series of monitoring wells installed by Berninger.

4. Field Observations and Findings

Soils, fill material, unconsolidated sedimentary surficial deposits, and bedrock comprise the sub-aerial setting beneath the American Cleaners Middletown site. Surface water from stormwater and snowmelt provides recharge to the water-bearing zones in these geologic materials along with the downgradient groundwater flow from higher elevations on the south. These elements provide the physical framework to investigate the nature and extent of contamination, to trace the fate and transport of contaminants, and to select and implement remedial measures to cleanup the remnants of dry-cleaning spillage.

■ 4.1. Regional Geological Setting

On the Geologic Map of New York (1970) a golden–color swath extends from Kingston and Newburgh southwest to the northern New Jersey border representing sedimentary rocks deposited in the time interval of 470 to 460 million years ago. The westernmost unit of this band of the Trenton Group is the Austin Glen Formation, extending from east of Middletown about eight miles west to the Shawangunk Ridge.

Stratigraphic strike of the Ordovician and Silurian rocks in southeastern New York is generally North 30 degrees East. This strike is shown in the hills known as Hussey Hill, Shaupeneak, Illinois, and Marlboro Mountains extending from Kingston to Newburgh on the western side of the Hudson River. The characteristic strike is represented by the trend of the Shawangunk Ridge extending from Port Jervis to Kingston.

The Austin Glen Formation is composed of greywacke and shale. Graywacke is a sandstone mixture made of grains of quartz and dark iron-magnesium silicate minerals, often cemented by calcite. The greywacke represents deposition of sediments from active erosion of metamorphic and igneous mountains to the east (western Connecticut). The shale represents more quiet times of deposition of fine grain sediments such as mud, clay, organic carbon, and limestone.

The sedimentary Trenton Group has been folded and faulted at least three times in geologic history, so that groundwater within the bedrock is found in fractures, joints, and cracks associated with times of compressional and tensional deformation. Drillers tend to refer to these linear openings in rock as “seams.”

The bedrock surface of New York State has been sculptured by advancing glaciers. Overburden deposits or unconsolidated sediments have been formed by glacial grinding and melting, Aeolian (wind), and flowing water. Stream deposition can take place on the land surface or on top of, within, or beneath glaciers.

Much of glacial deposition is till consisting of unsorted mixtures of gravel, rock fragments, sand, silt, and clay. There are two types of till, the gray sticky dense clay till and the yellow-brown compacted silt. Both types have varying proportions of gravel, rock fragments, sand, silt, and clay.

Deposits, which are primarily silt, are most likely windblown “loess” sediments associated with thermal winds on the edge of glaciers. Silt grains are more easily entrained and carried by wind than other size particles.

The Soil Survey of Orange County New York (USDA, 1981) shows that the area of the Caldor-Lloyds Mall is surrounded by Mardin gravelly silt loam, 3 to 8 percent slopes (map symbol MdB). The general description of the MdB soil type is as follows:

“This deep, moderately well drained, gently sloping soil formed in glacial till deposits derived from sandstone, shale, and slate. It has a dense fragipan in the subsoil. It is on broad divides, hilltops, and ridges in uplands.”

"Typically the surface layer is dark brown gravelly silt loam 8 inches thick. The upper 7 inches of the subsoil is a leached layer of mottled pale brown gravelly silt loam. Extending from 20 to 60 inches is a firm, olive brown channery silt loam fragipan."

"The water table in this Mardin soil is perched above the fragipan early in spring and in other excessively wet periods. Permeability is moderate in the surface layer and upper part of the subsoil and is slow or very slow in the ftagipan and substratum."

"Seasonal wetness and slow or very slow permeability in the pan are limitations for many urban uses. Carefully designed and installed drains around foundations are needed to overcome the risk of damage from wetness in spring."

■ 4.2. Site Geology

As shown in a table in section 3.2, 46 soil borings were drilled and sampled. Boring logs are provided in Appendix A. Some soil borings were advanced into the unconsolidated sediments for the purpose of obtaining samples of groundwater or soil vapor, but the soils in those boring were not described or logged in any detail. The soil borings were reviewed meticulously and the locations mapped to scale for the purpose of creating a stratigraphic fence diagram (Figure 4-1) and a south-north cross section (Figure 4-2) showing the unconsolidated sediments beneath the site.

The Soil Survey of Orange County New York (USDA, 1981) shows that the area within the Caldor-Lloyds Mall is covered with Udorthents, smoothed (map symbol UH). The general description of the UH soil type is as follows:

"These soils formed in manmade cut and fill areas, which are generally near industrial sites, urban developments, or other construction sites. They consist of excavated earthy material that has been stockpiled for eventual use as fill or topdressing; soil and rock material that has been trucked from other areas and leveled; or soil left in areas that have been excavated or cut. The unit is dominantly nearly level to sloping. Some areas are steeper, particularly at the edge of cuts and along the sides of mounded fill."

"Typically the surface layer is brown or grayish brown very gravelly loamy sand to silty clay loam and 1 to 8 inches thick. The substratum is commonly light olive brown, brown, or dark yellowish brown and varies in texture from very gravelly loamy fine sand to silty clay."

"These soils are excessively drained to moderately well drained. Texture, stone content, soil pH, and depth to bedrock vary considerably from one area to another. Bedrock, however, is generally at depths greater than 5 feet. The depth to seasonal high water table and the permeability vary considerably, depending on topography, degree of compaction, soil texture, and other related factors."

In a word, such Udorthents are "fill." However, in the immediate area of the American Cleaners building, it appears that the top soil in that area was stripped off and moved to the west creating a berm beyond the western curb of the parking lot behind the building. The overburden materials encountered in borings on the "parcel" of land associated with the building seems to be glacial till of both the gray clay variety and the yellow-brown silty material. Borings in the parking lot between American Cleaners and the Cheeseburger Paradise

Restaurant encountered weathering blacktop at depths of 13 feet in MW24 and 11 feet in MW31. Most of that parking lot was once covered by the Lloyd's Store. Once the store was demolished, additional fill was brought in to raise the area up to the level at the south end of the Lloyd's property, where the Shop Rite store is now located. The new parking lot lies on fill that was brought in to level the area and build up the area where the Cheeseburger Paradise lies overlooking Route 211 at higher elevation than the old Lloyd's parking lot.

The Anson Report referred to the soils with the following statement:
" The soils on-site have significant components of clay from below the asphalt and bluestone base of the parking lot (top six inches) to approximately nine feet below grade, the end of the borings. The clay closer to the surface was gray in color while the deeper clay in some areas was orange-brown. A two-inch thick layer of black gravel was present at approximately 42-44 inches below grade. Gravel was present throughout the clay." (Anson Environmental Report, April 18, 2001, page 3)

Berninger (2006) shows the "Brown Clayey Silt" overlying the "Dense Gray Till," as shown in east-west (Figure 4) and north-south (Figure3) cross sections. Mid-Hudson Geosciences boring logs from Geoprobe® cores collected in November 2009 indicate the yellow-brown silty beds are interbedded with the dense gray clay layers. The two lithologies are easily distinguished by color. However, stratigraphic correlation of the two lithologies from boring to boring is not readily apparent even with detailed boring logs. So the current geologic interpretation of these soil and overburden materials is that they were deposited by glacial processes during the advance and retreat at the edge of a glacier overlying that area of Orange County during the Pleistocene Epoch (2.6 to 0.1 million years ago).

Although many of Berninger's soil borings ended in refusal, meaning the drilling rig cannot penetrate deeper; bedrock is reported in only one case. At a depth of 20 feet below grade, shale bedrock is reported in T-6, a monitoring well, located just off the curb near the southwest back corner of the Credit Union Building.

■ 4.3. Site Hydrogeology

The hydrogeology of this site is unusual and complex. The complexity arises because the two stratigraphic units of gray clay and yellow-brown silt are discontinuous and variable in grain size distribution, moisture content, and permeability. The zones with significant proportions of loose rock fragments, gravel, and sand are the permeable hydrostratigraphic units through which water travels downgradient under the influence of gravity.

The construction of each of the monitoring wells in November 2009 was planned to place the screened interval in contact with water-bearing zones. At the time of the drilling, the Geoprobe® cores were examined and boring logs were prepared. It became evident that the saturated zones in the borings were not vertically continuous. Subsequently, a hydrostratigraphic analysis indicates that of the twelve water-bearing zones encountered, they ranged from 5 inches to 33 inches in thickness, averaging 14 inches. Some wells have one zone and others have up to four. The sediments in zones between the water-bearing zones were found to be damp to dry and are considered aquitards. Eleven such zones ranged in thickness from 4 to 33 inches and average about 19 inches. During monitoring well construction the screened interval was installed to collect water from all of the transmissive water-bearing zones encountered in that boring. Sometimes, the borehole was backfilled so the bottom of the screen would coincide with the bottom of the lowest transmissive zone.

These water-bearing zones are individual confined "aquifers" as shown by the static water levels above the screened intervals and the highest transmissive zone. When a well punctures a confined aquifer, the water level rises up the well casing under hydrostatic pressure.

The nature of the lateral and vertical hydraulic connections between these transmissive zones is not known. In one case, the zones could be correlated between two neighboring wells, MW25 and MW26. Both wells have two transmissive zones:

Comparison of Thickness of Zones in Two Wells		
MW25		**MW26**
14"	Water-bearing transmissive zone	33"
14"	Aquitard	15"
16"	Water-bearing transmissive zone	22"

These wells are about 30 feet apart and the correlation is good, except the upper zone in MW26 is twice the thickness as found in MW25. However, such correlations and hydraulic connectivity can not be traced with the existing network of monitoring wells because the distances between wells is much greater than this example. Due to the transmissivity and horizontal permeability these zones are highly conductive. PCE dissolved in groundwater has moved through these zones.

Because vertically thin beds are significant in understanding the hydrogeology of this site, the detailed soil boring logs prepared by Mid-Hudson Geosciences are necessary to reach this interpretation of hydrostratigraphic conditions.

The hydrogeology of this site is unusual because the majority of groundwater seems to come from surface water recharge as a result of infiltration of rainfall and snowmelt through the blacktop and unpaved areas. The effect of recharge is shown by a comparison of water levels measured in three monitoring wells on one day in November 2009 and two dates in January 2010.

Monitoring Well	**Depth to Water (Feet)**		
	11/25/09	**01/16/10**	**01/27/10**
MW4	4.28	4.50	3.90
MW6	7.47	8.22	3.60
MW3	6.50	7.45	3.93

Water Level Decline & Rise		
Monitoring Well	**Decline from 11/25 to 01/16**	**Rise from 01/16 to 01/27**
MW4	0.12	0.6
MW6	0.75	4.82
MW3	0.95	4.52

There was very little precipitation and very little recharge between November 25 and January 16, resulting in a slow decline of static water levels in the three wells. Between January 14 and 27, significant rainfall occurred and water levels rose. The decline in water levels indicates that constant recharge from upgradient areas does not occur at this site. Hence, the groundwater comes directly from stormwater and snowmelt discharge. Probably for that reason, Berninger considered the groundwater "perched."

Groundwater Flow Direction- Previous water level measurements in only the seven old monitoring wells behind the building were recorded, converted to elevations, and contoured by Berninger for the following dates:

- June 19, 2003 (Revised as Figure 4-3 in this report)
- July 15, 2003 (Revised as Figure 4-4 in this report)
- November 17, 2005 (Figure 4-5)

Because those wells are close together and in a sub-parallel line to the direction of groundwater flow, they do not really show the groundwater flow regime at American Cleaners and the surrounding area. To date, only one set of water level measurements is available for all of the 23 usable monitoring wells. (Note: Two wells are considered unusable. T2 is shallow and hydraulically connected to the surface drainage and the Storm Drain Well's surface cover was damaged exposing the well to collection of debris surface drainage.) The water elevation contours from the January 14 to 17, 2010 sampling event shows a converging pattern beneath the gully between American Cleaners and Route 211 (Figure 4-???). The gully is the sloping weed patch between the higher elevation of the Cheeseburger Paradise east parking lot and the lower elevation of the Credit Union west parking area. Based on the smooth interpreted contour pattern, the water table appears to be continuous. Also the contour pattern supports the ideas that the thin transmissive zones are interconnected and the hydraulic gradient is quite steep conducting groundwater toward the gully and Route 211.

Additional elevation information is needed to determine if the groundwater observed in the monitoring wells could be discharging to the stormwater drainage system at the lower end of the gully on the south side of Route 211. If elevation information supports the idea of groundwater discharge, a tracer test may be appropriate to confirm or reject the concept.

Continuous Recordings of Groundwater Levels- On January 27, 2010; transducers were programmed and placed in 13 monitoring wells to record water levels. After the winter snowmelt and spring rainy period, those transducers will be removed and data downloaded to document the fluctuations in water levels throughout the site. Another transducer was placed between the outer steel casing and the inner PVC casing to record barometric pressure. The water level data will be compensated for barometric pressure changes.

Groundwater Flow around American Cleaner's Building Foundation- The building foundation has a French drain around it to intercept groundwater flowing downhill beneath the asphalt parking lot. The French drain goes around the building perimeter to conduct water to the stormwater drainage system at the northeast corner of the building. About 30 feet from the building, a surface grate can be seen in the parking lot, which collects surface water in addition to conducting the water from the French drain. Another surface drainage grate is located at the southeast corner of the building. As a result of the French drain conducting water away from the building foundation, all of the soil borings advanced beneath the floor of the building encountered dry soil, rather than soil saturated with near surface groundwater.

Hydraulic Gradient- Based on a difference in water table elevation (544.64 minus 528.9 feet) in MW21 and T5 and the distance between them (about 186 feet), the ***hydraulic gradient is about 0.085***.

Hydraulic Conductivity- To accurately measure hydraulic conductivity, a series of slug tests will be performed on each of the wells to have a quantitative measure of permeability of the Water-Bearing Sand Unit.

Estimated Permeability and Effective Porosity- For the thin water-bearing transmissive units, an estimate of permeability is about 0.5 cm/sec using an average value range for clean sand or gravel presented in Freeze & Cherry (1979, Table 2.3, page 29). Effective porosity for gravelly sand or fine gravel is selected from a table of Specific Yields (Fetter, 1988, second edition, Table 4-3, page 74) averaged at 0.25 from a reported range of 20 to 35 percent. Specific yield is actual water given up by a unit pore volume of sediments, so it is a better approximation than actual porosity because porosity is measured by heating the sediment and driving all water out of the sample.

Average Linear Groundwater Flow Velocity- The average linear velocity of groundwater flow is the actual rate at which one could observe a tracer moving in the groundwater from one point to another. As Freeze and Cherry (1979, page 71) state average linear velocity (V_X) "does not represent the average velocity of water particles traveling through pore spaces. These true, microscopic velocities are generally larger than V_X, because the water particles must travel along irregular paths that are longer than the linearized path represented by V_X." The average linear velocity is found by multiplying the hydraulic conductivity (0.5 cm/sec) times the hydraulic gradient (0.085) and dividing by the effective porosity (0.25). Using those values, V_X is found to be 0.17 cm/sec, which is equivalent to an average linear groundwater flow of 54,000 meters per year. If these estimates are correct, the water is moving quite rapidly through the thin transmissive zones because of the high porosity, high permeability and steep hydraulic gradient.

Physical-Chemical Properties of Groundwater- With the low flow sampling method, several water quality parameters are measured while pumping to obtain stabilization. During the purging process, the following parameters were measured in each of the monitoring wells for a minimum of 4 times, every 5 minutes for a total of 20 minutes or more: pH, conductivity, Turbidity, Dissolves Oxygen, temperature, and Oxidation Reduction Potential. These readings are important to define the nature of the groundwater environment for the potential for bioremediation or chemical oxidation remediation. If the environment is not suitable with respect to these qualities, remediation may be ineffective. Hence, it is important to collect this information now and during the remedial design phase.

■ 4.4. Field Observations of Dry-Cleaning Impacts

At the American Cleaners Middletown site, there do not seem to be any actual field observations that one could make on a daily basis, such as stains on the ground or chemical buildups on solid surfaces or persistent odor in the air. The contamination that has been detected requires digging to depth in the soils, sampling groundwater at depth, and sampling air for 24 hours.

As will be described in great detail in Section 5, Low levels of VOCs at background levels of 2-3 parts per million were detected from soil samples using a Photoionization Detector. Low levels of tetrachloroethylene have been found in soils where the molecules apparently are sorbed onto soil particles. Dissolved product has been detected in groundwater. Gaseous tetraethylene has been detected in soil gas and air samples collected from subsurface soils, sub-slab locations under buildings or parking lots, indoor air, and outdoor air samples.

Other anthropogenic activities, which may relate to subsurface contamination include the installation an underground storage tank for heating oil and distribution of black organic fill in the backyard of the American Cleaners building. When the oil tank was replaced with a new smaller one, sampling at that time and in soil borings SB1 through SB4 of this investigation indicated no contamination at that location (Figure 5-1).

■ 4.5. Land Use & Database Search

On June 12, 2009, a three-part database search was obtained from Environmental Data Resouces, Inc. of 4340 Wheelers Farms Road, Milford, CT 06461 (phone 800-352-0050, www.edrnet.com). The entire EDR Environmental Database Search within 0.5 miles of American Cleaners Middletown is contained in Appendix B of this report. The search within a half mile radius around American Cleaners Middletown included a Certified Sanborn Map search (no maps found), Aerial Photo Package (6 photos, only 1978 and 2006 were useful), and ERD Radius Map™ Report with GeoCheck®.

The map findings summary listed the following sites of interest within 0.25 miles of the site:

Record Type	Miles from American Cleaners	Number of Sites Plotted on Map
RCRA-CESQG	1/8 - 1/4	1
LTANKS LTANKS	1/8-1/4 1/4-1/2	1 10
HIST LTANKS	1/4 - 1/2	9
RCRA - Nongen	1/8 - 1/4	2
MANIFEST	1/8 - 1/4	2

The report contains two maps. An over view map shows a radius of 1 mile and with 13 sites within ¼ mile and 9 sites within ¼ to ½ mile from American Cleaners Kingston (Figure 4-6 in this report). On the detailed map (Figure 4-7 this report), the following 5 sites are shown within 0.5 mile of American Cleaners

Map Number	Business Name	Street Address	Role in Listing	Elevation	Distance (ft) & Direction
1-4	***American Cleaners***	***360 Route 211E***	***Subject Property***	***564***	
5	Lothar's Body Shop	20 Maltese Drive	FINDS RCRA-CESQG MANIFEST	523	866 North
6	U-Haul Center	333 Route 211E	FINDS RCRA-CESQG MANIFEST	523	989 Northwest
7 8	Stop & Shop Fueling Facility Stop & Shop Fueling Facility	330 Route 211E 330 Route 211E	LTANKS HIST LTANKS RCRA-NONGEN LTANKS HIST LTANKS	527? 527?	1012 West 1012 West
12	Lloyds	33 Rt 211	LTANKS	527?	2346? West

		(Pre-911 address)	HIST LTANKS NY SPILLS NY HIST SPILLS		
15	Middletown/Lloyds	Rt 211	LTANKS HIST LTANKS	527?	2346? West
16	Board of Education	223 Wisner Ave	LTANKS HIST LTANKS	563	2586 Southwest
17	Middletown School District	223 Wisner Ave	LTANKS HIST LTANKS	563	2586 Southwest
Note: ? Indicates elevation and distance are incorrect. Elevation = 560, distance = 200 feet					

Some of the sites have different names for the same location due to inconsistencies in the databases searched. Locations and elevations are in error, in particular for the old Lloyds gas station and auto shop which were located less than 200 feet from the American Cleaners building and could not have been more than 20 feet lower in elevation. The present-day Stop and Shop Fueling Facility is in the approximate center of the old Lloyds area and it's elevation could not be more than 10 feet lower than American Cleaners and more likely actually at a slightly higher elevation because the area was raised with fill when the old Lloyds building was demolished.

Spills from the gas dispensaries at the former Lloyds and the present day Stop and Shop both have potential for detection in the area downgradient of American Cleaners as well as stormwater drainage potential into the drainage stream along Route 211. The following table is a summary of spills at these gas stations listed in the ERD database search:

Spill Location	**Spill Date**	**Material**	**Spill Cause**	**Resource Affected**
Lloyds	01/22/1987	Gasoline	Tank Test Failure	Groundwater
DEC Memo: "1/5 monitoring well has 1" product"				
Lloyds	02/16/1987	Gasoline	Tank Test Failure	Groundwater
DEC Memo: "1/5 monitoring well has 1" product"				
Lloyds	04/16/1987	Gasoline	Tank Test Failure	Groundwater
DEC Memo: "Same as spill 86-6482…failed retest"				
Middletown Lloyds	08/09/1988	#2 Fuel Oil	Tank Overfill	Soil
DEC Memo: "Contained on blacktop, cleaned up with speedi dri"				
Middletown Lloyds	01/20/1995	Gasoline	Unknown	Groundwater
DEC Memo: "tanks removed 04/21/2000 by new owner Stop 'N Shop , "Site assessment performed contaminated g/w discovered in M/W report will be submitted"				
Stop and Shop	10/11/2006	Gasoline	Tank Overfill	Soil
DEC Memo: "Fire Dept. cleaned up. Cleaned up speedi dri by Fire Dept."				

Lothar's Auto Body Shop and the U-Haul Center are included in this listing because their surface runoff drains into the small stream, which flows northeast into Silver Lake on the north side of Route 211. Drainage from the south side of Route 211 enters the stream east of the U-Haul Center and southwest of Lothar's.

5. Analytical Results Define Nature and Extent of Contamination

This section presents the environmental conditions present in soil, groundwater, soil gas (vapor), and air (sub-slab, indoor, and outdoor) samples and field observations collected during several phases of field investigation. Analytical results are provided in tabular form for each environmental media. Where appropriate applicable analytical data for each medium are compared to cleanup objectives and/or screening criteria to identify *constituents of potential concern* (COPCs). COPCs are defined as any constituent that is detected at a concentration greater than a cleanup objective or screening value. The environmental conditions in each sample media are also illustrated in figures as an aid to evaluate the vertical and horizontal distribution of the target compound at the Site.

Based on the data validation as provided in data usability reports (Appendix D) by independent contractors it is concluded that the data quality is usable for the purposes of satisfying the project objectives.

5.1. Screening Criteria

PCE concentrations in soil samples were compared to Recommended Soil Cleanup Objective (RSCO) of 700 ug/L listed in NYSDEC TAGM 4046. That RSCO represents a conservative value for protection of human health, groundwater, and ecological systems. Specifically, the human-health based RSCOs were developed in consideration of exposure of a child resident and an adult resident to soils via ingestion, inhalation, dermal contact, and through consumption of homegrown vegetable and animal products. The groundwater RSCOs are protective of groundwater via the soil to groundwater migration pathway (i.e., soil leaching and groundwater transport). The ecological RSCOs are protective of ecological resources (i.e., wildlife).

For groundwater, standards and/or guidance values from the NYSDEC (1998) Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations were used to identify constituents of potential concern. Specifically, Class GA standards and guidance values of 5 ug/L was used to screen groundwater data. That standard and guidance value is considered protective of drinking water sources.

Air samples were collected as part of the field investigation to determine if there is a complete transport pathway of PCE from soil gas and/or sub-slab vapor to indoor air. If a complete transport pathway occurs for PCE in indoor air then both of the following environmental conditions must be present:

- PCE must be present in indoor air and ambient air or soil vapor
- PCE concentration in ambient air or soil vapor must be greater than the concentration in indoor air.

Note the second condition assumes there is no indoor source of PCE present. Indoor air sample results were compared to ambient air, soil gas and sub-slab vapor results as well as the NYSDOH Guideline for PCE in air (100 ug/m^3 = 15 ppbv, NYSDOH, 2006).

■ 5.2. Soils in the Vadose Zone

The evaluation of the PCE contamination in soil is based on 30 soil samples from 57 soil borings. On March 29, 2001; Anson Environmental conducted the earliest soil sampling for which documentation is available. Berninger's soil sampling is provided in Table 5 with analytical results from H2M Laboratories sampling events conducted on June 18 and July 16, 2003. Laboratory reports from York Analytical Laboratories are summarized in Table 3 for sampling conducted by Mid-Hudson Geosciences in November 2009. Laboratory data reports are provided in Appendix C. Independent soil sample data validation reports and the laboratory Category B data packages are provided in Appendix D.

Soil sampling behind and to the north of American Cleaners Building- Anson Environmental collected soils at 10 soil sampling locations and submitted 6 for laboratory analyses because they had PID readings above background. The laboratory results for PCE and degradation products are recorded on a map (Figure 5-1 in this report). The laboratory reports prepared by Long Island Analytical Laboratories, Inc. are reproduced in Appendix C. Two samples exceed the 1400 ug/kg cleanup objective. One (B5) was about 20 feet north of the former dumpster location near the curb and across from the former UST location. The other exceedence (B9) was 3296 ug/kg near the curb north of the building. The written report refers to another analysis for a sub-slab-sample (B-10) inside the building as having a PCE concentration of 482 µg/L. Because this sample was obtained indoors, it was probably collected on another date. The sample for B10 was not included on the chain-of-custody for the other soil samples and the monitoring well samples collected on March 29, 2001.

The Berninger and Mid-Hudson Geosciences laboratory results are shown on Figure 5-2. Total VOC concentrations ranged from ND (not detected) to 430 and PCE concentrations ranged from ND to 370 ug/kg. No samples exceed the TAGM 4046 Recommended Soil Cleanup Objective for PCE of 1.4 ppm of 1400 ug/L. The individual concentrations are posted next to boring locations with year of sampling and with the sample depth shown as concentration @ depth format (Figure 5-2).

Degradation products of PCE were detected in most of the soil samples, where the entire list of analytes is available. Such degradation products of PCE are from the reaction series

PCE → TCE → DCE → VC → Carbon Dioxide

Where PCE is tetrachloroethylene (aka perchloroethylene or "perc"), TCE is tricholorethene, DCE is 1,2-Dichloroethylene, and VC is vinyl chloride.

PCE Concentrations Beneath Building Floor- The greatest concentrations of PCE in soil samples was found under the southwestern quadrant of the American Cleaners building beneath the main floor level (Figure 5-2):

Year of Sampling	Boring Identification	PCE Concentration ug/L	Depth (Feet)
2001	B-10	482	NA
2003	BEI-02	1300J	5
		940J	7
	BEI-05/11	130	2-3
		840	3.5
		20	7-8

	BEI-10	78,000	5-6

Inspection of Table 5 indicates that for each sample, degradation products (TCE and DCE) were detected in significantly lower concentrations than PCE. Their presence in the dry soil beneath the floor indicate that some form of degradation, either biological or chemical, is occurring in that location. In this group, only one sample (BEI-10) exhibited a concentration greater than the NYSDEC soil cleanup objective of 1400 ug/L for PCE. Given conditions of degradation and passage of time, it is not known if such a high PCE level persists beneath the floor now.

PCE Concentrations in Soil by the Back Door- PCE concentrations detected in soils outside the back door were present (Figure 5-1):

Year of Sampling	Boring Identification	PCE Concentration ug/L	Depth (Feet)
2003	BEI-03	18	2
		1900	10
	BEI-04	57	10
	BEI-09	500J	10-12

These samples also have TCE and DCE associated with the PCE again indicating the degradation in the soils by the back door. Only one sample (BEI-03, 10 feet) exceeded the NYSDEC soil cleanup objective of 1400 ug/L. The validity of the samples collected from a depth of 10 feet or greater is questionable because in three nearby monitoring wells (MW2, MW5, and MW6), groundwater is detected at 7 to 8 feet below ground surface. Given the height of the water table in the wells, the soil samples should be saturated. If the soil were saturated, then the PCE could be present in groundwater or could have migrated to that location with groundwater movement. Alternatively, the soils could be compact and dry, so that the PCE is sorbed onto the soil particles.

Although 19 soil borings were initiated by Berninger in 2003, only 12 samples were sent for laboratory analyses. Apparently, those were the only samples with Photoionization readings above background. For the nine T-series monitoring wells installed in Geoprobe® borings in 2005, Berninger did not send any soil samples to a laboratory for VOC analyses. Again in 2008, Berninger did not have any soil samples analyzed from the seven GP-series soil borings.

In November of 2009, Mid-Hudson Geosciences hired Todd K. Syska, Inc. to drill 11 soil borings for soil sampling and installation of eight new monitoring wells using a Geoprobe®. 16 soil samples were sent to the laboratory for analyses because they exhibited Photoionization readings greater than background levels.

Former Dumpster Area- Borings D1, D2, D3, and D4 were advanced in the vicinity of the former dumpster location. One sample from each boring was sent for laboratory analysis for VOCs (Table 3). Each sample was selected from the boring because the PID response was the highest and in these cases, the reading was barely above background. Of the four samples, the only sample with a reading above Not Detected was from D4 (5.8-5.9 feet) at 57 ug/L.

Other samples in the 2009 borings from MW22, MW24, and MW28 were reported as "Not Detected" from the laboratory for PCE. For MW25 in the area immediately north of the building, in the sample from 6.8 feet, PCE was reported at 44 ug/L with 5 ug/L for TCE and 6J ug/L for DCE. None of the laboratory analyses for soil samples from the 2009 borings had PCE concentrations above the 1400 ug/L NYSDEC soil cleanup objective.

■ 5.3. Groundwater

The original monitoring wells (MW1B, MW2, and MW3) were installed in April 2000 by HRP as 2-inch diameter PVC wells with drive-over covers sealed into the blacktop. Three other wells (MW4, MW5, and MW6) were reported to be installed sometime after April 2000 and before March 2001 by an unnamed company. Currently, there are 7 old wells on the west side of American Cleaners and at the northwest corner of the building. The installation date of MW7 is unknown, but it is also a 4-inch PVC well similar in construction to the MW4, MW5 and MW6.

Three rounds of sampling have been conducted on these wells in 2001 by Anson Environmental (Figure 5-1), in 2003 by Berninger (Table 10), and in 2010 by Mid-Hudson Geosciences (Table 4, Figures 5-3 and 5-4):

PCE Concentrations in ug/L			
Well Identification	**Year 2001**	**Year 2003**	**Year 2010**
1B	ND	ND	ND
2	472	1100	110
3	1330	1700	430
4	NA	8J	ND
5	553	4000J	240
6	684	530	280
7	956	1100	69

All five of the downgradient wells show the same pattern of increasing concentrations from 2001 to 2003 and then significant decline in PCE by 2010. Each of the data sets also show the presence of TCE and DCE in those wells indicating that degradation of PCE is occurring in the groundwater as well as the soils.

In 2003, Berninger obtained groundwater samples from some of the BEI-series of Geoprobe borings in the northwest corner of the property and along the northern boundary (Figure 5-3). Those samples are identified as the BEI-GW-series (Table 7). PCE was detected in hundreds of ug/L along the northern half of the western (back) property line and in thousands of ug/L along the eastern half of the northern property line. In 2005 (Table 10), additional Geoprobe® sampling confirmed thousands of ug/L at two more locations (6A and 6B) along the northern property line. TCE and DEC were associated with TCE in the northern property line samples, but not in the western property line samples.

In 2005, Berninger installed and sampled the T-Series of monitoring wells and those same wells were sampled by Mid-Hudson Geosciences in January 2010.

PCE Concentrations in ug/L		
Well	**Year**	**Year**

Identification	2005	2010
T1	ND	ND
T3	870	18
T4	1000	1J
T5	1700	47
T6	ND	ND
T7	ND	ND
T8	dry	ND
T9	ND	ND

These wells were installed in downgradient and cross gradient locations to define the extent of contamination. The three wells showing PCE concentrations in 2005 are now showing remarkably less to no PCE. Degradation products of TCE and DCE are associated with the TCE.

From the January 2010 sampling event, the distribution of PCE in groundwater (Figures 5-3 and 5-4) indicates the presence of a kidney bean-shaped plume moving from the west and north walls of the American Cleaners building.

In the blacktop area immediately northwest of the building, PCE concentrations are highest near the backdoor at slightly less than 300 ug/L grading off to less than 100 at the curbs on the edge of the blacktop in the corner of the new dumpster location. Migrating from the back parking area, off-site PCE concentrations are 42 ug/L at MW22 just beyond the curb to the west and 18 ug/L at T3 in the parking lot to the north.

In the area north of the building, the highest PCE concentration detected within the plume is 2600 ug/L at the new monitoring well MW26 at the edge of the blacktop. The plume seems to be funneled by groundwater flow to the steep gully between the eastern Cheeseburger Paradise parking lot and the western Credit Union parking lot. Three wells along the eastern edge of the plume (MW26, MW28, and T7) show decline in PCE, TCE and DCE concentrations. Concentrations at MW28 are about 10% of those at MW26. Likewise concentrations at T7 are Not Detected for PCE and TCE with cis-DCE estimated at 1 ug/L.

■ 5.4. Surface Drainage and Sediment

As described in section 4.3, additional elevation information is needed to determine if the groundwater observed in the monitoring wells could be discharging to the stormwater drainage system at the lower end of the gully on the south side of Route 211. Two sets of stormwater and sediment samples were collected in that stormwater stream next to Route 211. One was in the stream coming out from the “gate” under the northeast corner of the Cheeseburger Paradise Restaurant parking lot. The second set of sample was at the toe of the gully slope where subsurface drainage through overburden, soils and fill could be discharging to the stream. Both sets of water and sediment samples were found to be “Not Detected” for all VOCs (Table 4).

If, indeed, groundwater is traveling downgradient from American Cleaners and discharging to the stormwater drainage stream, the analytical results for those sediment and water samples indicate that PCE and other VOCs are not reaching the drainage stream beside Route 211.

■ 5.5. Soil Vapor and Air Sampling

Soil vapor samples were collected for 32 sample points and air samples were collected from 3 sub-slab locations, 3 indoor air and 3 outdoor air locations. Seven soil vapor samples were collected through the floor of the American Cleaners Building and the remainder from the site and surrounding downslope areas. For discussion purposes, the samples are divided into three groups: soil vapor under parking lots and undeveloped areas, sub-slab soil vapor under the American Cleaners building, and air sampling at neighboring buildings.

▪ 5.5.1. Soil Vapor under parking lots and undeveloped areas

Validated laboratory analyses for VOCs for the 32 soil vapor samples are reported in Table 6 (2003) and Table 9 (2005). Analyses of air samples are provided in Table 6. Since "New York State currently does not have any standards, criteria or guidance values for concentrations of compounds in soil vapor." (NYSDOH, 2006, page 41), there are no screening criteria for these samples.

The 2003 soil vapor samples were collected around American Cleaners, focusing on the paved areas on the west and north sides of the building (Table 9, Figure 5-6).

Former Dumpster Location- PCE was detected at 620J, 510J and 480J µg/m^3 in three sampling locations clustered around the former dumpster location, by the curb across from the shed addition on the back of the building.

PCE was not detected in soil vapor samples from beyond the western curb, inside the northwestern blacktop area, and beyond the northern curb.

North Side of Building and Northeast Corner of Building- PCE concentrations ranged from ND to 1800J µg/m^3 in a cluster of five samples.

An "Upgradient" soil vapor sample collected 321 feet south of the building showed 63 µg/m^3 and 73 µg/m^3 for total VOCs.

The 2005 soil vapor samples (Table 9, Figure 5-6) were collected at the American Cleaners building, next to each of the three neighboring downslope buildings and some locations approximately half-way between American Cleaners and the neighboring buildings (MHV Credit Union, Cheeseburger Paradise Restaurant, and the vacant Video Store).

By the back door, in 2005 a duplicate sample SG-1 (rep) was collected from the same location as the earlier sample SG-1.

Year	Sample Identification	PCE µg/m^3	TCE µg/m^3	DCE µg/m^3	MTBE µg/m^3	Total VOCs µg/m^3
2003	SG-1	1500J	1500J	36J	32J	3371
2005	SG-1 (rep)	580,000	1100	7100	NA	598,100

For unknown reasons, the concentrations of PCE and degradation products were much higher in the 2005 sample than in the 2003 sample.

In 2005, at neighboring buildings, insignificant levels of PCE were detected in soil vapor samples.

Building	Year	Sample Identification	PCE µg/m^3	TCE µg/m^3	DCE µg/m^3	VC µg/m^3	Total VOCs µg/m^3
Credit Union	2005	SG26	2.4	ND	75	6.6	296.7
Cheeseburger	2005	SG29	1.8	ND	ND	ND	375.3
Former Video Store	2005	SG31	ND	ND	ND	ND	6750

However, degradation products were found in the sample from the southwest corner of the Credit Union and Dichlorfluoromethane was detected at 5900 µg/m^3 in the sample from the southeast corner of the former Video Store. Dichlorfluoromethane is used in fire extinguishers and as a solvent and refrigerant. Also BTEX compounds were detected in all three samples.

Midway between American Cleaners and the former Video Store, sample SG-30 had no detection of PCE, not its degradation products. That location is well beyond the groundwater plume, so a source of vapor is not there. Also at that location, the groundwater flow direction cross-gradient relative to flow at American Cleaners.

Midway between American Cleaners and the MHV Credit Union, sample SG-25 has the highest PCE and TCE concentration detected in soil vapors off site with 120,000 µg/m^3 and 640 µg/m^3, respectively. This soil gas sampling location is near that of the highest PCE concentrations in groundwater. For that reason, the soil vapors are likely to be the result of near surface vaporization of PCE from the groundwater. BTEX compounds were not detected in this particular soil vapor sample, although sub-slab sampling at the Credit Union will be shown later to have BTEX.

Some PCE vapors were detected beyond the groundwater plume outline. The following combinations of groundwater monitoring samples and soil vapor samples are in close proximity if not the same location:

Monitoring Well	Soil Vapor Sample	Description of Location
T-6	SG-26	Southwest corner of Credit Union Building
T-8	SG-28	about 100 feet east of AC front door

In both wells, the 2010 sampling event, TCE was not detected. However, in the 2005 soil vapor sampling event (Table 9, Figure 5-6 and Figure 5-3), TCE was detected in both locations as well as in another soil vapor sample identified as SG-27 about half way between SG-26 and SG-28. Back in 2005, when Berninger sampled T-6, PCE was not detected and T-8 was considered dry and not sampled.

Occurrence of PCE in Soil Vapor is generally in locations where PCE has been sorbed to soil particles or where PCE is dissolved in groundwater. The VOCs need sufficient pore space to vaporize from the soil or liquid state. Also sufficient permeability is needed for the gaseous molecules to move through soils and overburden materials. If the soil is highly permeable relative to gases, the VOCs can escape to the atmosphere or move along such permeable zones. In the compacted clay and silt zones of this site, the zones, which are highly transmissive for groundwater could allow the migration of gases, when the water table is lower than such zones.

- **5.5.2. Sub-slab Vapor Sampling under American Cleaners Building**

The following samples were collected from beneath the main floor in the southwestern quadrant of the building:

Year	Sample Identification	PCE μg/m³	TCE μg/m³	DCE μg/m³	Total VOCs μg/m³
2003	SG-13	ND	ND	ND	6J
2003	SG-14	60	6	ND	66
2003	SG-20	520J	ND	ND	523J
2003	SG-21	610J	400	ND	1181J
2003	SG-22	1600J	1100J	ND	2745J
2003	SG-23	410J	ND	ND	448J
2005	SSV-1	20,000	ND	160	20,170

These samples indicate that the PCE associated with that detected in the soil samples is vaporizing and accumulating under the floor. Some degree of degradation is occurring as shown by the presence of some TCE and DCE also detected in the samples. One sample (SG-13) was collected in the northwest corner of the building and no PCE, nor its degradation products were detected; however, MTBE was estimated at 6J.

- **5.5.3. Air Sampling at Neighboring Buildings**

Three air samples (indoor air, outdoor air, and sub-slab vapor) were collected in Summa canisters at three neighboring buildings: MHV Credit Union in January and Cheeserburger Paradise Restaurant and the vacant Video Store in March of 2009. Validated sample analyses for air samples are listed in Table 11 and summarized on small tables shown on Figure 5-6. A review of the laboratory results indicates that no indoor air samples exceed the NYSDOH air guideline value of PCE of 100 ug/m^3, equivalent to 15 ppbv. VOCs found in the indoor air samples are generally two orders of magnitude less than the sub-slab sample collected at the same building. In the three neighboring buildings, many of the VOCs are detected at higher levels than measured at American Cleaners. The differing suites of VOCs indicate that vapors from sources other than American Cleaners may have migrated to the neighboring buildings.

Inside the MHV Credit Union building, PCE was detected at 0.49 ppbv, about 3 percent of the indoor guidance value of 15 ppbv. Also similar concentrations of organic solvents and refrigerants were detected in the indoor air. The outdoor air quality is virtually the same as the indoor air quality. PCE and TCE were detected in the sub-slab vapor samples along with BTEX compounds found in gasoline and VOCs used as refrigerants, in fire extinguishers, and propellants. The VOCs found beneath the building are generally one order of magnitude greater than detected in the indoor and outdoor air. These VOCs are likely vapors from contaminants in the soils used for fill or former site activities.

Trace quantities of a suite of five VOCs were detected in both the indoor and outdoor air samples from the Cheeseburger Paradise Restaurant, with the exceptions of methylene chloride and PCE found in the outdoor air. PCE was not detected in the sub-slab vapor sample, but TEX and other gasoline components were detected at two orders of magnitude greater than concentrations in the air samples at the Restaurant. The gasoline compounds may be from the gasoline spills reported at the former Lloyds Store (see Section 4.5 Land Use and Database Search). The store was located uphill from the parking lot. The Restaurant is situated on part of the old Lloyds' parking lot. The soils under the parking lot and fill used to raise it to the current level for restaurant could have traces of contamination. The gasoline VOCs could vaporize and accumulate beneath the Restaurant slab.

Both the indoor and outdoor air sampled at the Video Store contained trace amounts of a few VOCs. PCE was not detected in any of the three samples. In the sub-slab sample several gasoline components were detected in levels similar to those detected at the Cheeseburger Paradise Restaurant next door. The Video Store is also located on filled land above the former Lloyds Store parking lot.

■ 5.6. Data Validation

All of the data validation reports conveyed to Mid-Hudson Geosciences by Berninger are included in Appendix D.

6. Conceptual Site Model Reveals Contaminant Fate and Transport

This section of the RI presents the conceptual site model, which pertains to the nature, extent, and transport of PCE in subsurface soil and groundwater.

■ 6.1. Sources, Nature, and Movement of PCE

Based on information obtained during the remedial investigation, it is not clear if there is one source of contamination or a series of spills leading to current site conditions. It appears that there may have been one primary source and site activities have spread the source to downgradient and off-site locations.

▪ 6.1.1. Primary Source

Figure 5-3 shows the isopleths of the PCE impacted contamination area in soils from zero to 10 feet depth. As shown by the soil sampling results, spills apparently occurred inside the building, on the ground near the back door and on the ground near the former dumpster location. The PCE has moved downward into soils in all of these locations. Inside the building, under the influence of gravity, spilled PCE has moved through cracks or crevices in the floor and possibly the trenches. The PCE may have originated as free product, but movement through small openings probably broke the surface tension and any globs of PCE would have been dispersed as tiny bubbles or dissolved in mop water. Outdoors, the downward movement of PCE involves dissolving in rainwater infiltrating down through the asphalt, soils, and overburden materials within the vadose zone.

▪ 6.1.2. Secondary Source

Anson's report refers to the replacement of the fuel oil tank as follows:
"Laboratory analysis of soil samples collected as endpoint samples following the excavation and removal of a fuel oil tank indicated that the soil was contaminated with dry cleaning chemicals. Therefore, additional soils were removed from the vicinity of the former fuel oil tank location." (Anson Environmental Report, April 18, 2001, pages 1-2)

Close to the location of the fuel tank grave, a discharge of boiler water condensate occurs. The output is directed downward toward the blacktop and a crack has developed in the pavement from that location curving around the corner of the building nearly reaching the north curb near the new monitoring well MW25. Apparently, this very hot source of water has persisted throughout the operation of the dry cleaning establishment. The hot water was probably responsible for vaporizing some PCE in the soils and releasing it to the atmosphere as well as dissolving some of the PCE and moving it toward the north curb. Some of the PCE was sorbed onto soil particles and some may have migrated downward until reaching groundwater. Once in the groundwater, PCE began migrating with the water downgradient beyond the blacktop area to the north of the building. In the strictest sense of the word, this entrainment via hot water may not be a “secondary source,” but it certainly is a significant transport mechanism at this site.

▪ 6.1.3. Vertical and Horizontal Extent of Contamination

PCE contamination in soils is limited to the blacktop area to the west and north of the site. The presence of degradation products indicates that the PCE concentrations are diminishing as indicated by soil sampling in the former dumpster area by Mid-Hudson Geosciences in 2009. PCE concentrations above the cleanup objective of 1400 ug/L were observed in 2001 near the curb north of the building in boring B-9 at 3296 ug/kg from an unknown depth. In 2009, Mid-Hudson Geosciences collected a sample at 6.8 feet in MW25 showing 44 ug/kg. This statement is not meant to say that both samples were from the same location; however, they were located in the same area and they were chosen for laboratory analysis because their PID readings were the highest observed in that boring. Again the presence of degradation products indicates that a natural biological or chemical is breaking down the PCE.

In areas beyond the north curb, the driving force of the condensate trail is no longer present, so that any PCE contamination in the soils will be conducted downward in the vadose zone by gravity and entrainment with rainfall and snowmelt. Some PCE is vaporized and migrates through the unsaturated sediments. PCE reaching the water table is moved with the groundwater.

The lateral extent of groundwater contamination has been well defined by groundwater sampling in monitoring wells. The well-defined groundwater flow regime also shows flow field for the plume as entering a funnel or area of convergence beneath the gully between the Cheeseburger Paradise eastern parking area and the Credit Union western parking area.

The downgradient extent appears to be somewhere between the lane between American Cleaners and the neighboring Credit Union and Restaurant buildings and the outflow of stormwater just south of Route 211. That area in the gully is probably difficult to drill into because of the buried stormdrain pipes and the likely presence of large cobbles or boulders placed there for slope stability. Two sampling of the stormwater and sediments from the stormwater drainage taken in January 2009 showed no PCE or other VOCs detected. In the 2005 sampling event, at monitoring well T7 PCE, TCE, DCE, and VC were detected in the following concentrations: 5, 1J, 54, and 1J ug/L indicating that PCE was definitely degrading in the plume. The presence of lowest measurable concentration of DCE (1J ug/L) in monitoring well T7 indicates that PCE and its degradation products are not reaching that location now.

The vertical extent of soil contamination is at the water table because PCE reaching that depth would become dissolved in groundwater. Since the water seems to move through thin transmissive zones with intervening damp or dry zones, the contaminated groundwater is likely to stay in those zones and move laterally since that would be the path of least resistance.

At this time, the vertical separation of the transmissive zones by aquitards is important because horizontal movement of groundwater is much more likely than vertical because it is the path of least resistance. It is likely PCE-contamination is restricted to the water-bearing zones, which have been screened in the monitoring wells. Some of the lower water-bearing zones and aquitards may not have been contaminated prior to the installation of monitoring wells. Aquitards beneath the monitoring wells present a barrier to downward migration of groundwater with dissolved PCE.

■ 6.3. Fate and Transport of Contaminants

The following table lists the processes or mechanisms involved in the fate and transport of PCE contaminants:

Contaminant Fate and Transport Processes		
Medium	**Process**	**Result**
Ground surface	Volatilization	Liquid to gas and dispersal in atmosphere
Air	Wind	Moves and disperses gases in atmosphere
Soil	Gravity	Moves liquid into soil
Soil	Dissolution	Contaminants dissolved in rainfall or snowmelt and infiltrate deeper into the soil
Soil	Sorption	Temporary adhesion of PCE molecules to soil
Soil	Leaching	Desorption of PCE and movement into groundwater
Groundwater	Hydrodynamic Dispersion	Mixes dissolved PCE with cleaner water and spreads out the plume
Groundwater	Hydrodynamic Flow Advection, Dispersion	Moves PCE plume downgradient through preferrential pathways of porous & permeable media in the Water-Bearing Sand Unit
Groundwater	Volitilization	At water table, releases PCE as a gas beck into soils in the vadose zone.
Soil & Groundwater	Biodegradation	Breakdown of PCE into series of products PCE → TCE → DCE → VC
Soil & Groundwater	Biodegradation as Type 2 Behavior anaerobic conditions	in the presence of biologically available native organic Carbon, microbes use the carbon as a source and they metabolize the ethene solvents by reductive dechlorination.
Soil & Groundwater	Biodegradation under aerobic conditions	In the presence of dissolved oxygen, VC can be oxidized rapidly.

■ 6.4. Potential Exposure Pathways and Receptors

Analytical data indicate that PCE concentrations in indoor air quality samples are within NYS guidelines. Groundwater beneath the site is not used as a potable source and therefore exposure via ingestion of groundwater is unlikely. There is relatively little potential for direct contact with groundwater for residents, recreational users, and workers given the depth to groundwater and because these receptors would not be involved in intrusive activities. However, if the groundwater is discharged to the stormwater drainage stream at the base of the hill next to Route 211 and if that groundwater contained PCE that is a potential route of exposure to humans, animals, and plant. In January of 2009, the laboratory reports were “not detected” for all VOCs in the surface water and sediment samples.

■ 6.5. Potential Changes in PCE Contaminant over Time

The maps of PCE concentrations in groundwater have been constructed to show variations in two-dimensional space for near surface contaminated interval. The groundwater samples taken with the Geoprobe® represent plume conditions at one point in time at one depth. Sampling of the monitoring wells show the PCE concentrations for each specific sampling event. To date, as shown in section 5.3, three sets of laboratory reports were compared for the seven old wells (MW1B through MW7) and two sampling events were compared for the T-series wells (T1 to T9). Both sets of data show a significant decline in PCE concentrations and the presence of degradation products TCE and DCE. A natural degradation process has been going on for at least 8 years, perhaps longer, and there is no reason to think it will stop. If no action were taken to remediate the PCE in groundwater, the natural degradation process would have the groundwater clean to NYSDEC class GA groundwater standards within 10 years.

Testing of soil is not as easy as groundwater monitoring because we do not have “soil monitoring wells.” New holes or borings have to be made to obtain soil samples. However, all of the soil samples with PCE detections are on the American Cleaners property, which is covered with asphalt, so there is little exposure to the soil. No doubt natural degradation of PCE in the soils will continue and concentrations will decline.

7. Qualitative Human Health Exposure Assessment

This section of the RI presents a qualitative human health exposure assessment, which evaluates the potential for human exposure to PCE released at the American Cleaners Kingston site. This assessment is prepared consistent with the NYSDOH guidance as presented in *Draft DER-10 Technical Guidance for Site Investigation and Remediation* (NYSDOH, 2002) and uses information regarding current and foreseeable land uses and available site data to evaluate the potential for exposure of human receptors. The assessment includes an evaluation of contaminant fate and transport for PCE and the identification and characterization of complete exposure pathways. The results of this qualitative exposure evaluation will be used, in part, to help evaluate proposed remedial actions for the site.

■ 7.1. Site-Specific COPC

PCE is the site-specific COPC for soil, groundwater, and indoor air. Other VOCs such as the BTEX compounds may be present in neighboring properties, but they have not come from a source on the American Cleaners.

■ 7.2. Contaminant Fate and Transport

PCE has a high vapor pressure and will partition into the atmosphere from surface soil and surface water. Rates of volatilization from soils depend on temperature, humidity and soil type.

Subsurface soil infiltration will also occur. This chemical has a relatively high mobility in soils because sorption is not significant enough to prevent migration. PCE will leach into the groundwater particularly in soils with low organic carbon. In surface water, PCE can be transformed via photooxidation and biodegradation. In soils, anaerobic soil microbes are responsible for biodegradation.

■ 7.3. Exposure Assessment (potential exposure points, receptors and route of exposure)

An initial step in evaluating potential human exposure is the identification of potentially complete exposure pathways. “For an exposure pathway to be complete, the following five elements must exist: 1) a contaminant source; 2) contaminant release and transport mechanisms; 3) a point of exposure; 4) a route of exposure; and 5) a receptor population.” If all five elements exist, then that exposure pathway is considered to be complete (NYSDOH, 2002).

▪ 7.3.1. Potential Direct Contact with Soil

Potential direct contact with soil is not a concern because the PCE concentrations measured in all of the soil samples were below the Recommended Soil Cleanup Objective.

▪ 7.3.2. Potential Inhalation of Vapors from Surface Soil

Potential inhalation of vapors from soil is not a concern because the PCE concentrations measured in all of the soil samples were below the Recommended Soil Cleanup Objective.

▪ 7.3.3. Direct Contact with Groundwater and Surface Waters

The groundwater Table beneath the site ranges from approximately 9 to 12 feet below grade. Groundwater is not used as a potable source at the site, and depth to groundwater precludes potential direct exposures of human receptors to this medium.

However, there is potential for human exposure if the groundwater discharges to the to the stormwater drainage system at the lower end of the gully on the south side of Route 211. If, indeed, groundwater is traveling downgradient from American Cleaners and discharging to the stormwater drainage stream, the analytical results for those sediment and water samples indicate that PCE and other VOCs are not reaching the drainage stream beside Route 211. The stormwater drainage stream flows north from the site under Route 211 and enters a northeast flowing stream, which enters into Silver Lake about 1000 feet northeast of the site.

▪ 7.3.4 Inhalation of Indoor Air

Since concentrations of PCE detected in air samples were below the NYSDOH air guidance value of 100 ug/L (15 ppbv), an exposure pathway is not considered.

■ 7.4. Impact on Fish and Wildlife Summary

PCE at the American Cleaners site and surrounding properties does not impact fish or wildlife because the groundwater is the only contaminated medium to exceed NYS guidance values. The groundwater is buried 3 to 12 feet below grade making wildlife exposure unlikely.

However, there is potential for wildlife and fish exposure if the groundwater discharges to the to the stormwater drainage system at the lower end of the gully on the south side of Route 211. If, indeed, groundwater is traveling downgradient from American Cleaners and discharging to the stormwater drainage stream, the analytical results for those sediment and water samples indicate that PCE and other VOCs are not reaching the drainage stream beside Route 211. The stormwater drainage stream flows north from the site under Route 211 and enters a northeast flowing stream, which enters into Silver Lake about 1000 feet northeast of the site.

■ 7.5. Summary

Analytical data indicate that PCE concentrations measured in indoor air quality samples are within NYS guidelines. Groundwater beneath the site is not used as a potable source and therefore exposure via ingestion of groundwater is unlikely. However, there is potential exposure to humans, wildlife, and flora to the stormwater stream flowing off the property and eventually into Silver Lake, if groundwater does discharge into the stormwater channel. One set of the analytical results for sediment and water samples indicate that PCE and other VOCs are not reaching the drainage stream beside Route 211.

8. Summary and Conclusions

■ 8.1. Summary

The horizontal and vertical extent of PCE contamination at American Cleaners Kingston and neighboring properties has been outlined on maps of soil samples (Figures 5-1 and 5-2), groundwater samples from Geoprobe® locations and monitoring wells (Figures 5-3 and 5-4), soil vapor samples and sub-slab air samples (Figure 5-5) and indoor and outdoor ambient air (Figure 5-6).

There is concern that BTEX and other VOC compounds may be migrating onto neighboring properties from unidentified external sources, not controlled or owned by American Cleaners Kingston. Those neighboring properties are on the west side of Ulster Avenue.

There are no significant exposure pathways because the only groundwater is in contravention of NYSDEC standards and guidance values. Groundwater is 9 to 12 feet below grade, so it is not likely to be in contact with receptors except possibly during during construction activities.

■ 8.2. Conclusions

The RI objectives are achieved. In groundwater on the west side of Ulster Avenue, the most southwest sampling point (SG14 and GW27) is considered beyond and separate from the American Cleaners plume, because suites of BTEX and other VOCs are detected there in greater concentrations than observed at sampling points on the east side of Ulster Avenue on the property of American Cleaners.

■ 8.3 Recommendations for Future Work

Some data gaps which may prove useful for the Remedial Action Selection Report may include:
- Measure elevations of storm drainage channel on south side of Route 211
- Measurement of hydraulic conductivity (permeability) of the Water-bearing Transmissive Units in the screened interval of monitoring wells. Slug tests can be conducted prior to preparing the remedial design.
- Conduct pumping tests to determine vertical connectivity of transmissive zones in wells
- Sieve analyses for grain size distribution to estimate porosity
- Obtain information on location, depth, and construction details for stormwater drainage system for Cheeseburger Paradise Restaurant and Parking Lot and Drainage Basin
- Collect new Indoor and Sub-slab Air Samples in the southwest interior of the American Cleaners Middletown to assess current conditions.
- Continue sampling monitoring wells.

■ 8.4. Recommended Remedial Action Objectives

Appropriate remedial action objectives are selected to attain the goal of restoring the site to pre-contaminant conditions to the extent feasible. At a minimum, the remedy shall eliminate or mitigate all significant threats to public health and the environment presented by the contamination identified a the site through the proper application of scientific and engineering principles. The following protective remedial objectives may be appropriate, if significant threats to public health can be substantiated:

Remedial Action Objective #1 - Public Health Protection of Groundwater
- § Prevent people from drinking groundwater with contaminant levels exceeding drinking water standards.
- § Prevent contact with contaminated groundwater.
- § Prevent inhalation of contaminants from groundwater.

Remedial Action Objective #2 - Environmental Protection of Groundwater
- § Restore the groundwater aquifer to meet ambient groundwater quality criteria, to the extent feasible.
- § Prevent discharge of contaminated groundwater to surface water.

For each of the preventive objectives for groundwater, mitigating measures already exist because the groundwater is at a depth of 3 to 12 feet below grade.

At this time, it is not known if groundwater from the site discharges to surface water. However, surface water and sediment samples have been collected at the site of potential discharge and no VOCs were detected in any of four samples.

The restorative measure may not be needed if the site groundwater is similar in quality to the ambient groundwater in the neighborhood.

Remedial Action Objective #3 - Public Health Protection of Soil

- Prevent ingestion/ direct contact with contaminated soil
- Prevent inhalation of contaminants from soil.

Soil contamination was found to be limited to the northern and western areas of the site beneath blacktop and under the building. Historical sampling has indicated that degradation products of PCE were present in all soil samples where PCE detected. Some form of natural degradation of PCE has been occurring for at least 9 years in soils in the northwestern part of the site. Recent soil samples have exhibited any concentrations of PCE above the NYSDEC soil cleanup objective of 1400 ug/kg. Direct contact in any of these locations is impossible except for construction workers. Such exposure could be mitigated with the use of personal protective equipment.

Because the contaminants are beneath blacktop, inhalation of contaminants is highly unlikely. The site is located on a hill and PCE vapors are likely to be dissipated by air circulation and not likely to reach the breathing zone of humans. Recent soil samples have not detected any concentrations of PCE above the NYSDEC soil cleanup objective of 1400 ug/kg.

Remedial Action Objective #4 - Environmental Protection of Soil

- Prevent migration of contaminants that would result in groundwater or surface water contamination.
- Prevent impacts to biota from ingestion/ direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain.

As shown in this report, PCE contamination has migrated to groundwater. However, degradation of soil and groundwater has been documented as occurring naturally. Soil contamination was found to be limited to the northern and western areas of the site. Recent soil samples have not exhibited any concentrations of PCE above the NYSDEC soil cleanup objective of 1400 ug/kg. Downgradient form the location of PCE-contaminated groundwater, surface waters and sediments have been sampled and laboratory analyses have indicated that VOCs were not detected.

Because the contaminated soil is beneath blacktop, biota are not likely to ingest or contact the soil at this site.

Remedial Action Objective #5 - Public Health of Soil Vapor Intrusion

- Mitigate impacts to public health resulting from existing, or potential for, soil vapor intrusion into the indoor air of buildings at or near the site.

To date, on neighboring properties, all air sampling has shown that all indoor air quality is within the NYSDOH Guideline for PCE of 100 ug/m3, equivalent to 15 ppbv. Hence, there is no need to mitigate soil vapor concentrations of PCE on neighboring properties.

New sub-slab air sample shall be collected and analyses compared with the previous level of PCE trapped under the American Cleaners building. If levels are comparable, remedial measures such as active soil vapor extraction shall be appropriate. If levels have dropped and the indoor air quality is less than the NYSDOH Guidance value for PCE, then mitigation measures will not be necessary.

9. References

Anson Environmental, Ltd (April 18, 2001) Environmental Investigation, American Cleaners, Caldor/Lloyd Mall Plaza, Route 211, Middletown, NY 10940

DT Consulting Services, Inc. (unknown date), Map of Proposed Subdivision for Caldor Plaza

Environmental Data Resouces, Inc (June 12, 2009) ***EDR Environmental Database Search within 0.5 miles of American Cleaners Middletown, NY*,** prepared by EDR of 4340 Wheelers Farms Road, Milford, CT 06461 (phone 800-352-0050, www.edrnet.com).

Fetter, C.W. (1988, second edition) ***Applied Hydrogeology*,** Merrill Publishing Co.

Freeze, Allan and John H. Cherry (1979) ***Groundwater***, Prentice-Hall, Inc.

Montgomery, John (1996) ***Ground Water Chemicals Desk Reference, second edition***, Lewis Publishers.

US Department of Agriculture (1981) ***Soil Survey of Orange County, New York*** Map 64 and pages 63-64.

Wiedemeier, Todd H, et al, (September 1998) ***Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water***, US EPA /600/R/128.

Table 1
Summary of Monitoring Well Dimensions
All wells are PVC construction.
Remedial Investigation Report, February 2010
American Cleaners, Inc. Caldor Lloyds Mall, 340 Route 211 East, Middletown, NY 10940
NYSDEC DER VCP Site V-00461-3
Summarized by Mid-Hudson Geosciences

Well Identification	Date of Construction	Diameter (inches)	Total Depth (Feet)	Screen Interval (Feet)
MW1B	2000	2	7.6	2.6-7.6
MW4	2001	4	16?	6-16?
MW2	2000	2	8.4	3.4-8.4
MW5	2001	4	16.4	6.4-16.4
MW6	2001	4	16.8	6.8-16.8
MW7	2001	4	16.4	6.4-16.4
MW3	2000	2	10.2	5.2-10.2
T1	2005	1	9.7	5-10
T2 *	2005	1	19	9-19
T3	2005	1	20	10-20
T4	2005	1	20	10-20
T5	2005	1	20	10-20
T6	2005	1	19	9-19
T7	2005	1	18	8-18
T8	2005	1	18	8-18
T9	2005	1	20	10-10
StormWater **	2005?	2	12	7-12
MW21	2009	1	5.6	3.6-5.6
MW22	2009	1	16 from TOC	11-16 from TOC
MW24	2009	1	24	14-24
MW25	2009	1	15.5	5.5-15.5
MW26	2009	1	14	4-14
MW28	2009	1	14.5	9.5-14.5
MW31	2009	1	24	14-24
MW30	2009	1	8.6	3.6-8.6

Notes:
* Well T-2 is shallow and in hydraulic connection with surface, so it is not monitored.
** Storm Drain Well has been damaged at the surface, the driveover box is broken and open.
Storm Drain Well is not monitored.

Table 2
Summary of Water Level Measurements
In Monitoring Wells on January 16 and 27, 2010
TOC = Elevation of Top of Casing
All measurements are in Feet.
Elevations are relative to mean sea level
NA and #VALUE! = no measurement taken.
American Cleaners, Middletown, NY
NYSDEC DER VCP V-00461-3
RIR, February 2010

		January 16, 2010		**January 27, 2010**	
	TOC Elevation	Depth to Water	Water Elevation	Depth to Water	Water Elevation
MW1B	547.45	4.83	542.62		
MW2	545.97	7.51	538.46		
MW3	542.75	7.45	535.3	3.93	538.82
MW4	547.31	4.5	542.81	3.9	543.41
MW5	545.16	8.02	537.14		
MW6	545	8.22	536.78	3.6	541.4
MW7	542.35	NA	#VALUE!		
SDWell	540.61	NA	#VALUE!		
T1	547.73	10.21	537.52		
T2	546.34	NA	#VALUE!		
T3	545.18	10.11	535.07	9.13	536.05
T4	543.87	11.37	532.5	10.04	533.83
T5	542.18	13.28	528.9	13.32	528.86
T6	540.53	7.38	533.15		
T7	535.94	7.67	528.27	6.42	529.52
T8	544.72	6.58	538.14	4.45	540.27
T9	534.98	8.12	526.86		
MW21	549.22	4.58	544.64	0.4	548.82
MW22	545.47	11.47	534	7.24	534.32
MW24	544.85	11.09	533.76	11.15	533.7
MW25	541.27	6.23	535.04		
MW26	541.05	6.24	534.81	3.3	537.75
MW28	539.83	8.75	531.08	7.4	532.43
MW30	546.67	6.24	540.43		
MW31	544.19	10.9	533.29		

Table 3
Summary of Concentrations of PCE (Tetrachloroethylene) and Other VOCs
Detected in Soil Samples using EPA Method 8260
Remedial Investigation Report, February 2010
American Cleaners, Inc. 360 Route 211 E, Middletown, NY
NYSDEC DER VCP Site V-00461-3
Compiled by Mid-Hudson Geosciences from Technical Reports
Prepared by York Analytical Laboratories Dated 11/23/2009 and 11/24/2009
Complete Laboratory Reports are contained in Appendix C of this Report

Date of Sampling: 11/09/0903

Boring Identification	Sample Depth	PCE	TCE	disDCE	vinyl chloride	methylene chloride
D1	10-12inches					20JB
D2	16-18inches					22B
D3	5 feet					19JB
D4	5.9-5.9 feet	57				27B
MW22	0-0.5 feet					35B
MW25	6.8 feet	44	5	6J		25B
Trip Blank						4JB
Field Blank						5JB

Date of Sampling: 11/12/09

Boring Identification	Sample Depth	PCE	TCE	disDCE	vinyl chloride	methylene chloride	p- & m-Xylenes
MW24	14 feet					26B	
MW24	16 feet					31B	3JB
MW28	4.5 feet					32D	
MW28	9 feet					32B	
Trip Blank						5JB	
Field Blank						5JB	

Date of Sampling: 01/15/10

Sample Identification		PCE	TCE	disDCE	vinyl chloride	methylene chloride	
SED1						12JB	
SED2						10JB	
NYSDEC TAGM Recommended Cleanup Objectives		1400	700	300	200	100	NA

Table 4.
Summary of PCE (Tetrachloroethylene) and Other Volatile Organic Compounds (VOCs)
Detected in Groundwater, Surface Water and Sediments using EPA Method 8260
Remedial Investigation Report, February 2010
American Cleaners, Inc. Caldor Lloyds Mall, 340 Route 211 East, Middletown, NY 10940
NYSDEC DER VCP Site V-00461-3
York Analytical Laboratories Report #10010484, dated January 25, 2010
Summarized by Mid-Hudson Geosciences
Units of Measurement are ug/L for water and ug/kg for sediments.

Well Identification	PCE	TCE	disDCE	vinyl chloride	methylene chloride	napthalene	MTBE
MW1B					3JB	2JB	
MW4					3JB		
MW2	110				3JB		
MW5	240	11	5J		5JB		
MW6	280				13JB		
MW7	69	7	3J		3JB		
MW3	430	10J	15J		13JB		6J
T1					3JB		
T2	Not Sampled						
T3	18	2	1J		3JB		
T4	1J				6JB		
T5	47	4J	24		3JB	2JB	
T6					3JB		
T7			1J		4JB		
T8					4JB		
T9					3JB		
StormWater	NotSampled						
MW21					2JB		
MW22	42				4JB		
MW24					4JB		
MW24dup					3JB		
MW25	910	19	22		4JB	4JB	
MW26	2600	64	64	2	4JB		
MW28	270	24	25		3JB		
MW31					4JB		
MW30	110						
SW1					3JB		
SW2					3JB		
SED1					12JB		
SED2					10JB		
Trip Blank					3J		
EquipBlank					3J		

TABLE 5 - SUMMARY OF VOLATILE ORGANIC COMPOUNDS DETECTED AND/OR ELEVATED ABOVE NYSDEC SOIL CLEANUP OBJECTIVES

American Cleaners, Middletown New York SDG BER004									
Berninger Sample ID:	BEI-01 (UP) 2-2.5 ft	BEI-03 2 ft	BEI-03 10 ft	BEI-04 8-10 ft	BEI-05 2-3 ft	BEI-07 5-9 ft Comp	BEI-09 10-12 ft	Field Blank*	NYSDEC TAGM RECOMMENDED SOIL CLEANUP OBJECTIVES
Laboratory ID:	0306622-001A	0306622-002A	0306622-003A	0306622-004A	0306622-005A	0306622-006A	0306622-007A	0306622-008A	
Sampling Date:	06/18	06/18/03	06/18/03	06/18/03	06/18/03	06/19/03	06/19	06/19	
% Moisture	7.1	10.6	14.0	10.3	7.5	7.2	10.6	NA	
units: ug/kg (dry wt)									
Analyte									
Chloromethane	11 UJ	11 UJ	12 UJ	11 UJ	11 UJ	11 UJ	11 UJ	10 U	NA
Bromomethane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	NA
Vinyl Chloride	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	200
Chloroethane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	1,900
Methylene Chloride	27 UJ	23 UJ	25 UJ	56 UJ	47 UJ	52 UJ	26 UJ	10 U	100
Acetone	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 UJ	200
Carbon Disulfide	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	2,700
1,1-Dichloroethene	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	400
1,1-Dichloroethane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	200
1,2-Dichloroethene (total)	11 U	11 U	4 J	11 U	2 J	11 U	51	10 U	300
2-Butanone	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	300
Chloroform	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	300
1,2-Dichloroethane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	100
1,1,1-Trichloroethane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	800
Carbon Tetrachloride	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	600
Bromodichloromethane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	NA
1,2-Dichloropropane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	NA
cis-1,3-Dichloropropene	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	NA
Trichloroethene	11 U	11 U	15	11 U	2 J	11 U	19	10 U	700
Benzene	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	60
Dibromochloromethane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	300
trans-1,3-Dichloropropene	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	NA
1,1,2-Trichloroethane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	NA
Bromoform	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	NA
4-Methyl-2-Pentanone	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	1,000
2-Hexanone	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	NA
Tetrachloroethene	11 U	18	**1,900**	57	130	11 U	500	10 U	1,400
1,1,2,2-Tetrachloroethane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	600
Toluene	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	1,500
Chlorobenzene	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	1,700
Ethylbenzene	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	5,500
Styrene	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	1,200
Xylene (total)	11 U	11 U	12 U	11 U	11 U	11 U	11 U	10 U	NA
TVOCs	ND	18 J	**1,919** J	57 J	134 J	ND	570 J	ND J	10,000
TICs	ND	ND	ND	ND	ND	ND	13 J	ND	

*Field Blank results in ug/L

TVOCs=Total Volatile Compounds Bold=Exceeds regulatory comparative basis
J=Estimated Concentration
U=Not detected above Qua

TABLE 5 (cont'd) - SUMMARY OF VOLATILE ORGANIC COMPOUNDS DETECTED AND/OR ELEVATED ABOVE NYSDEC SOIL CLEANUP OBJECTIVES

American Cleaners, Middletown, New York													
SDG BER006													
Berninger Sample ID:	BEI-05/BEI-11(3.5ft.)		BEI-05/BEI-11(7-8ft.)		BEI-10(5-6ft.)		BEI-12(5 ft.)		BEI-12(7 ft.)		Field Blank *		NYSDEC TAGM RECOMMENDED SOIL CLEANUP OBJECTIVES
Laboratory ID:	0307612-001		0307612-002		0307612-003		0307612-004		0307612-005		0307612-006		
Sampling Date:	07/16/03		07/16/03		07/15/03		07/16/03		07/16/03		07/16/03		
% Moisture	12.6		8.4		7.5		17.3		9.9		NA		
units: ug/kg (dry wt.)													
Analyte													
Chloromethane	11	U	11	U	11	U	12	U	11	U	10	UJ	NA
Bromomethane	11	U	11	U	11	U	12	U	11	U	10	U	NA
Vinyl Chloride	11	U	11	U	11	U	12	U	11	U	10	U	200
Chloroethane	11	U	11	U	11	U	12	U	11	U	10	U	1,900
Methylene Chloride	12	U	17	U	13	U	12	U	12	U	10	U	100
Acetone	11	UJ	11	UJ	11	UJ	12	UJ	11	UJ	10	U	200
Carbon Disulfide	11	U	11	U	11	U	12	U	11	U	62		2,700
1,1-Dichloroethene	11	U	11	U	11	U	12	U	11	U	10	U	400
1,1-Dichloroethane	11	U	11	U	11	U	12	U	11	U	10	U	200
1,2-Dichloroethene (total)	29		5	J	11	U	64		28		10	U	300
2-Butanone	11	U	11	U	11	U	12	U	11	U	10	U	300
Chloroform	11	U	11	U	11	U	12	U	11	U	10	U	300
1,2-Dichloroethane	11	U	11	U	11	U	12	U	11	U	10	U	100
1,1,1-Trichloroethane	11	U	11	U	11	U	12	U	11	U	10	U	800
Carbon Tetrachloride	11	U	11	U	11	U	12	U	11	U	10	U	600
Bromodichloromethane	11	U	11	U	11	U	12	U	11	U	10	U	NA
1,2-Dichloropropane	11	U	11	U	11	U	12	U	11	U	10	U	NA
cis-1,3-Dichloropropene	11	U	11	U	11	U	12	U	11	U	10	U	NA
Trichloroethene	25		11	U	63		46		16		10	U	700
Benzene	11	U	11	U	11	U	12	U	11	U	10	U	60
Dibromochloromethane	11	U	11	U	11	U	12	U	11	U	10	U	300
trans-1,3-Dichloropropene	11	U	11	U	11	U	12	U	11	U	10	U	NA
1,1,2-Trichloroethane	11	U	11	U	11	U	12	U	11	U	10	U	NA
Bromoform	11	U	11	U	11	U	12	U	11	U	10	UJ	NA
4-Methyl-2-Pentanone	11	U	11	U	11	U	12	U	11	U	10	U	1,000
2-Hexanone	11	UJ	11	UJ	11	UJ	12	UJ	11	UJ	10	U	NA
Tetrachloroethene	840	J	20		**78,000**		1,300	J	940	J	3	J	1,400
1,1,2,2-Tetrachloroethane	11	U	11	U	11	U	12	U	11	U	10	U	600
Toluene	11	U	11	U	11	U	12	U	11	U	10	U	1,500
Chlorobenzene	11	U	11	U	11	U	12	U	11	U	10	U	1,700
Ethylbenzene	11	U	11	U	11	U	12	U	11	U	10	U	5,500
Styrene	11	U	11	U	11	U	12	U	11	U	10	U	1,200
Xylene (total)	11	U	11	U	11	U	12	U	11	U	10	U	NA
TOTAL VOCS	894	J	25	J	**78,063**		1,410	J	984	J	65	J	10,000
TICs	ND		ND		ND		ND		ND		ND		

*Field Blank results in ug/L

TVOCs=Total Volatile Compounds Bold=Exceeds regulatory comparative basis
J=Estimated Concentration
U=Not detedted above Qua

TABLE 6 - SUMMARY OF VOLATILE ORGANIC COMPOUNDS DETECTED (TO-17) IN SOIL GAS

American Cleaners, Middletown, New York												
SDGs BER002, BER003												
Berninger Sample ID:	SG-1		SG-2		SG-3		SG-4		SG-5		SG-6	
Laboratory ID:	0306552-001A		0306552-002A		0306552-003A		0306552-004A		0306552-005A		0306552-006A	
Sampling Date:	06/16/03		06/16/03		06/16/03		06/16/03		06/16/03		06/16/03	
% Moisture	NA		NA		NA		NA		NA		NA	
Volume Air Collected	3.5L		3.5L		3.5L		3.5L		3.5L		3.5L	
Units: ug/m3												
Analyte												
Vinyl Chloride	3	UJ	**160**	**J**	3	U	3	UJ	3	U	3	U
1,1-Dichloroethene	36	J	33	J	3	U	3	UJ	3	U	3	U
1,1-Dichloroethane	3	UJ	3	UJ	3	U	3	UJ	3	U	3	U
1,1,1-Trichloroethane	3	UJ	3	UJ	3	U	3	UJ	3	U	3	U
1,2-Dichloroethane	3	UJ	3	UJ	3	U	3	UJ	3	U	3	U
Benzene	3	UJ	3	UJ	3	U	3	J	3	U	7	U
Trichloroethene	**1,500**	**J**	**530**	**J**	54	U	20	J	12	U	3	U
Toluene	13	**UJ**	14	UJ	10	U	6	UJ	3	U	3	U
Tetrachloroethene	**1,800**	**J**	**630**	J	**620**	**J**	**510**	**J**	**480**	**J**	66	U
1,1,2,2-Tetrachloroethane	3	UJ	3	UJ	3	U	3	UJ	3	U	3	U
Ethylbenzene	3	UJ	6	UJ	3	U	4	UJ	3	U	3	U
m,p-Xylene	3	J	7	J	3	J	4	J	3	U	3	U
o-Xylene	3	UJ	3	UJ	3	U	3	UJ	3	U	3	U
1,3,5-Trimethylbenzene	3	UJ	4	J	3	U	3	UJ	3	U	3	U
1,2,4-Trimethylbenzene	3	UJ	9	J	4	UJ	5	J	3	U	3	U
1,3-Dichlorobenzene	3	UJ	3	UJ	3	U	3	UJ	3	U	3	U
1,2-Dichlorobenzene	3	UJ	3	UJ	3	U	3	UJ	3	U	3	U
Methyl tert-butyl ether	32	J	3	UJ	23	UJ	3	UJ	3	U	3	U
TVOCs	**3,371**	J	**1,373**	J	**707**	J	**542**	J	**492**	J	7	U

TVOCs=Total Volatile Compounds
J=Estimated Concentration
U=Not detected above Qu

Bold=Exceeds regulatory comparative basis

TABLE 7 - SUMMARY OF VOLATILE ORGANIC COMPOUNDS DETECTED AND/OR ELEVATED ABOVE NYSDEC CLASS GA AMBIENT WATER QUALITY STANDARDS

American Cleaners, Middletown, New York SDG BER005 Berninger Sample ID: Laboratory ID: Sampling Date: % Moisture units: ug/L	BEI-GW-01(10ft) 0307609-001 07/16/03 NA		BEI-GW-02(10ft) 0307609-002 07/16/03 NA		BEI-GW-04(12-14ft) 0307609-003 07/17/03 NA		BEI-GW-05(4-6ft) 0307609-004 07/17/03 NA		BEI-GW-06(6-8ft) 0307609-005 07/17/03 NA		BEI-GW-07(6-8ft) 0307609-006 07/17/03 NA		NYSDEC CLASS GA AMBIENT WATER QUALITY STANDARDS GUIDANCE VALUES units: ug/L
Analyte													
Chloromethane	10	U	10	U	10	U	10	U	10	U	10	U	NA
Bromomethane	10	U	10	U	10	U	10	U	10	U	10	U	5
Vinyl Chloride	10	U	10	U	10	U	10	U	10	U	10	U	2
Chloroethane	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	50
Methylene Chloride	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	5
Acetone	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	50
Carbon Disulfide	10	U	10	U	10	U	10	U	10	U	10	U	50
1,1-Dichloroethene	10	U	10	U	10	U	10	U	10	U	10	U	5
1,1-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	5
1,2-Dichloroethene (total)	10	U	10	U	10	U	**19**		**73**		**240**	J	5
2-Butanone	10	U	10	U	10	U	10	U	10	U	10	U	50
Chloroform	10	U	10	U	10	U	10	U	10	U	10	U	7
1,2-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	5
1,1,1-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	5
Carbon Tetrachloride	10	U	10	U	10	U	10	U	10	U	10	U	5
Bromodichloromethane	10	U	10	U	10	U	10	U	10	U	10	U	50
1,2-Dichloropropane	10	U	10	U	10	U	10	U	10	U	10	U	1
cis-1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	10	U	5
Trichloroethene	10	U	10	U	10	U	**7**		**48**		**160**		5
Benzene	10	U	10	U	10	U	10	U	10	U	10	U	0.7
Dibromochloromethane	10	U	10	U	10	U	10	U	10	U	10	U	NA
trans-1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	10	U	NA
1,1,2-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	5
Bromoform	10	U	10	U	10	U	10	U	10	U	10	U	50
4-Methyl-2-Pentanone	10	U	10	U	10	U	10	U	10	U	10	U	50
2-Hexanone	10	U	10	U	10	U	10	U	10	U	10	U	50
Tetrachloroethene	**1,000**		**380**		**370**	J	**24**		**2600**	J	**5800**	J	5
1,1,2,2-Tetrachloroethane	10	U	10	U	10	U	10	U	10	U	10	U	5
Toluene	10	U	10	U	10	U	10	U	10	U	10	U	5
Chlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U	5
Ethylbenzene	10	U	10	U	10	U	10	U	10	U	10	U	5
Styrene	10	U	10	U	10	U	10	U	10	U	10	U	5
Xylene (total)	10	U	10	U	10	U	10	U	10	U	10	U	5
TVOCs	**1,000**		**380**		**370**	**J**	**50**	**J**	**2721**	**J**	**6200**	**J**	
TICs	ND		ND		ND		ND		ND		ND		NA = Not Applicable

TVOCs=Total Volatile Compounds Bold=Exceeds regulatory comparative basis
J=Estimated Concentration
U=Not detected above

TABLE 7 (cont'd) - SUMMARY OF VOLATILE ORGANIC COMPOUNDS DETECTED AND/OR ELEVATED ABOVE NYSDEC CLASS GA AMBIENT WATER QUALITY STANDARDS

American Cleaners, Middletown, New York
SDG BER005

Berninger Sample ID:	MW-6		MW-7		FIELD BLANK		TRIP BLANK 7/15		TRIP BLANK		TRIP BLANK		NYSDEC CLASS GA AMBIENT WATER QUALITY STANDARDS GUIDANCE VALUES
Laboratory ID:	0307609-013		0307609-014		0307609-015		0307609-016		0307609-017		0307609-018		
Sampling Date:	07/15/03		07/15/03		07/17/03		07/15/03		07/16/03		07/17/03		
% Moisture	NA		NA		NA		NA		NA		NA		
units: ug/L													units: ug/L
Analyte													
Chloromethane	10	UJ	10	U	10	UJ	10	UJ	10	U	10	UJ	NA
Bromomethane	10	U	10	U	10	U	10	U	10	U	10	U	5
Vinyl Chloride	10	U	10	U	10	U	10	U	10	U	10	U	2
Chloroethane	10	U	10	UJ	10	U	10	U	10	UJ	10	U	50
Methylene Chloride	10	U	10	UJ	10	U	10	U	10	UJ	10	U	5
Acetone	10	U	10	UJ	10	U	10	U	10	UJ	10	U	50
Carbon Disulfide	10	U	10	U	10	U	10	U	10	U	10	U	50
1,1-Dichloroethene	10	U	10	U	10	U	10	U	10	U	10	U	5
1,1-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	5
1,2-Dichloroethene (total)	10	U	**18**		10	U	10	U	10	U	10	U	5
2-Butanone	10	U	10	U	10	U	10	U	10	U	10	U	50
Chloroform	10	U	10	U	10	U	10	U	10	U	10	U	7
1,2-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	5
1,1,1-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	5
Carbon Tetrachloride	10	U	10	U	10	U	10	U	10	U	10	U	5
Bromodichloromethane	10	U	10	U	10	U	10	U	10	U	10	U	50
1,2-Dichloropropane	10	U	10	U	10	U	10	U	10	U	10	U	1
cis-1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	10	U	5
Trichloroethene	10	U	**18**		10	U	10	U	10	U	10	U	5
Benzene	10	U	10	U	10	U	10	U	10	U	10	U	0.7
Dibromochloromethane	10	U	10	U	10	U	10	U	10	U	10	U	NA
trans-1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	10	U	NA
1,1,2-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	5
Bromoform	10	UJ	10	U	10	UJ	10	UJ	10	U	10	UJ	50
4-Methyl-2-Pentanone	10	U	10	U	10	U	10	U	10	U	10	U	50
2-Hexanone	10	U	10	U	10	U	10	U	10	U	10	U	50
Tetrachloroethene	**530**		**1,100**		10	U	10	U	10	U	10	U	5
1,1,2,2-Tetrachloroethane	10	U	10	U	10	U	10	U	10	U	10	U	5
Toluene	10	U	10	U	10	U	10	U	10	U	10	U	5
Chlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U	5
Ethylbenzene	10	U	10	U	10	U	10	U	10	U	10	U	5
Styrene	10	U	10	U	10	U	10	U	10	U	10	U	5
Xylene (total)	10	U	10	U	10	U	10	U	10	U	10	U	5
TVOCs	**530**		**1,136**		ND		ND		ND		ND		
TICs	ND		ND		ND		ND		ND		ND		

TVOCs=Total Volatile Compounds
J=Estimated Concentration
U=Not detected above

Bold=Exceeds regulatory comparative basis

Table 8
BEI Field Screening Data for Tetrachloroethene (PCE) with Comparison of Off-Site Laboratory Data - H2M Labs
American Cleaners, Middletown, New York

Sampling Location	PCE, *ug*/L	H2M Lab, *ug*/L
BEI- GW-01 (8-10 ft)	860	1,000
BEI- GW-02 (8-10 ft)	161	380
BEI- GW-03 (9-11 ft)	ND	NA
BEI- GW-04 (12-14 ft)	317	370J
BEI- GW-04 (17-19 ft)	77	NA
BEI- GW-04 (21-23 ft)	ND	NA
BEI- GW-05 (6 ft)	ND	24
BEI- GW-06 (6-8 ft)	2,270	2,600J
BEI- GW-06 (12-14 ft)	ND	NA
BEI- GW-07 (6-8 ft)	4,950	5,800J
BEI- GW-08 (8 - 10 ft)	430	NA

Notes:
BEI - Berninger Environmental Inc.
GW- temporary groundwater sampling location
(6-8 ft) subsurface depth interval below grade where groundwater sample was collected.
J - Estimated concentration
ND - Not detected above the method or calibration limit
NA - Not analyzed.
ug/L - Micrograms per liter

TABLE 9 - VOLATILE ORGANICS EPA Compendium METHOD TO-15

American Cleaners, Middletown, NY
SDG 111337

Cas #	Analyte	Units:	SG-1 (rep)	SG-25	SG-26	SG-27	SG-28	SG-29	SG-30	SG-31	SSSV-1	NYSDOH Indoor Air Concentrations Database 1989 to 1996
	Berninger Sample ID:		SG-1 (rep)	SG-25	SG-26	SG-27	SG-28	SG-29	SG-30	SG-31	SSSV-1	
	Laboratory ID:		649544	649545	649546	649547	649548	649549	649550	649551	649552	
	Sampling Date:		11/17	11/17	11/17	11/17	11/17	11/18	11/18	11/18	11/18	
	Volume Air Analyzed		67ml	67ml	200ml	67ml	200ml	200ml	200ml	15ml	80ml	
-4	Dichlorodifluoromethane	ug/m3	7400 U	1500 U	2.5 U	7.4 U	3.1	5.9	4.1	5900	310 U	
60	1,2-Dichlorotetrafluoroethane	ug/m3	4200 U	840 U	1.4 U	4.2 U	1.4 U	1.4 U	1.4 U	54 U	170 U	
-16	Chloromethane	ug/m3	3100 U	620 U	1.0 U	3.1 U	1.4	1.6	1.3	39 U	130 U	
70	Vinyl Chloride	ug/m3	1500 U	310 U	**6.6**	1.5 U	0.51 U	0.51 U	0.51 U	20 U	64 U	**<1**
7	1,3-Butadiene	ug/m3	3300 U	660 U	3.1	14	2.2	19	7.5	42 U	140 U	
-18	Bromomethane	ug/m3	2300 U	470 U	0.78 U	2.3 U	0.78 U	0.78 U	0.78 U	30 U	97 U	
72	Chloroethane	ug/m3	4000 U	790 U	1.3 U	4.0 U	1.3 U	1.3 U	1.3 U	50 U	170 U	
531	Bromoethene	ug/m3	2600 U	520 U	0.87 U	2.6 U	0.87 U	0.87 U	0.87 U	34 U	110 U	
2	Trichlorofluoromethane	ug/m3	3400 U	670 U	1.1 U	3.4 U	2.0	1.8	1.9	**730**	140 U	
62	Freon TF	ug/m3	4600 U	920 U	1.5 U	4.6 U	1.5 U	1.5 U	1.5 U	59 U	190 U	
36	1,1-Dichloroethene	ug/m3	2400 U	480 U	0.79 U	2.4 U	0.79 U	0.79 U	0.79 U	31 U	99 U	**<3.4**
60	Carbon Disulfide	ug/m3	4700 U	930 U	4.4	4.7 U	1.6 U	2.2	3.1	59 U	200 U	
101	3-Chloropropene	ug/m3	4700 U	940 U	1.6 U	4.7 U	1.6 U	1.6 U	1.6 U	59 U	200 U	
64	Methylene Chloride	ug/m3	5200 U	1000 U	1.7 U	5.2 U	1.7 U	1.7 U	1.7 U	66 U	220 U	<1
91	trans-1,2-Dichloroethene	ug/m3	2400 U	480 U	0.91	2.4 U	0.79 U	0.79 U	0.79 U	31 U	99 U	
53	n-Hexane	ug/m3	5300 U	1100 U	20	16	12	60	20	67 U	220 U	
38	1,1-Dichloroethane	ug/m3	2400 U	490 U	0.81 U	2.4 U	0.81 U	0.81 U	0.81 U	31 U	100 U	<1
95	cis-1,2-Dichloroethene	ug/m3	**7100**	480 U	**75**	2.4 U	0.79 U	0.79 U	0.79 U	31 U	**160**	**<1**
-2	Chloroform	ug/m3	2900 U	590 U	0.98 U	**300**	0.98 U	0.98 U	0.98 U	38 U	120 U	<2.4
10	1,1,1-Trichloroethane	ug/m3	3300 U	650 U	1.1 U	3.3 U	1.1 U	1.1 U	1.1 U	42 U	140 U	**<2.0-2.8**
21	Cyclohexane	ug/m3	2100 U	410 U	3.8	2.1 U	2.1	10	3.0	27 U	**170**	
28	Carbon Tetrachloride	ug/m3	3800 U	750 U	1.3 U	3.8 U	1.3 U	1.3 U	1.3 U	48 U	160 U	<3.1
455	2,2,4-Trimethylpentane	ug/m3	2800 U	560 U	3.3	2.8 U	2.5	34	8.9	36 U	120 U	
26	Benzene	ug/m3	1900 U	380 U	11	8.3	7.0	28	6.4	25 U	80 U	<1.6 - 4.7
99	1,2-Dichloroethane	ug/m3	2400 U	490 U	0.81 U	2.4 U	0.81 U	0.81 U	0.81 U	31 U	100 U	<1
55	n-Heptane	ug/m3	2500 U	490 U	9.8	8.2	7.0	36	6.6	32 U	100 U	
72	Trichloroethene	ug/m3	**11000**	**640**	1.1 U	3.2 U	1.1 U	1.1 U	1.1 U	41 U	130 U	**<1.7**
-14	1,2-Dichloropropane	ug/m3	2800 U	550 U	0.92 U	2.8 U	0.92 U	0.92 U	0.92 U	36 U	120 U	<1
44	Bromodichloromethane	ug/m3	4000 U	800 U	1.3 U	4.0 U	1.3 U	1.3 U	1.3 U	52 U	170 U	<5.0
10055	cis-1,3-Dichloropropene	ug/m3	2700 U	540 U	0.91 U	2.7 U	0.91 U	0.91 U	0.91 U	35 U	110 U	
17	Toluene	ug/m3	2300 U	450 U	**90**	**49**	**79**	**150**	**24**	**120**	94 U	**-5.1**
10053	trans-1,3-Dichloropropene	ug/m3	2700 U	540 U	0.91 U	2.7 U	0.91 U	0.91 U	0.91 U	35 U	110 U	
74	1,1,2-Trichloroethane	ug/m3	3300 U	650 U	1.1 U	3.3 U	1.1 U	1.1 U	1.1 U	42 U	140 U	<1
105	Tetrachloroethene	ug/m3	**580000**	**120000**	2.4	**160**	**120**	1.8	1.4 U	52 U	**20000**	**<3.7**
75	Dibromochloromethane	ug/m3	5100 U	1000 U	1.7 U	5.1 U	1.7 U	1.7 U	1.7 U	66 U	210 U	<5.0
9	1,2-Dibromoethane	ug/m3	4600 U	920 U	1.5 U	4.6 U	1.5 U	1.5 U	1.5 U	59 U	190 U	
11	Chlorobenzene	ug/m3	2800 U	550 U	0.92 U	2.8 U	0.92 U	0.92 U	0.92 U	35 U	120 U	<2
55	Ethylbenzene	ug/m3	2600 U	520 U	**12**	3.2	7.8	6.1	1.6	33 U	110 U	<4.3
1303	Xylene (m,p)	ug/m3	6500 U	1300 U	**33**	8.3	21	12	4.3	83 U	270 U	<4.3
42	Xylene (o)	ug/m3	2600 U	520 U	9.1	2.6 U	6.1	3.2	1.4	33 U	110 U	<4.3
53	Styrene	ug/m3	2600 U	1300 U	0.85 U	2.6 U	0.85 U	0.85 U	0.85 U	33 U	110 U	<1
48	Bromoform	ug/m3	6200 U	520 U	2.1 U	6.2 U	2.1 U	2.1 U	2.1 U	80 U	260 U	<1
40	1,1,2,2-Tetrachloroethane	ug/m3	4100 U	1200 U	1.4 U	4.1 U	1.4 U	1.4 U	1.4 U	53 U	170 U	<1.5
518	4-Ethyltoluene	ug/m3	2900 U	820 U	**6.4**	2.9 U	2.9	2.1	1.1	38 U	120 U	<1
33	1,3,5-Trimethylbenzene	ug/m3	2900 U	590 U	1.2	2.9 U	0.98 U	0.98 U	0.98 U	38 U	120 U	<1
38	2-Chlorotoluene	ug/m3	3100 U	590 U	1.0 U	3.1 U	1.0 U	1.0 U	1.0 U	40 U	130 U	
26	1,2,4-Trimethylbenzene	ug/m3	2900 U	620 U	4.7	2.9 U	2.0	1.6	1.3	38 U	120 U	<1
467	1,3-Dichlorobenzene	ug/m3	3600 U	590 U	1.2 U	3.6 U	1.2 U	1.2 U	1.2 U	46 U	150 U	<2
53	1,4-Dichlorobenzene	ug/m3	3600 U	720 U	1.2 U	2.6 U	1.2 U	1.2 U	1.2 U	46 U	150 U	
44	1,2-Dichlorobenzene	ug/m3	3600 U	720 U	1.2 U	2.6 U	1.2 U	1.2 U	1.2 U	46 U	150 U	
37	1,2,4-Trichlorobenzene	ug/m3	11000 U	2200 U	3.7 U	11 U	3.7 U	3.7 U	3.7 U	140 U	470 U	
16	Hexachlorobutadiene	ug/m3	6400 U	1300 U	2.1 U	6.4 U	2.1 U	2.1 U	2.1 U	82 U	270 U	
	Total VOC Concentration (ug/m3)		**598100**	**120640**	**296.7**	**567**	**278.1**	**375.3**	**110.9**	**6750**	**20170**	

TABLE 9 -VOLA[illegible]E ORGANICS EPA Compendium METHOD TO-15

American Cleaners, Middletown, NY
SDG 111337

	SG-1 (rep)	SG-25	SG-26	SG-27	SG-28	SG-29	SG-30	SG-31	SSSV-1
Berninger Sample ID:	SG-1 (rep)	SG-25	SG-26	SG-27	SG-28	SG-29	SG-30	SG-31	SSSV-1
Laboratory ID:	649544	649545	649546	649547	649548	649549	649550	649551	649552
Sampling Date:	11/17	11/17	11/17	11/17	11/17	11/18	11/18	11/18	11/18
Volume Air Analyzed	67ml	67ml	200ml	67ml	200ml	200ml	200ml	15ml	80ml

Cas #	Analyte	Units:	SG-1 (rep)		SG-25		SG-26		SG-27		SG-28		SG-29		SG-30		SG-31		SSSV-1	
-4	Dichlorodifluoromethane	ppbv	1500	U	300	U	0.50	U	1.5	U	0.62		1.2		0.82		1200		63	U
60	1,2-Dichlorotetrafluoroethane	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
-16	Chloromethane	ppbv	1500	U	300	U	0.50	U	1.5	U	0.66		0.76		0.61		19	U	63	U
70	Vinyl Chloride	ppbv	600	U	120	U	2.6		0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
7	1,3-Butadiene	ppbv	1500	U	300	U	1.4		6.2		1.0		8.4		3.4		19	U	63	U
-18	Bromomethane	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
72	Chloroethane	ppbv	1500	U	300	U	0.50	U	1.5	U	0.50	U	0.50	U	0.50	U	19	U	63	U
531	Bromoethene	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
2	Trichlorofluoromethane	ppbv	600	U	120	U	0.20	U	0.60	U	0.36		0.32		0.34		130		25	U
62	Freon TF	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
36	1,1-Dichloroethene	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.2	U	7.7	U	25	U
60	Carbon Disulfide	ppbv	1500	U	300	U	1.4		1.5	U	0.50	U	0.72		0.99		19	U	63	U
101	3-Chloropropene	ppbv	1500	U	300	U	0.50	U	1.5	U	0.50	U	0.50	U	0.50	U	19	U	63	U
64	Methylene Chloride	ppbv	1500	U	300	U	0.50	U	0.60	U	0.50	U	0.50	U	0.50	U	19	U	63	U
91	trans-1,2-Dichloroethene	ppbv	600	U	120	U	0.23		0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
53	n-Hexane	ppbv	1500	U	300	U	5.7		4.5		3.3		17		5.6		19	U	63	U
38	1,1-Dichloroethane	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
95	cis-1,2-Dichloroethene	ppbv	1800		120	U	19		0.60	U	0.20	U	0.2	U	0.20	U	7.7	U	40	
-2	Chloroform	ppbv	600	U	120	U	0.20	U	62		0.20	U	0.20	U	0.20	U	7.7	U	25	U
10	1,1,1-Trichloroethane	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
21	Cyclohexane	ppbv	600	U	120	U	1.1		0.60	U	0.60		3.0		0.87		7.7	U	48	
28	Carbon Tetrachloride	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
455	2,2,4-Trimethylpentane	ppbv	600	U	120	U	0.70		0.60	U	0.54		7.2		1.9		7.7	U	25	U
26	Benzene	ppbv	600	U	120	U	3.5		2.6		2.2		8.7		2.0		7.7	U	25	U
99	1,2-Dichloroethane	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
55	n-Heptane	ppbv	600	U	120	U	2.4		2.0		1.7		8.8		1.6		7.7	U	25	U
72	Trichloroethene	ppbv	2100		120		0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
-14	1,2-Dichloropropane	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
44	Bromodichloromethane	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
10055	cis-1,3-Dichloropropene	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
17	Toluene	ppbv	600	U	120	U	24		13		21		40		6.3		31		25	U
10053	trans-1,3-Dichloropropene	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
74	1,1,2-Trichloroethane	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
105	Tetrachloroethene	ppbv	86000		18000		0.36		24		18		0.26		0.20	U	7.7	U	2900	
75	Dibromochloromethane	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
9	1,2-Dibromoethane	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
11	Chlorobenzene	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
55	Ethylbenzene	ppbv	600	U	120	U	2.7		0.74		1.8		1.4		0.37		7.7	U	25	U
1303	Xylene (m,p)	ppbv	1500	U	300	U	7.7		1.9		4.8		2.7		0.98		19	U	63	U
42	Xylene (o)	ppbv	600	U	120	U	2.1		0.6	U	1.4		0.74		0.32		7.7	U	25	U
53	Styrene	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
48	Bromoform	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
40	1,1,2,2-Tetrachloroethane	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
518	4-Ethyltoluene	ppbv	600	U	120	U	1.3		0.60	U	0.59		0.42		0.23		7.7	U	25	U
33	1,3,5-Trimethylbenzene	ppbv	600	U	120	U	0.25		0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
38	2-Chlorotoluene	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
26	1,2,4-Trimethylbenzene	ppbv	600	U	120	U	0.95		0.60	U	0.40		0.33		0.26		7.7	U	25	U
467	1,3-Dichlorobenzene	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
53	1,4-Dichlorobenzene	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
44	1,2-Dichlorobenzene	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
37	1,2,4-Trichlorobenzene	ppbv	1500	U	300	U	0.50	U	1.5	U	0.50	U	0.50	U	0.50	U	19	U	63	U
16	Hexachlorobutadiene	ppbv	600	U	120	U	0.20	U	0.60	U	0.20	U	0.20	U	0.20	U	7.7	U	25	U
	Total VOC Concentration (ppbv)		**89900**		**18120**		**77.4**		**116.9**		**58.9**		**101.9**		**26.6**		**1361**		**2988**	

TABLE 10 - SUMMARY OF VOLATILE ORGANIC COMPOUNDS DETECTED AND/OR ELEVATED ABOVE NYSDEC CLASS GA AMBIENT WATER QUALITY STANDARDS

American Cleaners, Middletown, New York
SDG BER023, BER025

Berninger Sample ID:	GW-6A 6-10		GW-6B (6-8)		SW DRAIN		TEMP-1 (GW)		TEMP-3 (GW)		TEMP-4 (GW)		TEMP-5 (GW)		NYSDEC CLASS GA AMBIENT WATER QUALITY STANDARDS GUIDANCE VALUES units: ug/L
Laboratory ID:	511616		511615		511614		511613		511612		511611		511610		
Sampling Date:	11/18		11/18		11/17		11/17		11/17		11/18		11/18		
% Moisture	NA		NA		NA		NA		NA		NA		NA		
units: ug/L															
Analyte															
Chloromethane	5	U	5	U	5	U	5	U	5	U	5	U	5	U	NA
Bromomethane	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5
Vinyl Chloride	**15**		5	U	5	U	5	U	5	U	**3**	**J**	**3**	**J**	2
Chloroethane	5	U	5	U	5	U	5	U	5	U	5	U	5	U	50
Methylene Chloride	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5
Acetone	**11**	**U**	**9**	**U**	**7**	**U**	**8**	**U**	**11**	**U**	**12**	**U**	**51**	**U**	50
Carbon Disulfide	5	U	5	U	**5**	**UJ**	**5**	**UJ**	5	U	**5**	**U**	5	U	50
1,1-Dichloroethene	1	J	5	U	5	U	5	U	5	U	5	U	5	U	5
1,1-Dichloroethane	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5
1,2-Dichloroethene (total)	**430**		**86**		5	U	5	U	**25**		**79**		**160**		**5**
2-Butanone	5	U	5	U	5	U	5	U	5	U	5	U	5	U	50
Chloroform	1	J	1	J	5	U	5	U	5	U	5	U	5	U	7
1,2-Dichloroethane	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5
1,1,1-Trichloroethane	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5
Carbon Tetrachloride	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5
Bromodichloromethane	5	U	5	U	5	U	5	U	5	U	5	U	5	U	50
1,2-Dichloropropane	5	U	5	U	5	U	5	U	5	U	5	U	5	U	1
cis-1,3-Dichloropropene	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5
Trichloroethene	**300**		**46**		5	U	5	U	**16**		**24**		**41**		**5**
Benzene	5	U	5	U	5	U	5	U	5	U	5	U	5	U	0.7
Dibromochloromethane	5	U	5	U	5	U	5	U	5	U	5	U	5	U	NA
trans-1,3-Dichloropropene	5	U	5	U	5	U	5	U	5	U	5	U	5	U	NA
1,1,2-Trichloroethane	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5
Bromoform	5	U	5	U	5	U	5	U	5	U	5	U	5	U	50
4-Methyl-2-Pentanone	5	U	5	U	5	U	5	U	5	U	5	U	5	U	50
2-Hexanone	5	U	5	U	5	U	5	U	5	U	5	U	5	U	50
Tetrachloroethene	**7800**		**3200**		**5**		2	J	**870**		**1000**		**1700**		**5**
1,1,2,2-Tetrachloroethane	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5
Toluene	5	U	5	U	5	U	5	U	5	U	5	U	2	J	5
Chlorobenzene	5	U	5	U	5	U	5	U	5	U	**5**	**J**	1	J	5
Ethylbenzene	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5
Styrene	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5
Xylene (total)	5	U	5	U	5	U	5	U	5	U	5	U	**5**		5
TOTAL VOCS	**8547**		**3333**		**5**		**2**		**911**		**1111**		**1912**		
TOTAL TENTATIVELY IDENTIFIED CMPDS	**7**		**ND**		**ND**		**ND**		**192**		**ND**		**ND**		NA = Not Applicable

ND=None Detected

TABLE 10 - SUMMARY OF VOLATILE ORGANIC COMPOUNDS DETECTED AND/OR ELEVATED ABOVE NYSDEC CLASS GA AMBIENT WATER QUALITY STANDARDS

American Cleaners, Middletown, New York
SDG BER023, BER025

Berninger Sample ID:	Field Blank 11/18	Trip Blank 11/17	Trip Blank 11/18	Storm Sewer Well	TEMP-6 (GW)	TEMP-7 (GW)	TEMP-9 (GW)	NYSDEC CLASS GA AMBIENT WATER QUALITY STANDARDS GUIDANCE VALUES
Laboratory ID:	511609	511608	511607	512627	512626	512615	512624	
Sampling Date:	11/18	11/17	11/18	12/20	12/19	12/19	12/20	
% Moisture	NA	NA	NA	NA	NA	NA	NA	
units: ug/L								units: ug/L
Analyte								
Chloromethane	5 U	5 U	5 U	**5 UJ**	**5 UJ**	**5 UJ**	**5 UJ**	NA
Bromomethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
Vinyl Chloride	5 U	5 U	5 U	5 U	5 U	1 J	5 U	2
Chloroethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	50
Methylene Chloride	5 U	5 U	5 U	5 U	5 U	5 U	5 U	**5**
Acetone	**7 U**	**5 U**	**9 U**	**9 U**	**5 U**	5 U	**5 U**	50
Carbon Disulfide	**5 U**	5 U	5 U	**5 UJ**	**5 UJ**	**5 UJ**	**5 UJ**	50
1,1-Dichloroethene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
1,1-Dichloroethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
1,2-Dichloroethene (total)	5 U	5 U	5 U	5 U	5 U	**64**	5 U	**5**
2-Butanone	5 U	5 U	5 U	5 U	5 U	5 U	5 U	50
Chloroform	5 U	5 U	5 U	5 U	5 U	5 U	5 U	**7**
1,2-Dichloroethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
1,1,1-Trichloroethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
Carbon Tetrachloride	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
Bromodichloromethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	50
1,2-Dichloropropane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1
cis-1,3-Dichloropropene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
Trichloroethene	5 U	5 U	5 U	5 U	5 U	1 J	5 U	**5**
Benzene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	0.7
Dibromochloromethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	NA
trans-1,3-Dichloropropene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	NA
1,1,2-Trichloroethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
Bromoform	5 U	5 U	5 U	5 U	5 U	5 U	5 U	50
4-Methyl-2-Pentanone	5 U	5 U	5 U	5 U	5 U	5 U	5 U	50
2-Hexanone	5 U	5 U	5 U	5 U	5 U	5 U	5 U	50
Tetrachloroethene	5 U	5 U	5 U	5 U	5 U	**5**	5 U	**5**
1,1,2,2-Tetrachloroethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
Toluene	5 U	5 U	5 U	1 J	5 U	5 U	5 U	5
Chlorobenzene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
Ethylbenzene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
Styrene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
Xylene (total)	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
TOTAL VOCS	**0**	**0**	**0**	**1**	**0**	**71**	**0**	
TOTAL TENTATIVELY IDENTIFIED CMPDS	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**NA = Not Applicable**

ND=None Detected

TABLE 10 - SUMMARY OF VOLATILE ORGANIC COMPOUNDS DETECTED AND/OR ELEVATED ABOVE NYSDEC CLASS GA AMBIENT WATER QUALITY STANDARDS

American Cleaners, Middletown, New York
SDG BER023, BER025

Berninger Sample ID:	Field Blank 12/19		Trip Blank 12/19		NYSDEC CLASS GA AMBIENT WATER QUALITY STANDARDS GUIDANCE VALUES
Laboratory ID:	512623		512622		
Sampling Date:	12/19		12/19		
% Moisture	NA		NA		
units: ug/L					units: ug/L
Analyte					
Chloromethane	**5**	**UJ**	**5**	**UJ**	NA
Bromomethane	5	U	5	U	5
Vinyl Chloride	5	U	5	U	**2**
Chloroethane	5	U	5	U	50
Methylene Chloride	5	U	5	U	5
Acetone	**5**	**U**	5	U	50
Carbon Disulfide	**5**	**UJ**	**5**	**UJ**	50
1,1-Dichloroethene	5	U	5	U	**5**
1,1-Dichloroethane	5	U	5	U	5
1,2-Dichloroethene (total)	5	U	5	U	**5**
2-Butanone	5	U	5	U	50
Chloroform	5	U	5	U	**7**
1,2-Dichloroethane	5	U	5	U	5
1,1,1-Trichloroethane	5	U	5	U	5
Carbon Tetrachloride	5	U	5	U	5
Bromodichloromethane	5	U	5	U	50
1,2-Dichloropropane	5	U	5	U	1
cis-1,3-Dichloropropene	5	U	5	U	5
Trichloroethene	5	U	5	U	5
Benzene	5	U	5	U	0.7
Dibromochloromethane	5	U	5	U	NA
trans-1,3-Dichloropropene	5	U	5	U	NA
1,1,2-Trichloroethane	5	U	5	U	5
Bromoform	5	U	5	U	50
4-Methyl-2-Pentanone	5	U	5	U	50
2-Hexanone	5	U	5	U	50
Tetrachloroethene	5	U	5	U	**5**
1,1,2,2-Tetrachloroethane	5	U	5	U	5
Toluene	5	U	5	U	5
Chlorobenzene	5	U	5	U	5
Ethylbenzene	5	U	5	U	5
Styrene	5	U	5	U	5
Xylene (total)	5	U	5	U	5
TOTAL VOCS	**0**		**0**		
TOTAL TENTATIVELY IDENTIFIED CMPDS	**ND**		**ND**		**NA = Not Applicable**

ND=None Detected

Table 11
Summary of Concentrations of PCE (Tetrachloroethylene) and Other Volatile Organic Compounds (VOCs)
Detected in Air Samples Using EPA Method ETO-15
SS = Sub-slab, IA = Indoor Air, OA = Outdoor Air, 09 = Year
American Cleaners, 340 Route 211 East, Middletown, NY 10940
NYSDEC DER VCP V-00461-3
Compiled by Mid-Hudson Geosciences from Records of Berninger Environmental, Inc.

Building >	MHV Credit Union Building			Cheeseburger Paradise Restaurant			Video Store (vacant)			
Date of Sampling >	1/14/2009			3/11/2009			3/11/2009			
Sample Identification >	IA-1	OA-1	SS-1	IA09-REST	OA09-REST	SS09-REST	IA09-VID	OA09-VID	SS09-VID	Units
Sample >	Indoor	Outdoor	Sub-slab	Indoor	Outdoor	Sub-slab	Indoor	Outdoor	Sub-slab	
Source >	Air	Air	Vapor	Air	Air	Vapor	Air	Air	Vapor	
Reported Detection Limit (RDL)	0.2	0.2	0.2	0.2	0.2	2	0.2	0.2	0.4	ppbv
Analyte										
Dichlorodifluoromethane	0.78	0.81	3.39	0.485	0.481	U	0.509	0.5	0.547	ppbv
Chloromethane	0.61	0.67	0.22	0.557	0.516	U	0.919	0.533	U	ppbv
Methylene chloride	0.54	0.38	0.62	U	1.18	U	U	U	U	ppbv
Trichlorofluoromethane	0.27	0.28	0.27	0.222	0.229	U	0.222	0.264	0.457	ppbv
n-Hexane	0.26	U	13.1	U	0.244	U	U	U	U	ppbv
Chloroform	U	U	U	U	U	2.73	U	U	U	ppbv
Cyclohexane	U	U	1.64	U	U	U	U	U	1.45	ppbv
2,2,4-Trimethylpentane	U	U	1.97	U	U	U	U	U	0.839	ppbv
Trichloroethene **	0.05 U	0.05 U	1.30	U	U	U	U	U	U	ppbv
Benzene	0.26	U	0.45	0.247	0.275	U	0.244	0.257	1.6	ppbv
n-Heptane	0.30	U	1.26	U	U	U	U	U	2.28	ppbv
Tetrachloroethene *	0.49	0.37	1.50	U	0.332	U	U	U	U	ppbv
Toluene	0.43	0.28	1.99	0.409	0.424	43.9	0.392	0.371	41.8	ppbv
Ethylbenzene	U	U	0.47	U	U	5.79	U	U	8.5	ppbv
Styrene	U	U	U	U	U	U	U	U	20.1	ppbv
Xylenes (m&p)	U	U	2.38	U	U	24.8	U	U	31.9	ppbv
Xylenes (o)	U	U	1.03	U	U	8.14	U	U	11	ppbv
4-Ethyltoluene	U	U	U	U	U	U	U	U	2.79	ppbv
1,3,5-Trimethylbenzene	U	U	U	U	U	2.04	U	U	3.44	ppbv
1,2,4-Trimethylbenzene	U	U	1.03	U	U	6.17	U	U	10	ppbv
Heptane	U	U	U	U	U	7.22	U	U	6.38	ppbv

* NYSDOH Guidline for PCE for Indoor air = 100 ug/m3 = 15 ppbv
** NYSDOH Guidline for TCE for indoor air = 100 ug/m3 = 15 ppbv
U = not detected at RDL, RDL = Reported Detection Limit mesured in ppbv (parts per billion volume)
Differing RDLs are the result of different dilution factors
Data Sources
For MHV Credit Union, H2M Labs, Inc. Sample Data Summary Package BER082, January 2009.
For Cheeseburger Paradise Restaurant and vacant Video Store, H2M Labs, Inc. Sample Data Summary Package BER086, March 2009.

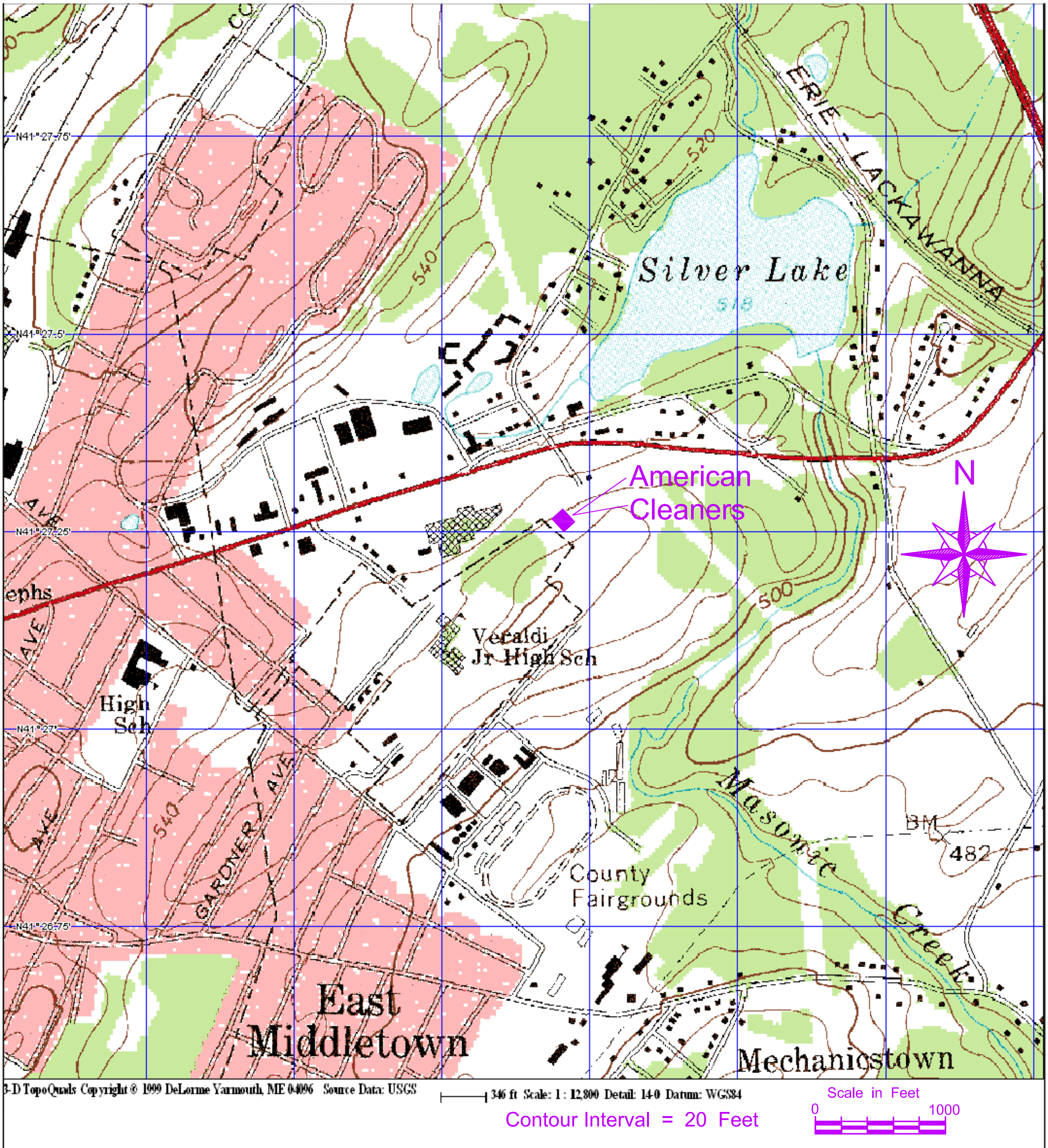

Figure 1-1. Site Location Map
USGS 7.5 Minute Quadrangle: Middletown, NY
American Cleaners at Caldor Lloyds Mall
340 Route 211 East, Middletown, NY 10940
NYSDEC DER VCP V-00601-3, February 22, 2010

Mid-Hudson Geosciences
Katherine J. Beinkafner, PhD, CPG #6611
1003 Route 44/55, PO Box 332
Clintondale, NY 12515-0332
(845) 883-5866
rockdoctor@optonline.net

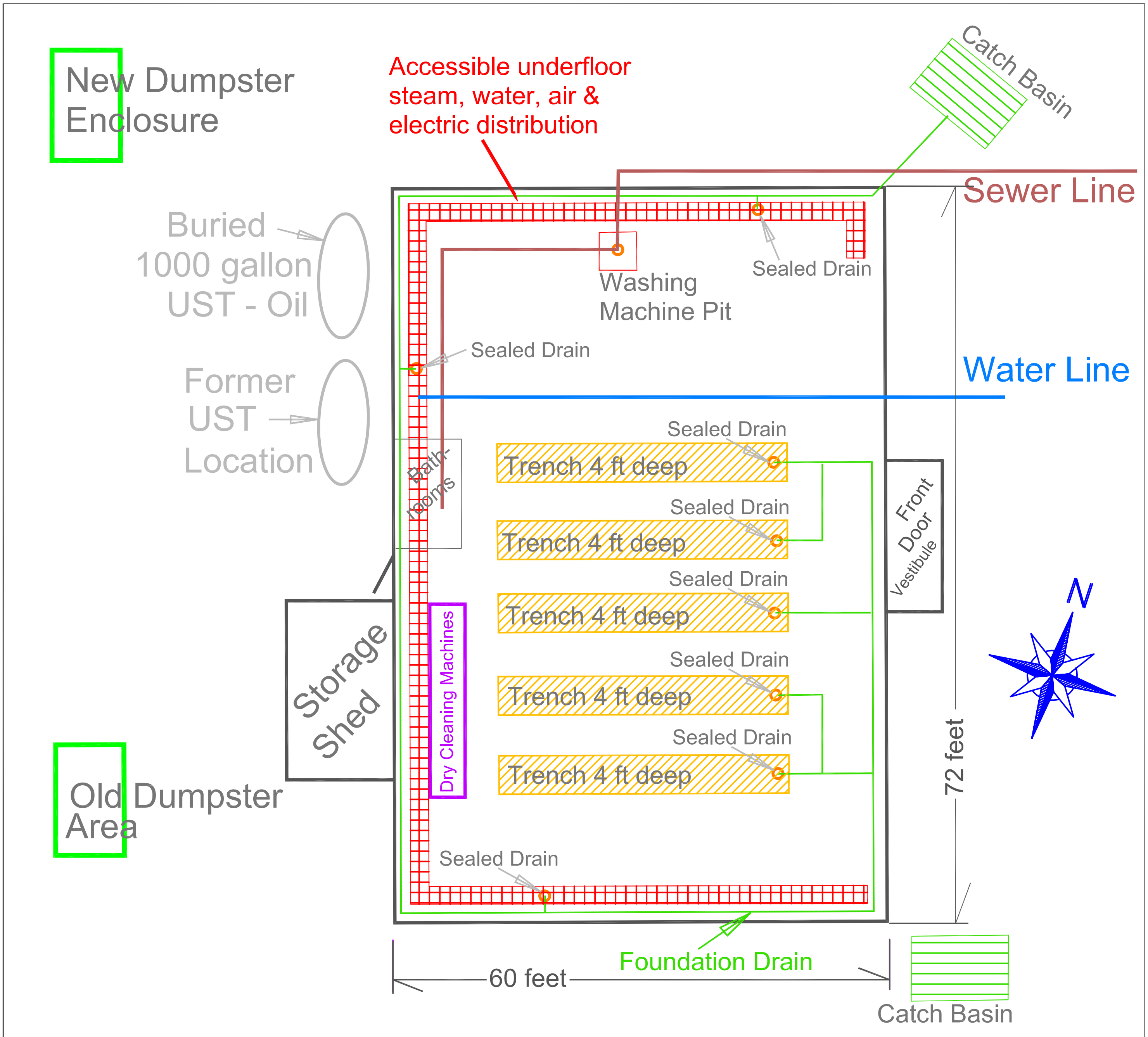

Figure 1-2. Site Plan of Building, Utilities, & Special Features Constructed for Dry-Cleaning Operations
American Cleaners at Caldor Lloyds Mall
340 Route 211 East, Middletown, NY 10940
NYSDEC DER VCP V-00601-3, February 22, 2010

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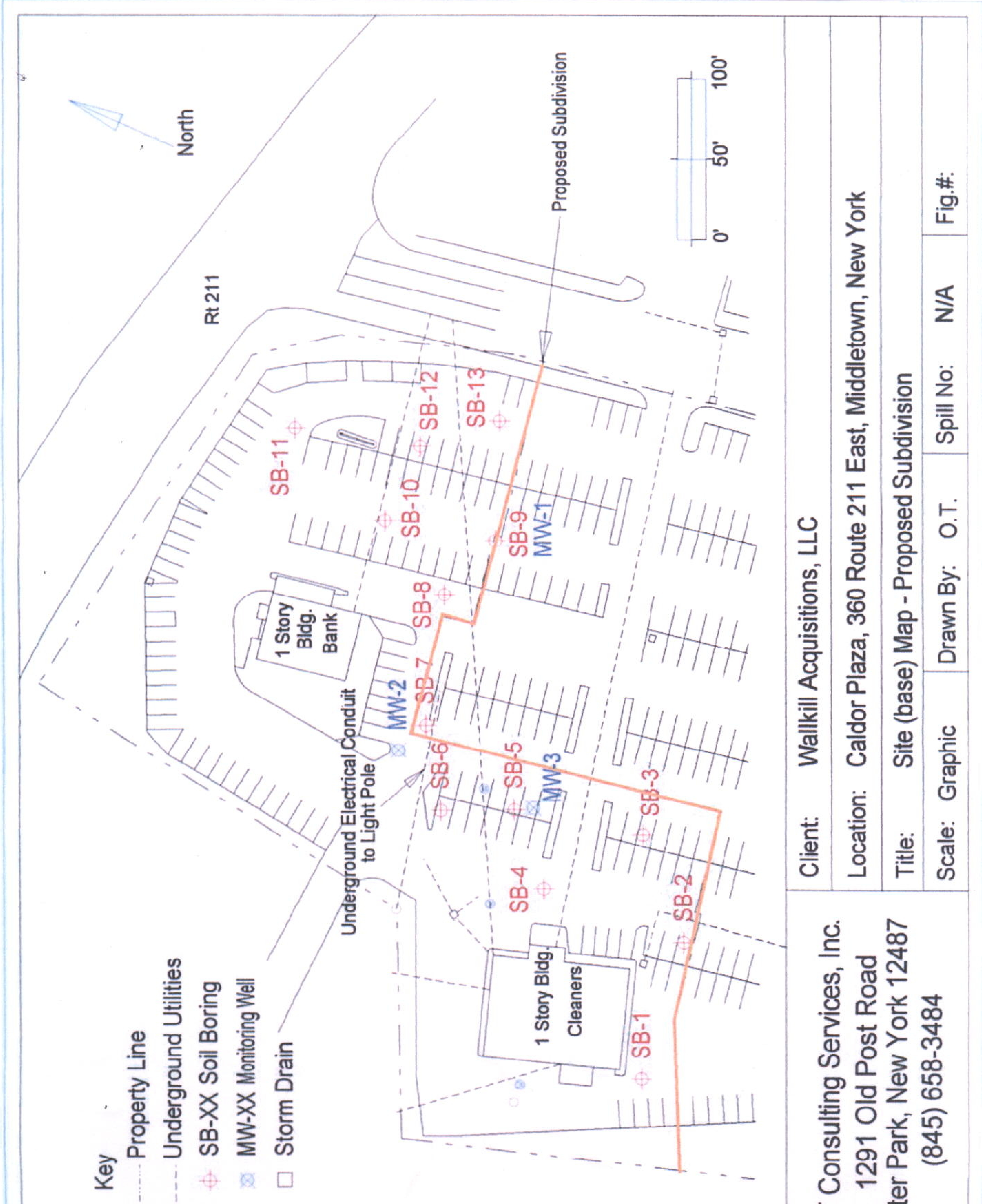

Figure 1-3. Map of Proposed Subdivision at Caldor Plaza, Middletown, NY, Wallkill Acquistions.

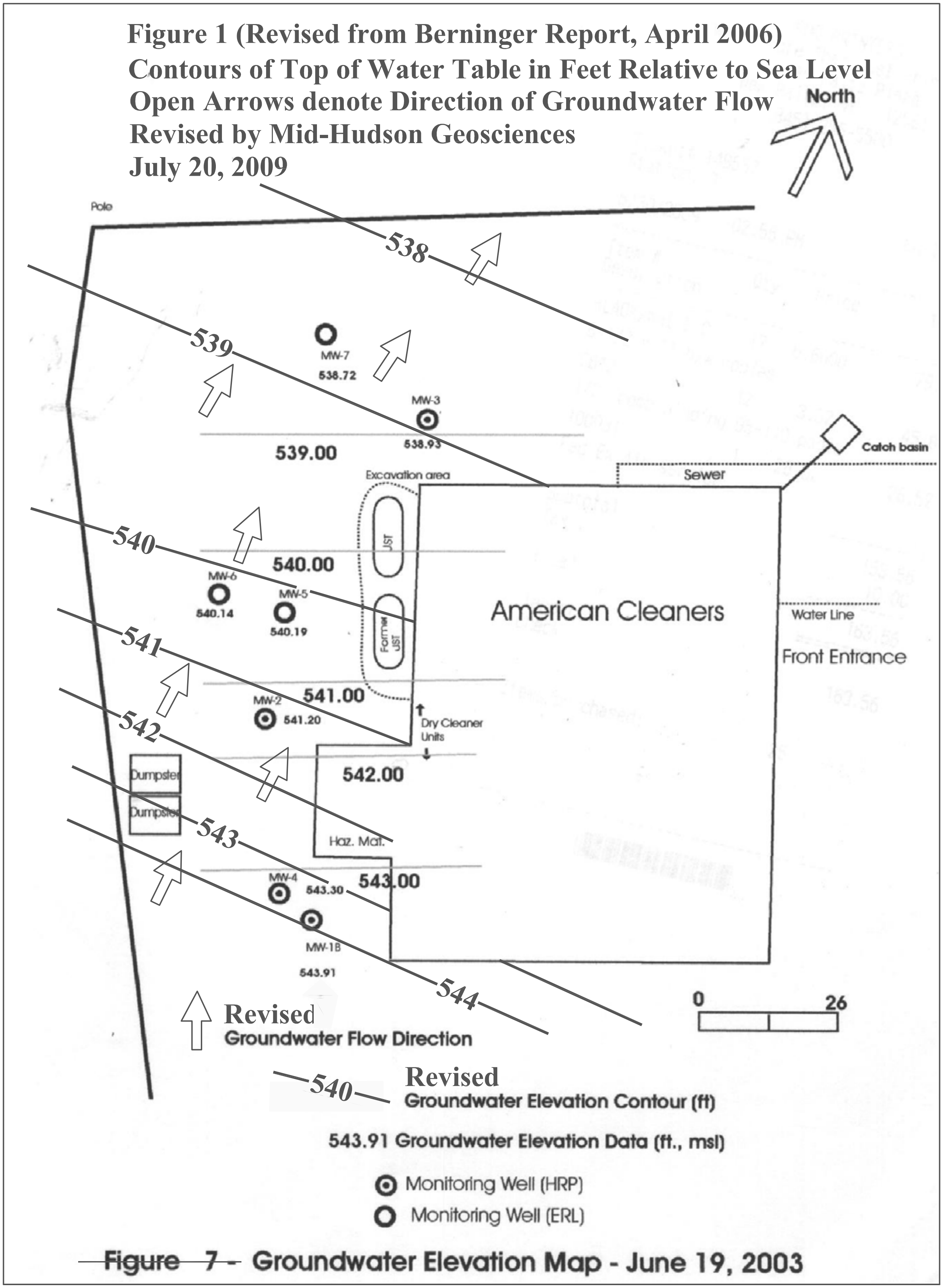

Figure 1-3. Map of Proposed Subdivision at Caldor Plaza, Middletown, NY, Wallkill Acquistions.

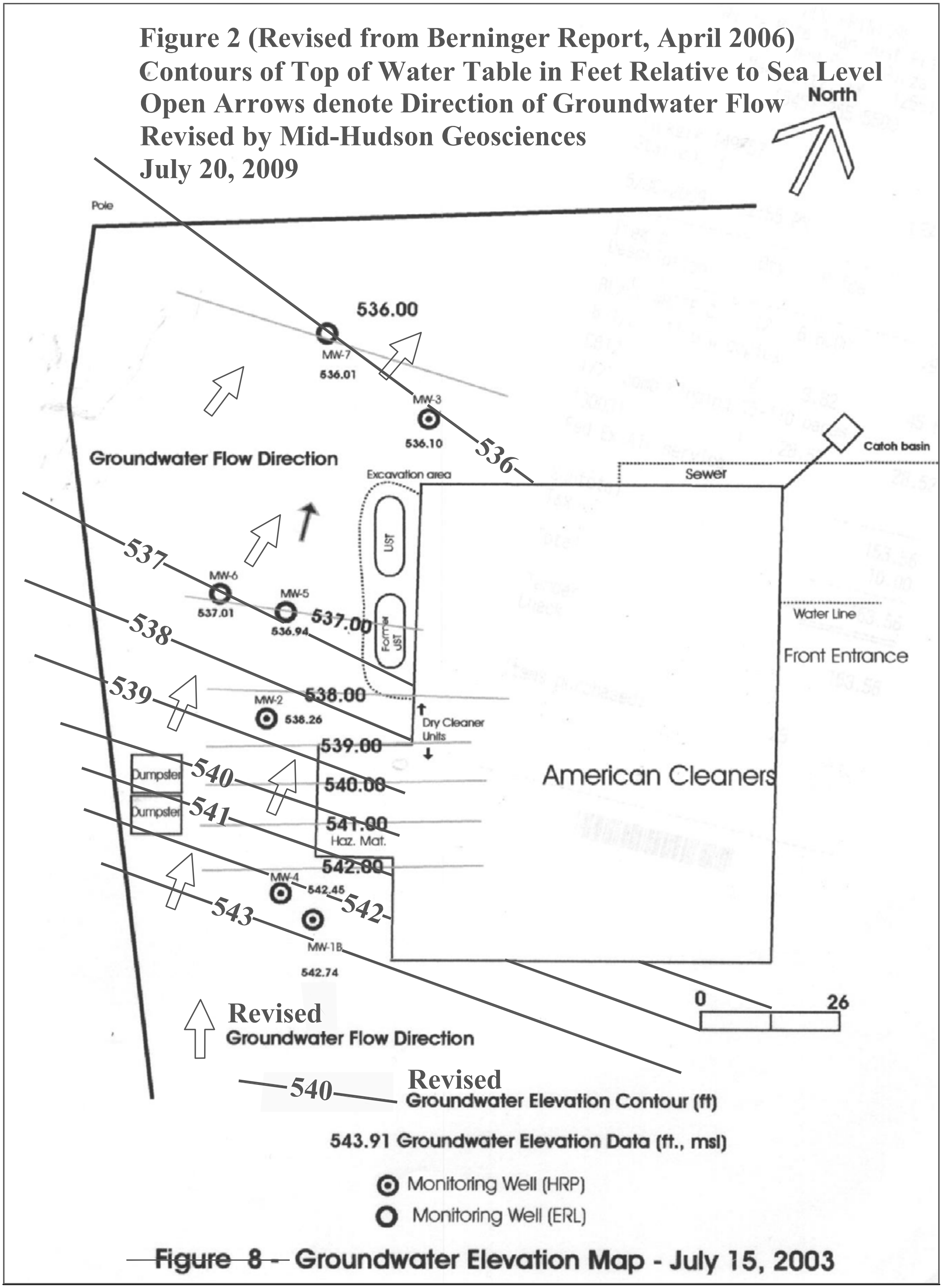

Figure 1-3. Map of Proposed Subdivision at Caldor Plaza, Middletown, NY, Wallkill Acquistions.

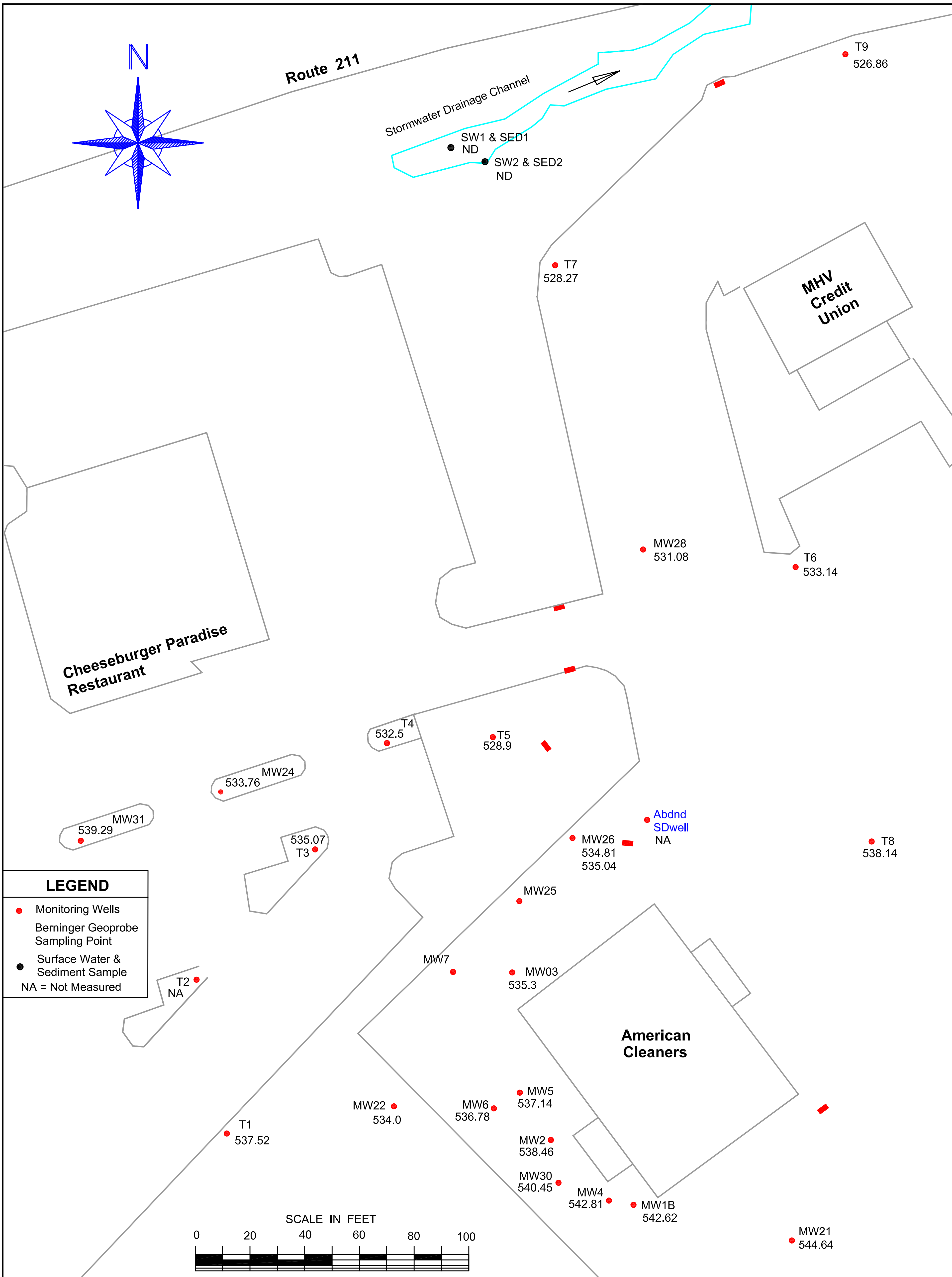

Figure 4-5. Contour Map of Groundwater Elevations for January 14-17, 2010, Measurements taken during Mid-Hudson Geosciences Sampling Event. Elevations in Feet relative to mean sea level.

American Cleaners at Caldor Lloyds Mall
340 Route 211 East, Middletown, NY 10940
NYSDEC DER VCP V-00461-3, Feb 2010

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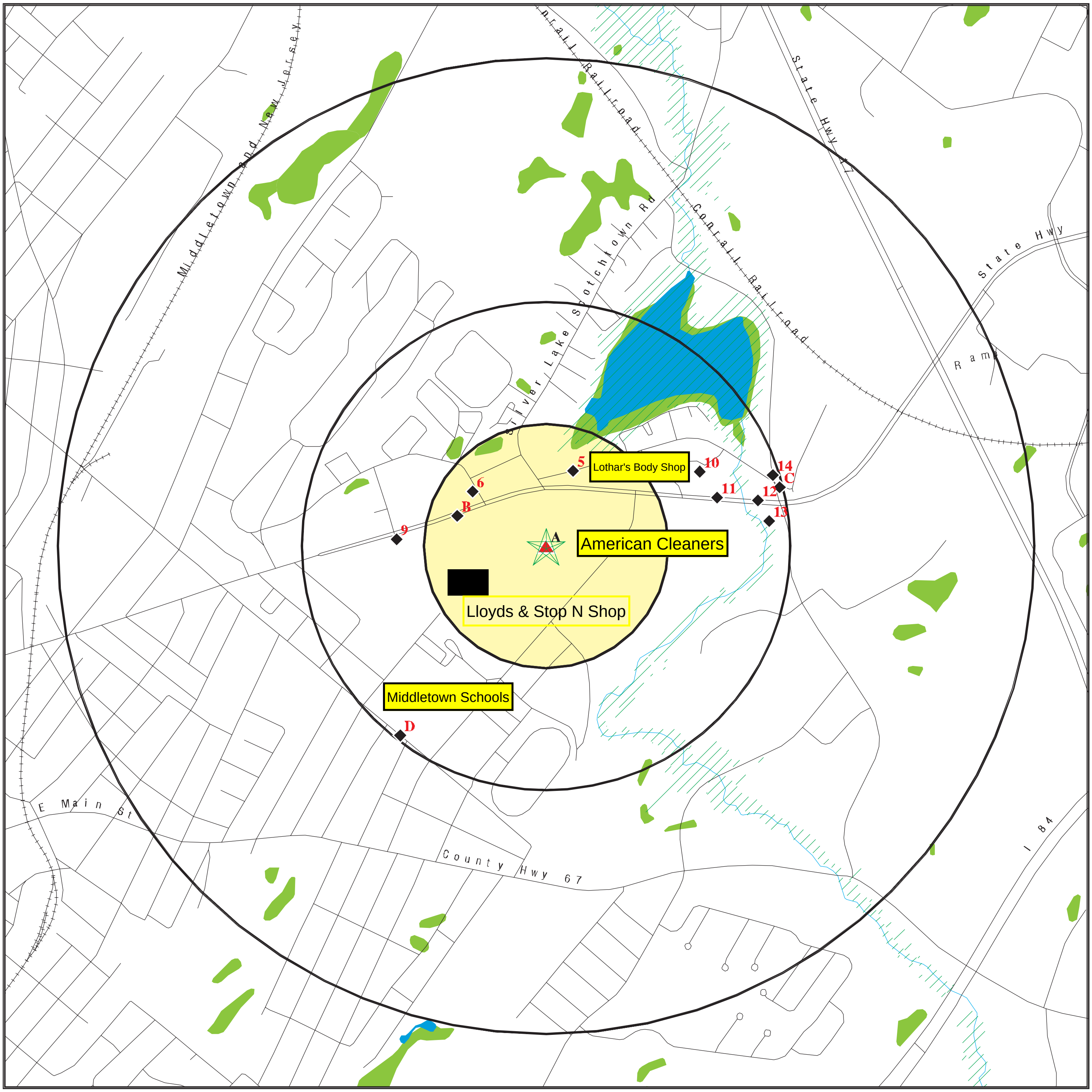
OVERVIEW MAP - 2520754.2s



0 1/4 1/2 1 Miles

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Oil & Gas pipelines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands

Figure 4-6 Overview Map from EDR Environmental Database Search.

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME:	American Cleaners/Caldor	CLIENT:	Mid-Hudson Geosciences
ADDRESS:	Caldor Plaza	CONTACT:	Kathy Beinkafner
	Middletown NY 10940	INQUIRY #:	2520754.2s
LAT/LONG:	41.4543 / 74.3927	DATE:	June 17, 2009 11:00 am

DETAIL MAP - 2520754.2s

0 1/16 1/8 1/4 Miles

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites

- Indian Reservations BIA
- Oil & Gas pipelines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands

Figure 4-7. Detail Map from EDR Environmental Database Search.

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME:	American Cleaners/Caldor	CLIENT:	Mid-Hudson Geosciences
ADDRESS:	Caldor Plaza Middletown NY 10940	CONTACT:	Kathy Beinkafner
		INQUIRY #:	2520754.2s
LAT/LONG:	41.4543 / 74.3927	DATE:	June 17, 2009 11:01 am

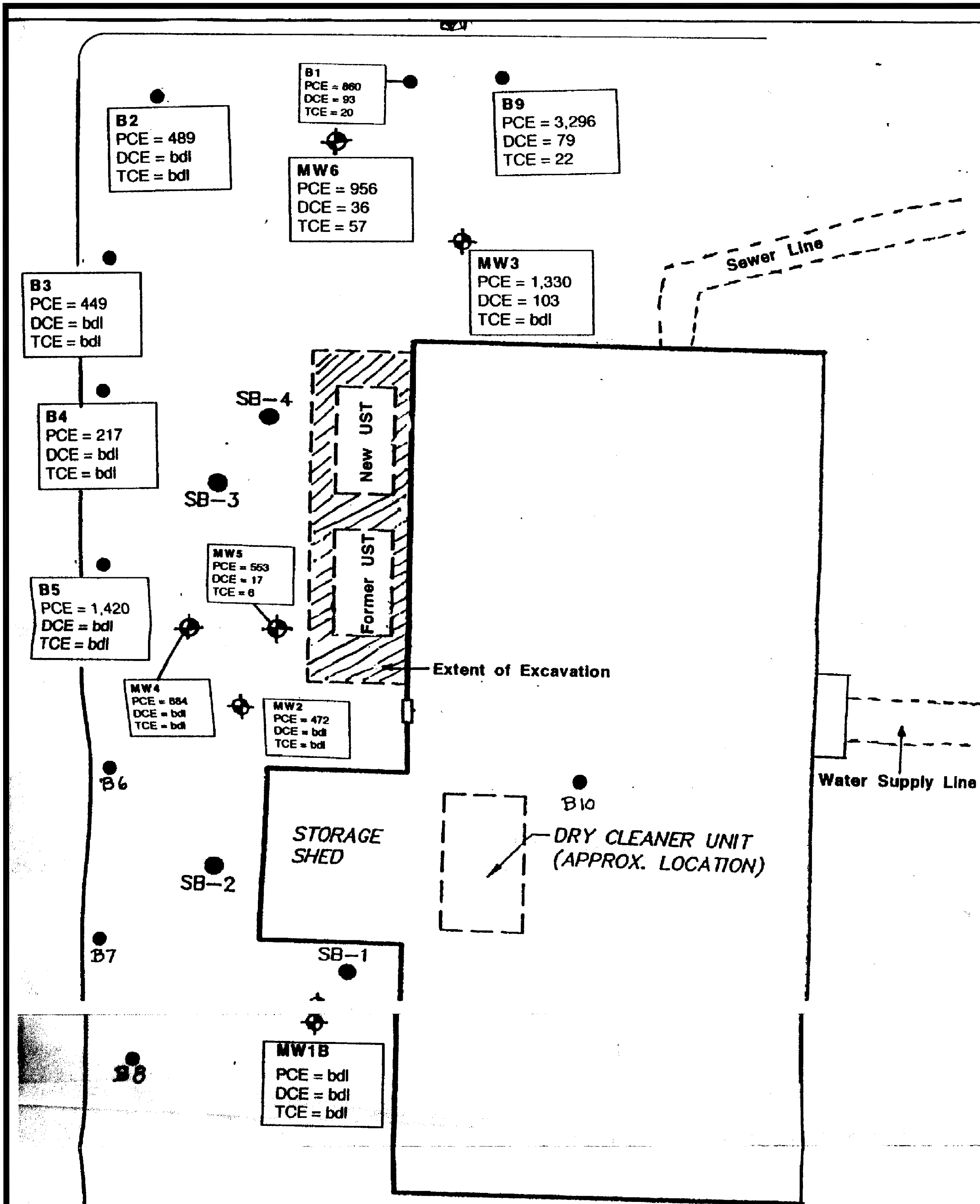


Figure 1-3. Map of Proposed Subdivision at Caldor Plaza, Middletown, NY, Wallkill Acquistions.

Lloyds & Stop N Shop

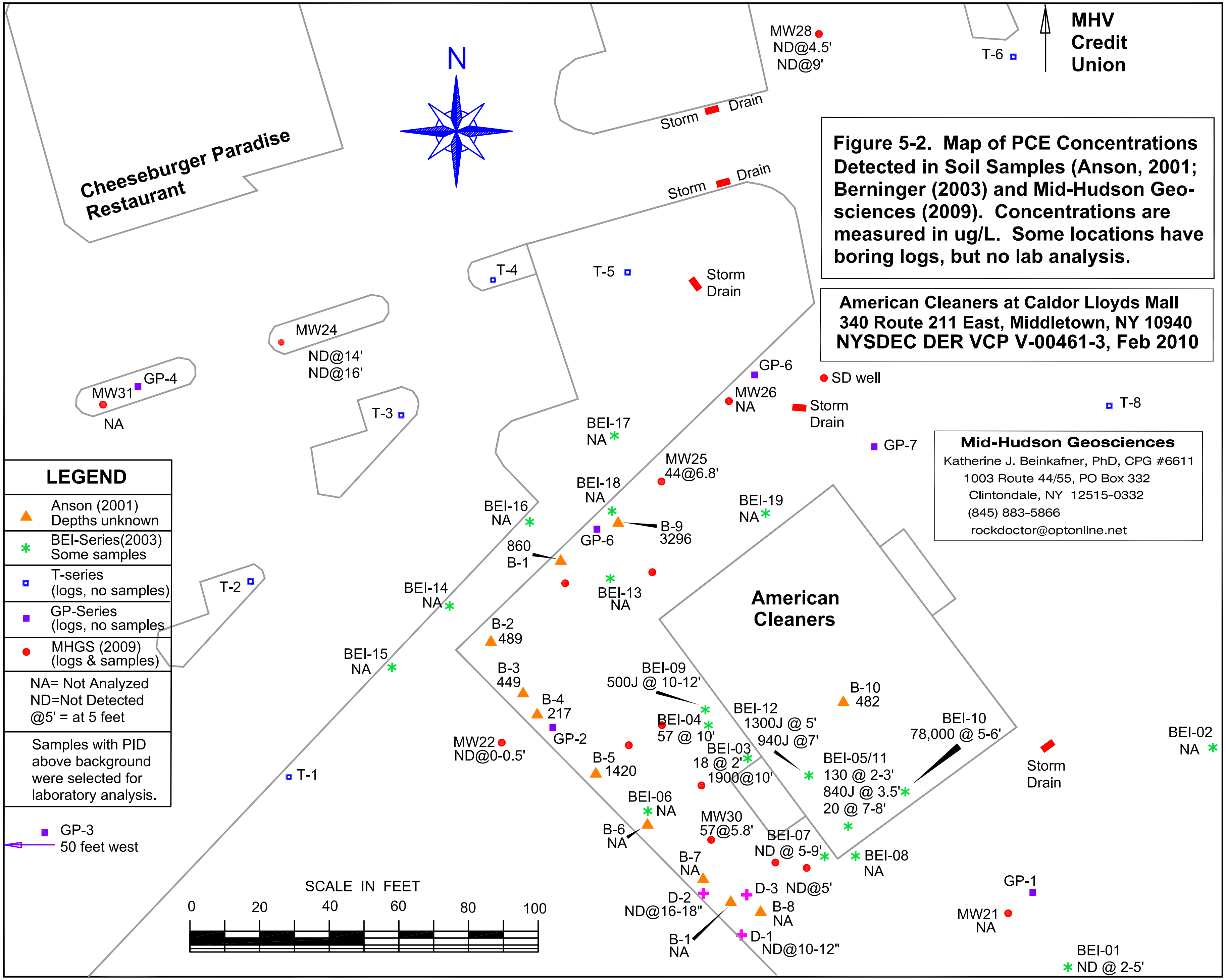


Figure 5-2. Map of PCE Concentrations Detected in Soil Samples (Anson, 2001; Berninger (2003) and Mid-Hudson Geosciences (2009). Concentrations are measured in ug/L. Some locations have boring logs, but no lab analysis.

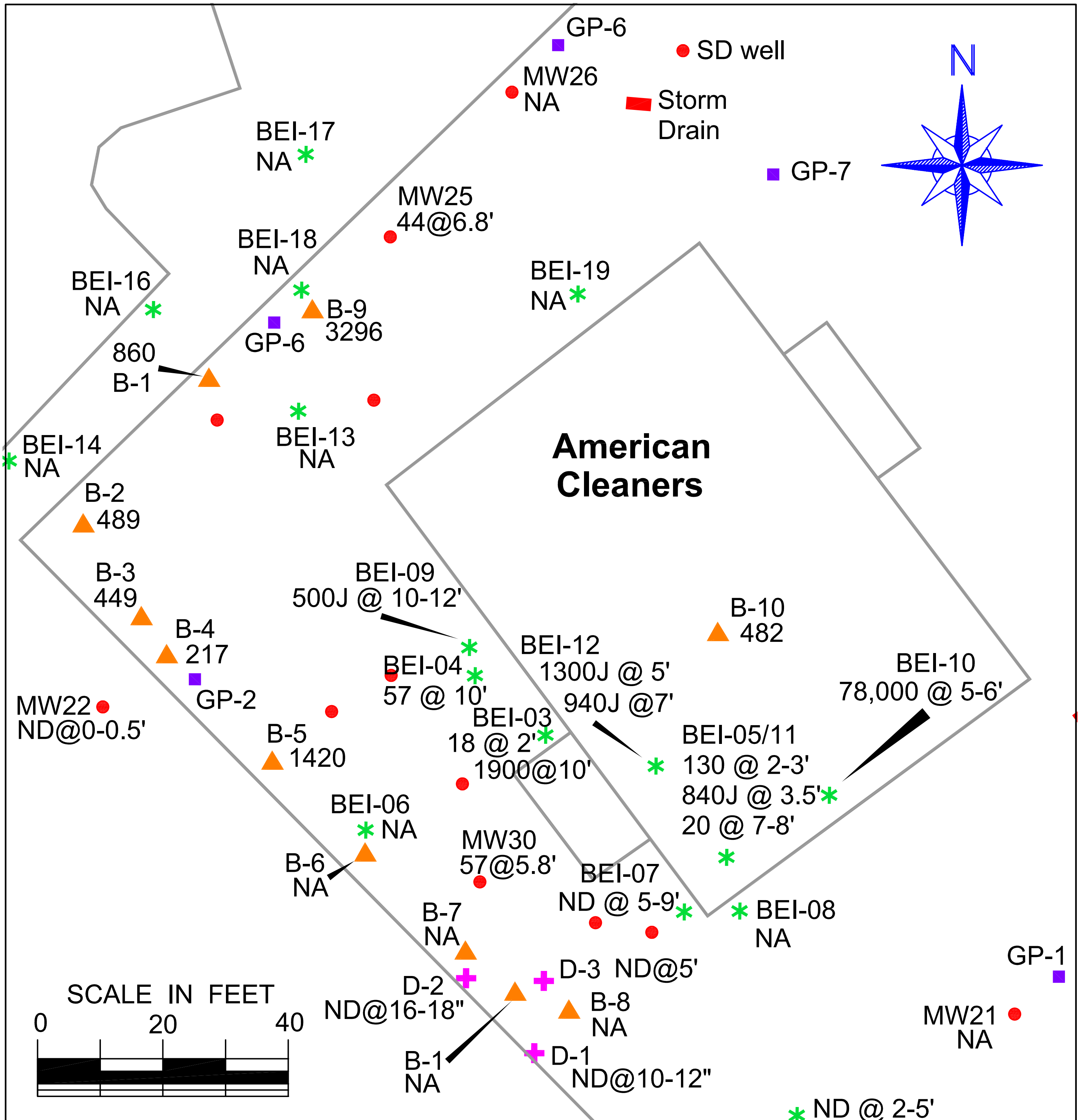


Figure 5-3. Isopleth Map of PCE
Concentrations (in ug/L) Detected in Soil

American Cleaners at Caldor Lloyds Mall
340 Route 211 East, Middletown, NY 10940
NYSDEC DER VCP V-00601-3, Feb 22, 2010

Mid-Hudson Geosciences
Katherine J. Beinkafner, PhD, CPG #6611
1003 Route 44/55, PO Box 332
Clintondale, NY 12515-0332
(845) 883-5866
rockdoctor@optonline.net

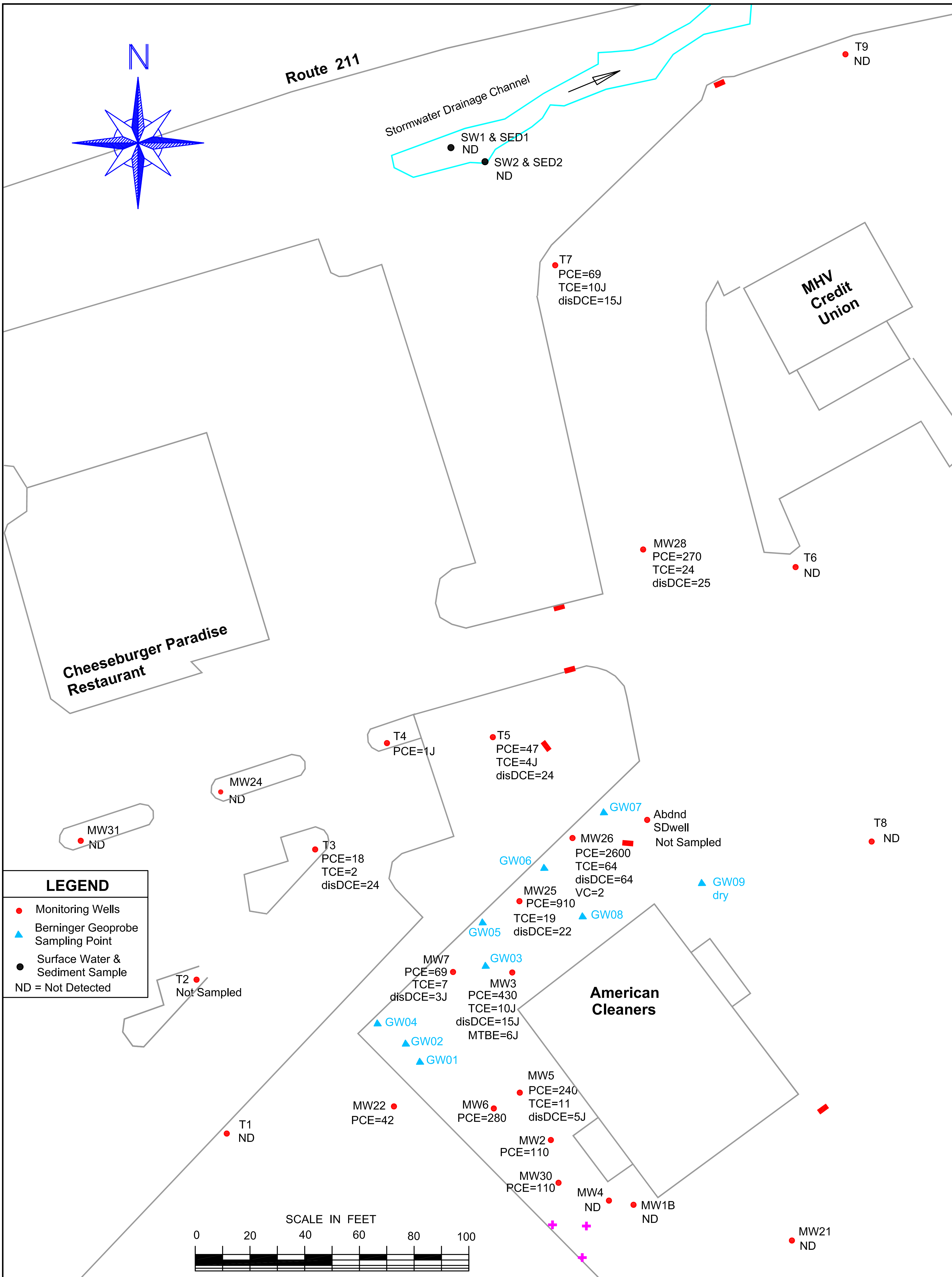


Figure 5-4. Map of PCE Concentrations (in ug/L) Detected in Groundwater, Mid-Hudson Geoscience January 2010 Sampling Event.

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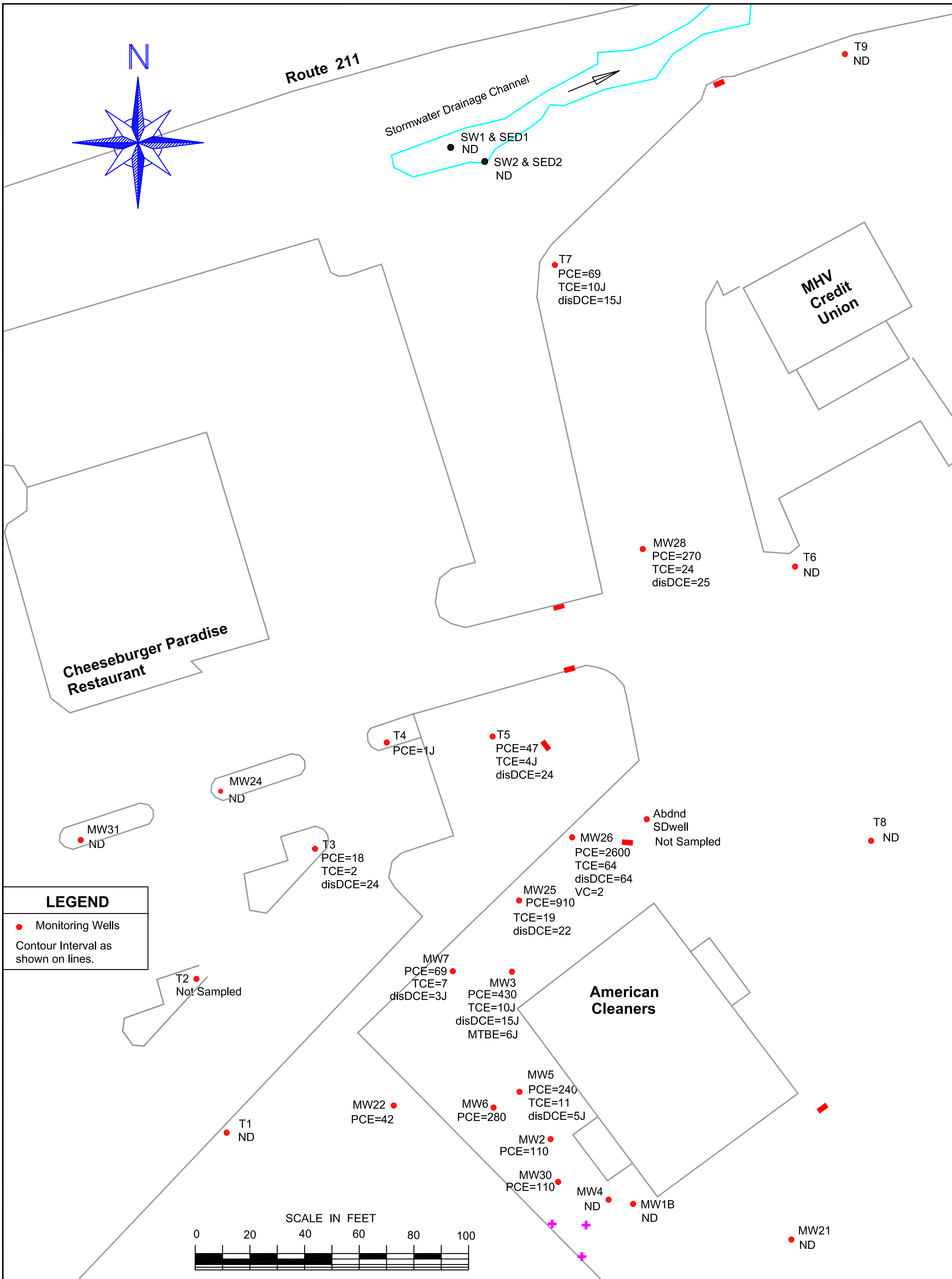

Figure 5-5. Isopleth Map of PCE Concentrations (in ug/L) in Groundwater, Mid-Hudson Geoscience January 2010 Sampling Event.	**American Cleaners at Caldor Lloyds Mall 340 Route 211 East, Middletown, NY 10940 NYSDEC DER VCP V-00461-3, Feb 2010**	**Mid-Hudson Geosciences** Katherine J. Beinkafner, PhD, CPG #6611 1003 Route 44/55, PO Box 332 Clintondale, NY 12515-0332 (845) 883-5866 rockdoctor@optonline.net

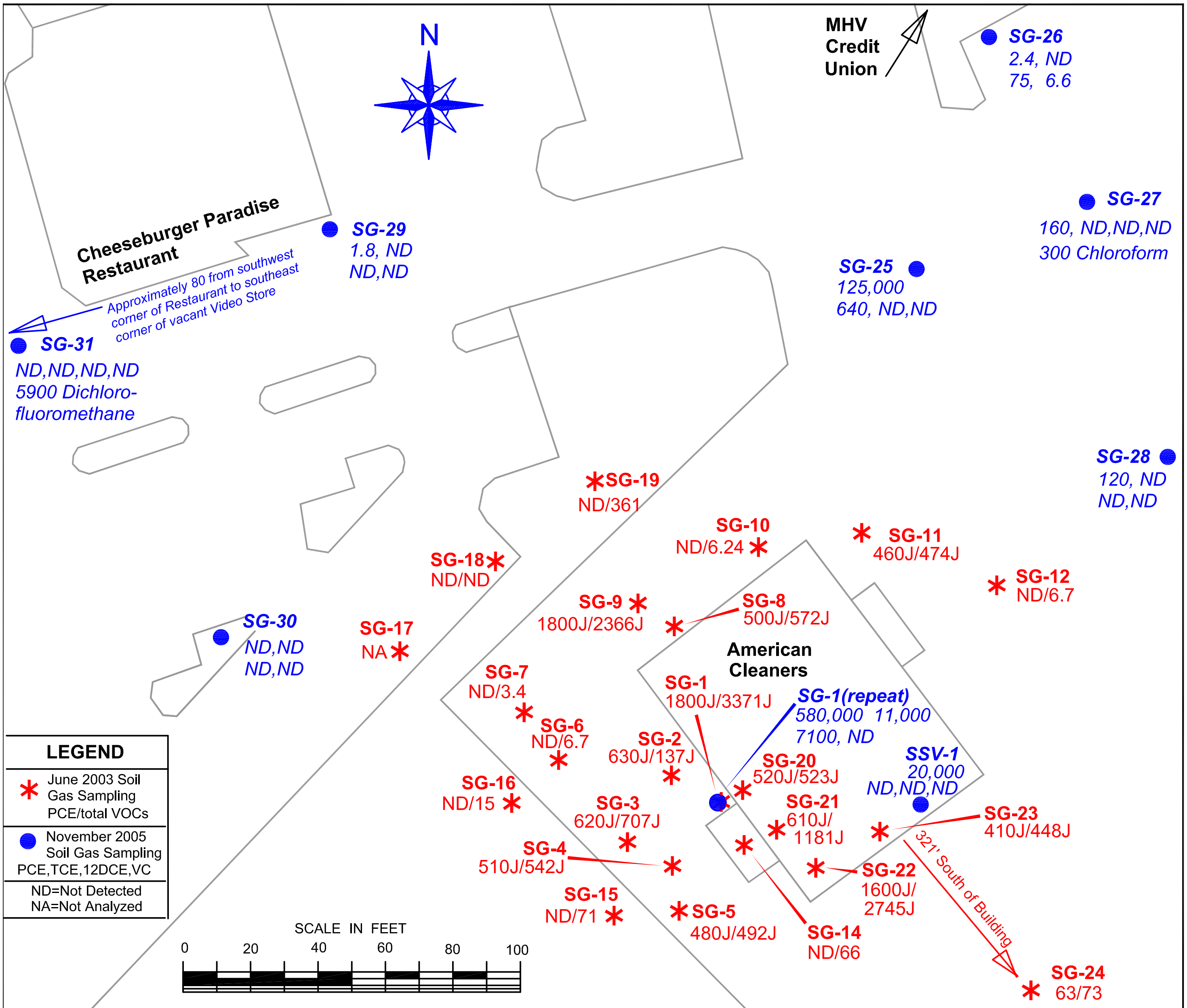

Figure 5-6. Map of PCE Concentrations (in ug/m³) Detected in Soil Gas Samples (adapted from Berninger, April 2006, Figure 5c for June 2003 Sampling and Figure 5f for November Sampling Event.

American Cleaners at Caldor Lloyds Mall
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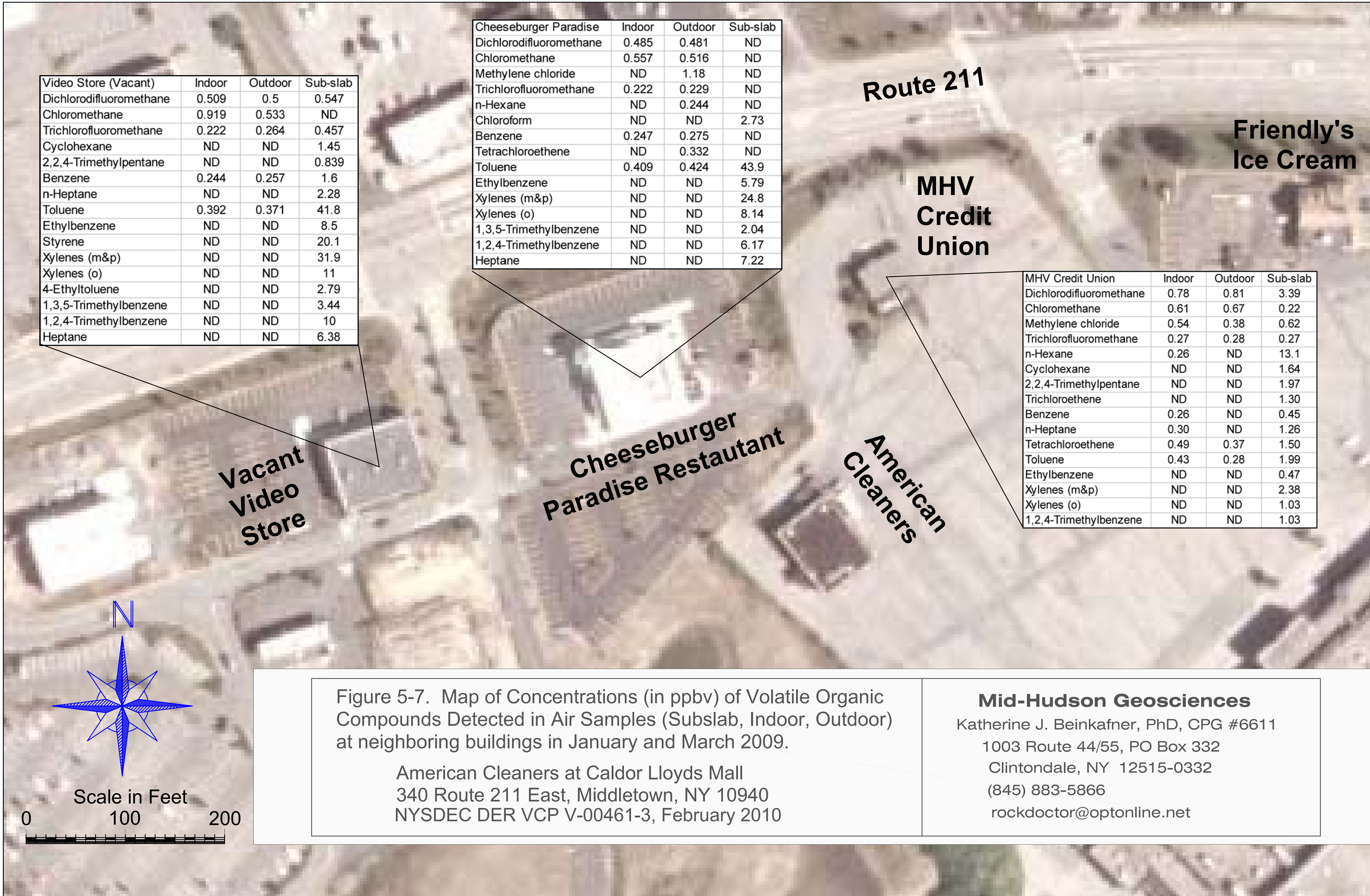

Video Store (Vacant)	Indoor	Outdoor	Sub-slab
Dichlorodifluoromethane	0.509	0.5	0.547
Chloromethane	0.919	0.533	ND
Trichlorofluoromethane	0.222	0.264	0.457
Cyclohexane	ND	ND	1.45
2,2,4-Trimethylpentane	ND	ND	0.839
Benzene	0.244	0.257	1.6
n-Heptane	ND	ND	2.28
Toluene	0.392	0.371	41.8
Ethylbenzene	ND	ND	8.5
Styrene	ND	ND	20.1
Xylenes (m&p)	ND	ND	31.9
Xylenes (o)	ND	ND	11
4-Ethyltoluene	ND	ND	2.79
1,3,5-Trimethylbenzene	ND	ND	3.44
1,2,4-Trimethylbenzene	ND	ND	10
Heptane	ND	ND	6.38

Cheeseburger Paradise	Indoor	Outdoor	Sub-slab
Dichlorodifluoromethane	0.485	0.481	ND
Chloromethane	0.557	0.516	ND
Methylene chloride	ND	1.18	ND
Trichlorofluoromethane	0.222	0.229	ND
n-Hexane	ND	0.244	ND
Chloroform	ND	ND	2.73
Benzene	0.247	0.275	ND
Tetrachloroethene	ND	0.332	ND
Toluene	0.409	0.424	43.9
Ethylbenzene	ND	ND	5.79
Xylenes (m&p)	ND	ND	24.8
Xylenes (o)	ND	ND	8.14
1,3,5-Trimethylbenzene	ND	ND	2.04
1,2,4-Trimethylbenzene	ND	ND	6.17
Heptane	ND	ND	7.22

MHV Credit Union	Indoor	Outdoor	Sub-slab
Dichlorodifluoromethane	0.78	0.81	3.39
Chloromethane	0.61	0.67	0.22
Methylene chloride	0.54	0.38	0.62
Trichlorofluoromethane	0.27	0.28	0.27
n-Hexane	0.26	ND	13.1
Cyclohexane	ND	ND	1.64
2,2,4-Trimethylpentane	ND	ND	1.97
Trichloroethene	ND	ND	1.30
Benzene	0.26	ND	0.45
n-Heptane	0.30	ND	1.26
Tetrachloroethene	0.49	0.37	1.50
Toluene	0.43	0.28	1.99
Ethylbenzene	ND	ND	0.47
Xylenes (m&p)	ND	ND	2.38
Xylenes (o)	ND	ND	1.03
1,2,4-Trimethylbenzene	ND	ND	1.03

Figure 5-7. Map of Concentrations (in ppbv) of Volatile Organic Compounds Detected in Air Samples (Subslab, Indoor, Outdoor) at neighboring buildings in January and March 2009.

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