FINAL REMEDIAL INVESTIGATION/ FEASIBILITY STUDY REPORT

Former Doro Cleaners
(Site No. 915238)
Cheektowaga, New York

New York State Department of Environmental Conservation

Work Assignment No. D007621-6

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CDM Smith

Table of Contents

Table of Contents

Acronmyns

Section 1 – Introduction

Section 2 – Physical Setting

Section 3 – Field Investigation

Section 4 – Analytical Results

Section 5 – Nature and Extent of Contamination

Section 6 – Qualitative Human Health Exposure Assessment

Section 7 – Remedial Investigation Conclusions and Recommendations

Section 8 – Remedial Goals and Remedial Action Objectives

Section 9 – General Response Actions

Section 10 – Identification and Screening of Remedial Technologies

Section 11 – Development and Analysis of Remedial Alternatives

Section 12 – References

List of Figures

List of Tables

Appendices

Acronyms

˚C	degrees Celsius
˚F	degrees Fahrenheit
AGS	Advanced Geological Services
ASP	Analytical Services Protocols
atm	atmosphere
AUL	Activity and Use Limitation
bgs	below ground surface
BASE	Building Assessment and Survey Evaluation
CBS	Chemical Bulk Storage
CDM Smith	Camp Dresser McKee & Smith
COC	chemical of concern
CSM	conceptual site model
CVOC	chlorinated volatile organic compounds
cis-1,2-DCE	*cis*-1,2-dichloroethene
1,1-DCE	1,1-dichloroethane
DER	Division of Environmental Remediation
DER-10	Final Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation, dated May 2010
DHC	dehaloccoccoides
DO	dissolved oxygen
DPT	direct push technology
DUSR	Data Usability Summary Report
EDR	Environmental Data Resources
ELAP	Environmental Laboratory Approval Program
EM	electromagnetic method
EQA	Environmental Quality Associates
ESA	Environmental Site Assessment
EP	Environmental Professional
EPA	Environmental Protection Agency
FOIL	Freedom of Information Law
FS	Feasibility Study
ft bgs	feet below ground surface
g/L	grams per liter
GIS	Geographic Information System
GPR	ground penetrating radar
HAS	hollow stem auger
mg/L	milligram per liter
mm	millimeter
msl	mean sea level
NAD	North American Datum
NAVD	North American Vertical Datum
NYCRR	New York Code of Rules and Regulations

NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
ORP	oxidation-reduction potential
PBS	Petroleum Bulk Storage
PCA	tetrachloroethane
PCE	tetrachloroethylene
PID	photoionization detector
ppb	parts per billion
ppm	parts per million
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RAIS	Risk Assessment Information System
RECs	recognized environmental conditions
RF	radio frequency method
RI	Remedial Investigation
SCGs	standards, criteria and guidance
SCOs	soil cleanup objectives
SPDES	New York State Pollutant Discharge Elimination System
SVI	soil vapor intrusion
SVOCs	semi-volatile organic compounds
TAL	target analyte list
1,1,1-TCA	1,1,1-trichloroethane
TCA	trichloroethane
TCE	trichloroethylene
TCL	target compound list
TOGS	Technical and Operational Guidance Series
µg/kg	micrograms per kilogram
µg/L	micrograms per Liter
µg/m^3	micrograms per cubic meter
USCS	Unified Soil Classification System
USGS	United States Geological Survey
UST	underground storage tank
UV	ultraviolet
VC	vinyl chloride
VCR	vinyl chloride reductase
VOCs	volatile organic compounds

Section 1

Section 1

Introduction

This Remedial Investigation/Feasibility Study (RI/FS) was prepared for the Former Doro Dry Cleaners Site (herein referred to as the "Site") located at 3460-3466 Genesee Street in the Town of Cheektowaga, Erie County, New York (**Figure 1-1**). This report was prepared by Camp Dresser McKee & Smith (CDM Smith) for the New York State Department of Environmental Conservation (NYSDEC) under the Engineering Services for Investigation and Design Standby Contract No. D007621 for site number 915238.

In 2008, a Phase I Environmental Site Assessment was performed by 56 Services, Inc. A Phase II Environmental Site Assessment was completed in 2010 by MS Analytical, LLC. In 2012, a Phase II Environmental Site Assessment was also completed at the property immediately east of the site. In early 2011, homes adjacent to the facility were evaluated for soil vapor intrusion.

Based on the findings of the multiple site characterizations conducted from 2008 to 2012, an RI/FS was recommended to delineate the migration of contaminants on-site and off-site. This RI/FS follows the guidelines set forth in the "*Final Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation, dated May 3, 2010".*

The RI/FS details the results of field investigations conducted between December 2012 and August 2013, evaluates the nature and extent of contamination, and qualitatively assesses the risks to human health posed by exposure to contaminated media. This RI/FS report was prepared in accordance with the *Remedial Investigation/Feasibility Study Work Assignment* (CDM Smith 2012). The field investigation was performed in general accordance with the Schedule 1 Scope of Work; however, modifications were made during implementation based on field observations and discussions with NYSDEC.

1.1 Scope and Objectives

The primary objectives of the RI were to characterize the nature and extent of soil, groundwater, and soil vapor contamination associated with a plume of chlorinated volatile organic compounds (CVOCs) observed in the area and identify areas that pose an unacceptable risk to human health and the environment. The FS will use the data collected during the remedial investigation to identify and screen technologies and alternatives for remediation.

As indicated in the project work plan, the field investigation was completed in two phases. Phase I of the field investigation was completed from December 3 to 14, 2012, March 12 to 13, 2013, and April 22 to 23, 2013. It included a geophysical survey; collection of soil samples at 33 on-site and off-site soil borings; collection of groundwater samples from 10 temporary groundwater monitoring wells; collection of sediment and liquid from an on-site sump inside the building; collection of water samples from two off-site storm water catch basins; sub-slab vapor intrusion sampling in four structures; and surveying of sample locations, the Site, and surrounding area. A sample location plan is included as **Figure 1-2**.

The major objectives of Phase 1 of the RI were the following:

- Locate any underground anomalies in the vicinity of the Site and identify underground utility trenches and storm sewer lines leading away from the Site that may have served as conduits for contamination;
- Collect lithologic information and groundwater flow direction and gradient information;
- Determine where permanent monitoring wells should be located based on the results of the temporary monitoring well sampling and gauging; and
- Determine the nature and extent of soil, soil vapor, and groundwater contamination and identify potential source area(s).

These tasks, along with the conclusions and recommendations, are described in detail in this report.

Phase 2 of the RI was completed from July 23 to 26, 2013 and August 12 to 14, 2013. It included collection of soil samples at 2 on-site soil borings; collection of groundwater samples from 8 permanently installed monitoring wells; and surveying of sample locations, the Site, and surrounding area. A sample location plan is included as **Figure 1-2**.

The objectives of Phase 2 of the RI was to support the FS by completing the following activities:

- Installation and development of 8 permanent overburden monitoring wells;
- Sampling of 2 onsite soil samples in order to delineate contamination levels within the glacial till lithologic layer;
- Sampling of 8 monitoring wells for volatile organic compounds (VOCs), natural attenuation parameters, Dehaloccoccoides (DHC), and Vinyl Chloride reductase (VCR);
- A site survey of the Phase 2 sample locations.

1.2 Site Description and Background

1.2.1 Site Description

The Site is located at 3460-3466 Genesee Street in the Town of Cheektowaga, Erie County, New York as shown on **Figure 1-1**. The 1.8 acre site includes two attached buildings totaling approximately 10,500 square feet. The smaller of the two buildings is a two-story brick front block building with a store front facing Genesee Street and office space on the second floor. The larger building is a one-story brick front block building warehouse/storage area, which housed the dry cleaning operations. The buildings are currently being used for storage, with the intent of a new tenant occupying the building. Asphalt parking areas are located to the south and west of the buildings. An open grassy area, approximately 55-feet wide by 960-feet long, extends from the north side of the building to New York State Route 33, Kensington Expressway.

A residential area is located to the northwest and immediately adjacent to the Site. A vacant commercial building and SweetWorks, a candy manufacturing facility formerly named Niagara Chocolates, are located to the east of the Site. Tread City Tire and Wheel is located on Genesee Street to the west of the Site and a small shopping plaza and another residential area are located across Genesee Street to the south of the Site.

1.2.2 Operational and Remedial History

According to the Phase I Environmental Site Assessment conducted by 56 Services, Inc. in December 2008, the Site operated as a dry cleaning facility (Doro Cleaners) for approximately 40 years starting in the 1950's. The buildings were vacant at the time of the Phase I Environmental Assessment and were used for storage until a tenant moved in on December 31, 2012. The use of the facility by this tenant is unknown. The Site owner indicated that it will be used as a testing facility.

A former gas station was identified immediately west of the Site across Colden Court on Genesee Street. The property is now Tread City Tire and Wheel. No historical spills were reported to NYSDEC in the area of the Site and no petroleum bulk storage (PBS) or chemical bulk storage (CBS) records were found for the Site.

1.2.3 Previous Investigations

1.2.3.1 56 Services, Inc. Phase I Environmental Site Assessments (ESA) – December 2008

56 Services, Inc. conducted a Phase I ESA in December 2008. Fifty-six identified the Site as ½-acre. The Site was formerly used as a dry cleaner and was vacant in December 2008. Two buildings were present – one dry cleaning building and one administrative building – totaling approximately 10,500-square-feet. Residential areas were present to the north and west of the Site, commercial building to the east, and a small commercial plaza and office building to the south. Existing underground utilities included electric, water, natural gas, and sanitary sewer.

No CBS or PBS records were found. Drums of tetrachloroethene (PCE) were identified on the Site in a fenced-in area on the west side of the building. Cleaning products were found stored in 5 gallon containers. The building contained stained concrete, and pits and floor drains. Mold was found inside the office building and it was suspected that asbestos materials were also present, however, this was never confirmed.

Also as part of the Phase I ESA, Environmental Data Resources, Inc. (EDR) searched for available environmental records to identify the risk associated with the property. This search identified spills, remediation efforts, and leaking tanks in the surrounding one mile radius from the Site. The findings from the environmental records search are presented in the table below.

Phase 1 ESA Environmental Records Search Summary (EDR, 2008)

Database	Search Distance (MI)	< 1/8	1/8-1/4	1/4-1/2	1/2-1	Total
CORRACTS	1.00	0	0	0	1	1
RCRA-NonGen	0.25	0	4	NR	NR	4
SHWS	1.00	0	0	1	0	1
LTANKS	0.50	0	6	10	NR	16
HIST LTANKS	0.50	0	6	9	NR	15
UST	0.25	1	3	NR	NR	4
HIST UST	0.25	1	3	NR	NR	4
AST	0.25	0	1	NR	NR	1
MANIFEST	0.25	0	3	NR	NR	3
NY Spills	0.13	7	NR	NR.	NR	7
NY Hist Spills	0.13	5	NR	NR	NR	5

NR=Not Requested at this Search Distance

The records search did not identify any spills, anomalies, or storage tanks on the Site.

CDM Smith reviewed the 56 Services, Inc. Phase I ESA and has concluded that Phase I ESA contains data gaps and was not conducted in accordance with the ASTM standard as follows:

Record Review:

- Missing source references for physical setting sources cited in the discussion;
- Missing discussion of historical sources (aerial photos, topographic maps, Sanborn maps, city directories) – Sanborn maps and city directories are included in the appendices but there is no discussion of these sources in the report;
- Environmental liens and AULs not discussed;
- Title records not discussed;
- Missing local records – tax assessor, building department, zoning department, etc.; and
- The only regulatory information was provided by the Environmental Data Resources Inc. (EDR) report.

Interviews: As part of a Phase I ESA, interviews should be conducted with the present and past owners and operators of the subject facility. Interviews should also be conducted with governmental agencies, including, at a minimum, Freedom of Information Law (FOIL) requests.

- No interviews were performed and the Phase I ESA provides no evidence that the user questionnaire was completed; and
- The Phase I ESA does not provide or discuss any records received from local, state or federal government agencies.

Recognized environmental conditions (RECs):

- As part of a Phase I ESA, the report should identify RECs. The report conclusions do not identify the specific RECs.

Environmental Professional:

- Report is missing the required Environmental Professional (EP) Statement and the signature of the EP;
- Report is missing EP qualifications.

Data Gaps:

- The report should identify the data gaps but does not.

The Sanborn maps indicate that the Site was not previously developed before the former Doro Cleaners building was erected and used for dry cleaning operations. Therefore, CDM Smith assumes that the RI currently under-way will address the potential environmental concerns for the Site and a new Phase I ESA is not necessary.

1.2.3.2 MS Analytical, LLC Phase II Environmental Site Assessment – January 2010

During the 2010 Phase II ESA at the Site, 10 soil borings were advanced inside and outside the building (**Figure 1-3**) and temporary one-inch monitoring wells were installed in 5 of these borings. The Geoprobe used for advancing the borings consistently hit refusal at 11- to 13-feet below ground surface (bgs). The soil was native soil at the surface with combinations of gravel, sand, and/or clay. The soil was stiff to hard to depths of 13 feet bgs. In some locations, a brown sand layer was found. Refusal was consistently encountered in hard, brown, gravelly, silty clay.

Groundwater was recovered at approximately 8 feet bgs in five of the borings, but the elevation was not measured. Four of the borings were advanced to approximately 11 feet bgs where refusal was met and the hole was dry. Boring B-2 was attempted unsuccessfully with a hand auger, this location was not accessible with a Geoprobe. This report anticipated that groundwater flows to the west, toward an unnamed intermittent creek located beyond the residential neighborhood.

A pit with a wooden cover, a water cistern, and capped steel piping protruding from the concrete floor inside the building were identified. The pit and cistern were assumed to be part of a trench drain system, however this was not confirmed. The capped steel piping was observed in two locations inside the east side of the front building and was suspected to be utility piping.

Six soil samples and five groundwater samples were submitted for lab analysis of VOCs by EPA Method 8260 Target Compound List (TCL). The maximum concentrations identified by lab analysis above NYSDEC 6 NYCRR Subpart 375-6(a) Unrestricted Use Soil Cleanup Objectives (SCOs) and New York State Standards and Guidance Values for Class GA Groundwater (NYSDEC TOGS 1.1.1) are listed in the table below.

Phase II ESA Soil and Groundwater Sample Results Summary (MS Analytical, 2010)

Compound	Matrix	Concentration (µg/kg) or (µg/L)	Sample Location
CIS-1,2-DICHLOROETHENE	SOIL	420	B-6
TETRACHLOROETHENE	SOIL	190,000	B-6
1,1-DICHLOROETHENE	GROUNDWATER	210	TPMW-2
CIS-1,2-DICHLOROETHENE	GROUNDWATER	40,000	TPMW-2
TRANS-1,2-DICHLOROETHENE	GROUNDWATER	81	TPMW-1
ETHYLBENZENE	GROUNDWATER	20	TPMW-2
TETRACHLOROETHENE	GROUNDWATER	44,000	TPMW-2
TOLUENE	GROUNDWATER	16	TPMW-2
TRICHLOROETHENE	GROUNDWATER	3,100	TPMW-2
VINYL CHLORIDE	GROUNDWATER	5,100	TPMW-2
XYLENES, TOTAL	GROUNDWATER	110	TPMW-1

Soil and groundwater impacts (PCE) were found north and west of the building as well as below the building. The study found CVOC impacts in soil and groundwater and concluded that groundwater impacts have likely migrated off-site.

1.2.3.3 Groundwater & Environmental Services, Inc. Soil Vapor Intrusion Investigation – December 2011

In April and July 2011, soil vapor intrusion (SVI) investigation samples were collected from 8 homes in the neighborhood immediately northwest of the Site on Colden Court. Indoor air and outdoor ambient air samples were also collected. The samples were analyzed using EPA Method TO-15.

High levels of PCE, trichloroethylene (TCE), and 1,2-dichloroethane (1,2-DCE) were found in the samples taken from one structure located north of the Site. Based on the results of the sub-slab samples and indoor air samples collected during the investigation, a sub-slab depressurization system was installed at this structure by Mitigation Tech in October 2011. This is the second closest structure to the Site; the closest structure was not sampled as access was denied by the property owner.

1.2.4 Surrounding Properties Investigations

1.2.4.1 Matrix Environmental Technologies, Inc. Phase II Environmental Site Assessment at 3470 Genesee Street – January 2012

As part of the Phase II ESA completed in 2012 at 3470 Genesee Street , the adjacent property to the east referred to as the SweetWorks, 9 soil borings were advanced with a Geoprobe to refusal at 11.5 to 13 feet bgs. The soil was clay and silty clay. Elevated VOC readings were detected with a photo ionization detector (PID) in borings B1 and B2 (**Figure 1-3**). However, no soil samples were submitted for lab analysis.

Groundwater was found from 8 to12 feet bgs. Temporary micro- wells were installed in 6 of the borings using 10-foot screen and 1-inch diameter PVC. Four groundwater samples were collected with bailers and submitted for VOC analysis by EPA Method 8260 full list. CVOCs were detected in groundwater at locations B1, B2, and B3, with the highest concentrations in B2 (**Figure 1-3**).

The maximum concentrations identified by lab analysis above Guidance Values for Class GA Groundwater (NYSDEC TOGS 1.1.1) for groundwater are listed in the table below.

3470 Genesee St. Phase II ESA Groundwater Analytical Results Summary (Matrix, 2012)

Compound	Matrix	Concentration (µg/L)	Sample Location
CIS-1,2-DICHLOROETHENE	GROUNDWATER	730	B2
TETRACHLOROETHENE	GROUNDWATER	278	B1
ACETONE	GROUNDWATER	19.4	B2
TRICHLOROETHENE	GROUNDWATER	8.1	B1
TRANS-1,2-DICHLOROETHENE	GROUNDWATER	20.2	B2
VINYL CHLORIDE	GROUNDWATER	196	B2

This study concluded that CVOC contamination from dry cleaning at the Site migrated to the area between the Site and 3470 Genesee Street, but not under the building.

Section 2

Section 2

Physical Setting

The physical characteristics of the Site and surrounding area are important to understanding the current nature and extent of contamination and future transport of contaminants. These characteristics can be described in terms of the demography and land use, meteorology, surface features and drainage, geology and hydrogeology. This section describes the physical characteristics of the Site and surrounding environment.

2.1 Demography and Land Use

The Site is located in the Village of Cheektowaga, Erie County, New York. Cheektowaga is located east of Buffalo, NY and Lake Erie along Interstate 90 and is the second largest suburb of Buffalo, after Amherst, NY. According to the 2010 United States Census, 88,226 people live in Cheektowaga, which covers a land area of 29.5 square miles, which equates to a population density of 3,187 people per square mile. Erie County has a population of 919,040 people over 1,227 square miles, equating to a population density of 880 people per square mile.

A residential area is located immediately adjacent to the northwest of the Site. SweetWorks and a second building being used for storage by SweetWorks are located on the east of the Site. Tread City Tire and Wheel is located on Genesee Street to the west of the Site and a small shopping plaza and another residential area are located across Genesee Street to the south of the Site.

2.2 Meteorology

The average high temperature in July in Cheektowaga, New York is 80 degrees Fahrenheit (°F) and the average low in January is 18.3 °F. The average annual precipitation is 36.5 inches and the average annual snowfall is 82.4 inches. The Phase I field investigation was performed in December 2012 and March 2013, December typically being a wet month and March being a drier month. Per the National Weather Service (NWS) Forecast Office (a division of the National Oceanic and Atmospheric Agency (NOAA)) located in Buffalo, NY, the average temperature during the month of December 2012 was 36.3 °F (6.2 °F above normal for December in Buffalo), and the total precipitation was 3.64 inches (0.25 inches below normal for December in Buffalo). The average temperature during the month of March 2013 was 32.9 °F (1.1 °F below normal for March in Buffalo), and the total precipitation was 1.06 inches (1.81 inches below normal for March in Buffalo).

The Phase II field investigation was conducted during July and August 2013. Per the NWS Forecast Office in Buffalo, NY, the average temperature during the month of July 2013 was 72.5 °F (1.4° F above normal for July in Buffalo), and the total precipitation was 2.86 inches (0.37 inches below normal for July in Buffalo). The average temperature during the month of August 2013 was 69.0 °F (0.6° F below normal for August in Buffalo), and the total precipitation was 3.51 inches (0.25 inches above normal for August in Buffalo).

2.3 Surface Features

The front, southern part of the Site is occupied by two attached buildings facing onto Genesee Street with small parking lots on the south and west side of the buildings on Genesee Street and Colden Court. The property extends to the north in a narrow, grassy strip to the Kensington Expressway, State Highway 33.

2.4 Surface Topography and Drainage

The Site is relatively flat, sloping slightly to the west and very slightly to the north. The elevation of the Site is approximately 660 feet above mean sea level (amsl). Surface water runoff in the southern, paved portion of the Site drains into municipal storm water catch basins located to the south on Genesee Street and to the west on Colden Court. Rainfall on the rest of the Site infiltrates into the grass.

2.5 Geology

2.5.1 Regional Geology

The Site is located in the Ontario Lowlands, which is characterized by glacial features such as drumlins, moraines, and glacial lakes (Isachsen, et al, 2000). A drumlin is defined as a long, smoothly rounded hill (narrow or oval in shape) of unstratified glacial drift(Random House Dictionary, Random House 2014). A moraine is defined as a ridge, mound, or irregular mass of unstratified glacial draft, comprised chiefly of boulders, gravel, sand and clay (Random House Dictionary, Random House 2014). Buffalo, New York is located at the eastern end of Lake Erie, one of the Great Lakes, at the beginning of the Niagara River, which flows north over Niagara Falls into Lake Ontario. The Buffalo region lies on dense glacial till underlain by the Onondaga Limestone Formation.

2.5.1.1 Onondaga Limestone

The Onondaga Formation is a widespread, thick deposit of limestones and Devonian age dolostones. It is resistant to erosion compared with rocks above and below it, so it forms an escarpment that runs east to west across New York State, roughly from Buffalo running east just south of Syracuse and Albany (Isachsen, et al, 2000). Though the Onondaga Formation is generally described as hard, competent limestone and dolostone, it is subject to dissolution and karst features, which are most prominent in eastern New York State. Karst features are characeterized by numerous caves, sinkholes, fissures and underground streams and typically form in regions of plentiful rainfall where bedrock consists of carbonate-rich rock (such as limestone, gypsum or dolomite) (American Heritage Science Dictionary, Houghton Mifflin, 2005). Chert nodules are frequently found throughout the Onondaga Limestone, varying in color from light brown to black. Chert is a variety of silica containing microcrystalline quartz, or a siliceous rock of chalcedonic or opaline silica occurring in limestone (American Heritage Dictionary, Houghton Mifflin, 2009). The Onondaga Limestone is quarried extensively, mostly for crushed stone used in cement production and other uses. The Buffalo Crushed Stone Quarry is located approximately 4.4 miles ENE of the Site where the Onondaga Limestone outcrops.

2.5.2 Site Geology

Figures 2-1 through 2-4 present cross-sections developed from boring logs completed on- and off-site. Based on boring logs completed during Phase I of the field investigation, the lithology on-site consists of a thin, 1- to 4-foot thick layer of topsoil and organics underlain by brown to reddish-brown low-plasticity clay, which varies in thickness from approximately 2 feet in the southeast corner of the Site at B-35 to approximately 10 feet northwest of the Site at B-13. This clay layer is underlain by a light-brown sandy clay layer, which varies in thickness from approximately 6 feet in the southeast corner of the Site at B-35 to 2 feet at B-13 northwest of the Site and dips from approximately 5.5 feet bgs at B-35 to 12 feet bgs at B-13. The sandy clay is underlain by glacial till, which ranges in thickness from about 4 feet at B-35 to about 2 feet at B-13. The glacial till was deposited on Onondaga Limestone bedrock, which was estimated at depths of between 14 and 16 feet bgs across the area sampled. The bedrock was found to be slightly deeper towards the south side of the Site. In boring B-17, the drill rig cored approximately 5 feet into rock to confirm the depth to bedrock at 16 feet bgs. Chert was recovered from the boring, which is commonly found in the Onondaga Limestone.

2.6 Hydrogeology

2.6.1 Regional Hydrogeology

The Buffalo area is located in the Erie-St. Lawrence drainage basin, within which precipitation drains into Lake Erie and the St. Lawrence River (Isachsen, et al, 2000). There are no primary or principal aquifers located in the Buffalo area. Drinking water for the Buffalo area is sourced from Lake Erie.

2.6.2 Site Hydrogeology

The groundwater table measured during sampling events at the Site lies at an approximate elevation of between 658 and 663 feet amsl (approximately 2-5 feet bgs). Groundwater elevation data collected from the surveyed permanent monitoring wells during the RI field investigation show groundwater flowing northwest and southwest from the former Doro Cleaners building **(Figure 2-5)**. The groundwater sampling events were conducted during December 2012 (B-11, B-14, B-17, B-18, B-23, B-27, B-28, B-35, and B-36), March 2013 (B-44 through B-54), and during August 2013 at the permanent monitoring wells (MW-01 through MW-08).

During the drilling of the borings completed during the December 2012 and March 2013 RI field investigations, and also during the July 2013 drilling of permanent monitoring wells, groundwater was observed only in a small perched layer, between approximately 8 to 12 feet bgs, underlain by dry glacial till. Boring logs indicate that a hard, red clay was present at approximately 0 to 8 ft bgs, with a sand lense at approximately 8 to 12 ft bgs, underlain by till at depths greater than 12 ft bgs. Saturated soils were observed in approximately this same depth interval in all borings advanced during the field investigation except B-49, located on the south side of Genesee Street, where no groundwater was observed. The sand layer is acting as a preferential pathway for the groundwater, which explains why groundwater was consistently observed in the sandy soils. The till layer encountered in the area of the Site appears to act as an aquitard, creating a perched water table that is fairly consistent in thickness and depth across the investigation area, but becomes slightly deeper to the northwest and south of the Site (**Figures 2-1 through 2-4**).

Using literature values for sandy clay for hydraulic conductivity and effective porosity, the groundwater flow rate was estimated as follows:

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

Where:

V = groundwater flow rate
K = hydraulic conductivity: 0.2 feet/day (Domenico and Schwartz, 1990)
i = gradient, 0.032
n = effective porosity, assumed to be 15% or 0.15 (McWorter and Sunada, 1977).

Using these values V is calculated as follows:

$$V = \frac{(0.2\ \mathit{feet/day})*(0.032)}{0.15}$$

$$V = 0.043\ \mathit{ft/day}$$

$$V = 15.7\ \mathit{ft/year}$$

Section 3

Section 3

Field Investigation

3.1 Remedial Investigation Summary

The following sections describe Phase I and Phase II of the RI field investigation conducted by CDM Smith from December 2012 through August 2013. The investigation was conducted in accordance with the December 2012 RI/FS Work Plan, with the exception of the modifications described below. The first part of Phase I of the RI was executed using a modified triad approach, wherein the placement and number of locations included in the investigation was determined based on field screening of soil borings using a photo ionization detector (PID). The second part of Phase I of the RI field investigation was executed based on the laboratory results from the first part of Phase I. The results were used to extend the radius of groundwater sampling to more specifically delineate the projected path of the COCs. Phase II of the RI field investigation was excecuted based on laboratory results of Phase I. These results were used to further delineate the appropriate solutions for the FS. The RI field investigation activities are explained in detail below.

3.1.1 RI Phase I Part I (December 3 – December 14, 2012)

The first part of Phase I of the RI field investigation was completed between December 3, 2012 and December 14, 2012 and included the following activities:

- Geophysical survey utilizing the ground penetrating radar method (GPR), terrain conductivity electromagnetic method (EM), and the radio frequency method (RF) was conducted at the Site to identify underground utilities, septic tanks, cesspools, dry wells, leach/drain fields, and Underground Storage Tanks (USTs);
- Advancement of 25 on-site and 8 off-site soil borings by Hollow Stem Auger (HSA), Direct Push Technology (DPT), and Indoor Tripod drilling methods. Samples were collected at 22 on-site and 8 off-site locations;
- Installation of 7on-site and 2 off-site temporary monitoring wells. Samples were collected at all temporary monitoring well locations;
- Collection of one on-site standing liquid and one sludge/sediment sample from the sump within the building; and
- Collection of 2 off-site stormwater runoff samples from nearby catch basins (CB-1 and CB-2).

3.1.2 RI Phase I Part II (March 12 – April 23, 2013)

The second part of Phase I of the RI field investigation was completed between March 12, 2013 and April 23, 2013 and included the following activities:

- Advancement of 11 off-site borings by DPT drilling method, which were used for installation of temporary monitoring wells. Samples were collected at 10 of the 11 temporary monitoring well locations. One well was dry and therefore unable to produce a sample. Soil samples were not collected from these borings.

3.1.3 RI Phase II (July 23 – July 26, 2013 and August 12 – August 14, 2013)

Phase II of the RI field investigation was completed between July 23, 2013 and August 14, 2013 and included the following activities:

- Advancement of 6 on-site and 4 off-site soil borings by HAS drilling method;
- Collection of 2 on-site soil samples to specifically delineate the levels of contamination within the glacial till lithologic layer;
- Installation of 4 on-site and 4 off-site permanent monitoring wells. Groundwater samples were collected from the 8 permanent monitoring wells two weeks after their installation; and
- Completion of a vapor intrusion investigation including collection of subslab, indoor air, and ambient outdoor air samples from 4 on-site and off-site structures.

All environmental samples were collected in accordance with the CDM Smith Generic Quality Assurance Project Plan (QAPP) dated May 2011, which has been provided to NYSDEC for Contract Number D007621-06 and referenced within the RI/FS Schedule 1 Scope of Work. A sample location plan is provided in **Figure 1-2.**

3.2 Phase I of the Remedial Investigation

The following subsections describe the first and second part of the RI field investigation conducted from December 2012 through April 2013 by CDM Smith. **Table 3-1** presents the sample summary for both parts of the RI.

3.2.1 Geophysical Survey

A geophysical survey utilizing GPR, EM, and RF was conducted at the site on December 3, through December 5, 2012 by Advanced Geological Services (AGS) to identify underground utilities, septic tanks, cesspools, dry wells, leach/drain fields, and potential USTs. In summary, there were no anomalies identified on the Site that would suggest any septic tanks, cesspools, drain fields, USTs, or any other buried features of environmental concern. The underground utilities in the vicinity of the Site were mapped. The geophysical survey report is provided in **Appendix A**.

3.2.2 DPT Soil Boring Sampling

A subsurface soil investigation was conducted at the Site to delineate the extent of soil contamination. The investigation included advancing 25 on-site and 8 off-site soil borings using a combination of HSA, DPT, and tripod drilling methods for some indoor sample locations. Of these 25 on-site soil borings, B-36, B-38, B-39, B-42, and B-43 were screened and logged, but not sampled, as directed by the on-site NYSDEC Project Manager. Continuous split spoon or macrocore samples were advanced at all on-site and off-site locations (B-11 through B-43) ranging in depth from 0-16 feet bgs (approximately 2 - 5 feet below the water table). All specific samples, their drilling method, and laboratory analyses are summarized within **Table 3-1.**

Discrete six-inch soil samples were collected at the highest PID reading at the location and/or where visible contamination was observed. If no PID readings were observed, the sample was collected from the six-inch interval at the water table interface. Based on this sampling strategy, 2 soil samples were collected at on-site boring B-29 due to elevated PID readings within intervals from 4-6 feet bgs and from 10-12 feet bgs. Two soil samples were also collected at on-site boring B-20 from interval 0-3 feet bgs due to elevated PID readings and from interval 12-14 feet bgs to classify the glacial till lithologic layer.

Elevated PID detections of 9,999+ parts per millions (ppm) total VOCs were observed from 10 to 12 feet bgs at B-29 and B-40. Very strong chemical odors were also noted at these locations. Another elevated PID detection of 2,190 ppm total VOCs was observed from 8 to 12 feet bgs at B-38. As stated above, B-38 was not sampled. This was due to its close proximity to B-29. PID detections at all other locations were minimal in comparison.

During drilling, the sample color, odor and PID screening level were noted in the field logbook, and the soil was described using the Unified Soil Classification System (USCS). Soil boring logs are provided in **Appendix B**.

Twenty-two on-site and 8 off-site soil samples collected during the investigation were analyzed for VOCs by EPA Method 8260C. At locations B-15, B-29, and B-40 additional analyses were run for SVOCs, PCBs/Pesticides, and TAL Metals including Hg and CN by EPA Methods 8270D, 8082A, 8081B, 6010C/6020A, 7470B, and 9014, respectively. A summary of soil sample parameters is included in **Table 3-1**.

3.2.3 Temporary Monitoring Well Installation

Between December 3, 2012 and December 14, 2012, 7 on-site and 2 off-site temporary monitoring wells were installed using HSA and DPT drilling methods to characterize the extent of the plume. The temporary monitoring wells were co-located with the following soil boring locations: B-11, B-14, B-17, B-18, B-27, B-28, B-35, and B-36. The final well locations were determined in consultation with the NYSDEC project manager and are shown on Figure 1-2.

Between March 12, 2013 and March 13, 2013, 10 off-site temporary monitoring wells were installed using the DPT drilling method. These locations were selected to further characterize the off-site extent of the plume based on laboratory results from the December 2012 field investigation.

Temporary 1-inch diameter monitoring wells were installed at the 9 well locations from the December investigation and the 11 well locations from the March investigation. Each well has a 5- to 10-foot screened interval straddling the identified water table and a sand pack. A summary of the well installation for Phase I of the RI is provided in Table 3-2.

3.2.4 Temporary Monitoring Well Development and Sample Collection

3.2.4.1 Well Development

The new temporary wells were developed on December 12, 2012 and March 13, 2013. Development was completed by purging at least three well volumes from each well using a low flow pump. Wells that were purged dry during development were given up to six hours to recharge and then sampled immediately.

3.2.4.2 Groundwater Sample Collection

Prior to sampling, a synoptic round of depth to water measurements was collected from the wells using a water level meter. Groundwater quality data was collected from 9 temporary monitoring wells on December 12 and 13, 2012 and and 10 wells on March 13, 2013. Samples were collected using low-flow sampling methods. Water quality parameters were not collected from temporary wells in accordance with the SOW.

All 19 groundwater samples were analyzed for VOCs by EPA Method 8260C. Additional analyses were run at B-23 for SVOCs, PCBs/Pesticides, and TAL Metals including Hg and CN by EPA Methods 8270D, 8082A, 8081B, 6010C/6020A, 7470B, and 9014, respectively.

Although ground water sampling parameters were not taken before sampling, most wells proved to yield visibly turbid samples. Many well locations did not yield much volume despite efforts using the low-flow sampling method.

3.2.5 Sediment/Sludge Sample Collection

On December 13, 2012 a sediment/sludge sample was collected from the on-site sump location (sample designation CISTERN). A long handled scooping device was created using a 4-foot hand bailor with an 8-ounce sample jar taped to it to collect the sample. The sampling device was approved by the on-site NYSDEC project manager. The sample was collected from the bottom of the sump. Prior to sampling a 10.9 ppm PID reading was taken from the headspace of the sump. Sulfur and chemical odors were observed during sampling.

One sample (CISTERN) was collected during the investigation and analyzed for VOCs by EPA Method 8260C. A summary of sample parameters is included in **Table 3-1**.

3.2.6 Sump Liquid Sample Collection

On December 13, 2012 an liquid sample was collected from the on-site sump location (sample designation CISTERN). The liquid sample was collected before the sediment/sludge sample in order to maintain an undisturbed liquid sample for analysis. The sample was collected using the same device noted in Section 3.2.5 and approved by the on-site NYSDEC project manager. The liquid was collected from the top of the sump material. Prior to sampling, a 10.9 ppm PID reading was taken from the headspace of the sump.

One sample (CISTERN) was collected during the investigation and analyzed for VOCs by EPA Method 8260C. A summary of sample parameters is included in **Table 3-1**.

3.2.7 Stormwater Sample Collection

On December 13, 2012 two stormwater runoff samples were collected from on-site catch basins (CB-1 and CB-2). The samples were collected using the same device identified in Section 3.2.5. The runoff water was collected from the effluent pipe at CB-1 (effluent from the direction of the Site). At location CB-2 runoff water was collected from standing water in the basin. No fumes were observed during samples and no PID detections were noted.

Two samples (CB-1 and CB-2) were collected during the investigation and analyzed for VOCs by EPA Method 8260C. A summary of sample parameters is included in **Table 3-1**.

3.2.8 Site Survey

All sample locations, including DPT borings and newly installed monitoring wells, were surveyed by subcontracted New York State licensed surveyor McIntosh and McIntosh, P.C., to identify the location (X,Y coordinates) and well elevations. The horizontal positions were tied into the North American Datum (NAD) 1983, New York State, West Zone coordinate system. The vertical positions were tied into the North American Vertical Datum (NAVD) 88. The measuring point associated with the wells was recorded to an accuracy of 0.01 feet vertically.

For RI Phase I Part II, a GPS Trimble unit was used to collect sample coordinates in the field. Accuracy ranged from 19 – 21 feet due to the cloudy weather and satellite availability. All GPS files were collected and post-processed to yield more accurate results, estimated to be sub-foot accuracy.

3.2.9 Vapor Intrusion Investigation

Sub-slab soil vapor, indoor air, and outdoor (ambient) air sampling were conducted at 4 structures both on and off-site to determine the extent of VOC contaminated soil vapor. A copy of the VI report is included in **Appendix C**. Sampling was conducted onApril 22 and April 23, 2013. Vapor intrusion (VI) sampling locations are identified on **Figure 1-2**. Samples were collected in accordance with the NYSDOH "Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006" and the NYSDEC "*Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation"* dated May 2010.

Components of air quality sampling included:

- Collection of one to two sub-slab soil vapor samples at each structure,
- Collection of an indoor air sample at the basement level (if present) of each structure, and
- Collection of one outdoor ambient air sample at each structure; where multiple structures were located within proximity to each other, one ambient air sample was collected to represent all locations.

All samples were collected using 6-liter Summa canister equipped with a 24-hour lab calibrated regulator. Sample collection was terminated before the canister vacuum reached zero inches of mercury. The canister vacuum levels at the start and end of sample collection was recorded on the sample label, in the field log book and on the sample chain of custody form. The Summa canister was labeled with sample identification, the start and end time of sample collection, date, project identification and requested laboratory analysis. The sub-slab soil vapor, indoor air, and outdoor (ambient) air samples were sent to an off-site NYSDOH approved Environmental Laboratory Approval Program (ELAP) certified laboratory, Con-Test Analytical Lab (Con-Test Lab) of East Longmeadow, MA, for VOC analysis via EPA Method TO-15. A NYSDEC ASP Category B data deliverable is provided for these analyses as **Appendix F.** A summary of soil vapor investigation sample parameters is presented in **Table 3-1**. To maintain the privacy of the property owners, the addresses are being kept confidential and are provided to NYSDEC with the Vapor Intrusion Report.

3.2.9.1 Sub-Slab Soil Vapor Sample Collection

At each structure, sub-slab soil vapor samples were collected from beneath the slab of the lowest level of the structure.

Sub-slab soil vapor points were installed on April 22, 2013 at 5 locations in 4 structures at the Site and surrounding area by CDM Smith personnel in accordance with NYSDOH guidance document. A shallow sampling point was installed at a depth of approximately 3 inches below the slab.

Prior to installation of the sub-slab vapor sample point, the building floor was inspected and any penetrations were noted and recorded. A chemical inventory was also completed as part of the Indoor Air Quality Questionnaire and Building Inventory. A copy of the completed questionnaire for each location is provided in the VI Report (**Appendix C**).

The sub-slab sample points were installed by using a hammer drill with a 1.25-inch diameter bit to drill a hole to a depth of approximately 3 inches beneath the concrete slab. When the drilling was complete, the area around the borehole was cleaned. A 3/8-inch outer diameter, ¼-inch inner diameter Teflon® lined tubing was extended about 2 inches into the sub-slab void space. The annular space between the borehole and the sample tubing was sealed with a rubber stopper and electrical conduit putty to prevent ambient air infiltration. The putty label indicated that it contained no VOCs.

Prior to sampling, the sealed sample point was tested for potential short circuiting by surface air infiltration using a helium tracer gas test. The procedure for helium tracer gas testing was conducted in accordance with the NYSDOH guidance document as follows:

- The soil vapor sampling tube is run through the hole in the prepared enclosure that is placed over the borehole.

- Helium gas is released through a sample port into the enclosure until a concentration of greater than 80 percent (%) is reached. The Helium enriched environment is monitored and confirmed with a Dielectric multi-gas detector inserted into a second sample port.

- After confirming 80% helium in the enclosure, the soil vapor sampling tube is purged using the low-flow air sample pump purging at a rate of not more than 0.2 liters per minute and discharging to a one-liter Tedlar bag. The Tedlar bag is removed when full, and screened for helium using a helium gas detector and for VOCs using a MiniRae photo ionization detector (PID). Tracer gas testing was performed at all sample locations.

No helium detections were observed during tracer gas tests. A summary of the soil vapor sample identification, trace gas test reading, PID reading, and the canister and regulator numbers used at each location is included in the VI Report (**Appendix C**). The floor of each structure was repaired following sampling.

3.2.9.2 Indoor Air Sample Collection

Indoor air samples were collected on the lowest level of the structures. The NYSDOH's Indoor Air Quality Questionnaire and Building Inventory were completed for each structure. The Summa canister was placed in such a location as to collect a representative sample from the breathing zone at three feet above the floor.

3.2.9.3 Outdoor (Ambient) Air Sample Collection

An outdoor ambient air sample was collected to represent structures where indoor air sampling was conducted. Where structures were located within proximity to each other, one ambient air sample was collected to represent both locations. One outdoor ambient air sample was collected for each of the following location groupings: SV-2, SV-4, and SV-5. The Summa canister was placed upwind of each structure in such a location as to collect a representative sample from the breathing zone at four or 6 feet above the ground.

3.2.10 Decontamination and Investigative Derived Waste

All non-dedicated equipment and tools used to collect samples for chemical analysis were decontaminated prior to and between each sample interval using an Alconox rinse and potable water rinse prior to reuse.

Purge water from groundwater sampling, and deconing equipment was containerized in a 55 gallon drum. Soil cuttings from DPT, HSA, and Tripod drilling were also contained in 55 gallon drums. The 55 gallon drums were stored on-site until they were transported to an off-site disposal facility by Op-Tech of Amhearst, New York (Op-Tech). Prior to transporting the drums Op-Tech collected composite waste classification samples from the drums and submitted them for analysis by an off-site lab. Waste disposal manifests for 13 drums of soil and 3 drums of purge water and the waste classification sample lab report are provided in **Appendix D**.

3.3 Phase II of the Remedial Investigation

The following subsections describe Phase II of the RI field investigation conducted in July and August 2013 by CDM Smith. **Table 3-1** presents the sample summary for both parts of the RI.

3.3.1 HSA Soil Boring Sampling

Continuous split spoon samples were advanced at 3 on-site locations (B-55,MW-06_B, and MW-02) to a depth of up to 13.1 feet bgs (approximately 2 to 5 feet below the water table). Discrete six-inch soil samples were collected within the glacial till interface in order to further categorize the lithologic layer. PID readings were recorded for the samples. Based on this sampling strategy, 2 soil samples were collected at on-site boring B-55 from 11.5-12 feet bgs and from MW-06 from 11.5-12 feet bgs. Two borings were advanced at location MW-06 due to equipment refusal at 13 feet bgs on the first attempt.

Elevated PID detection of 15,000+ ppm total VOCs was observed from 11.5 to 12 feet bgs at B-55. Very strong chemical odors were also noted at this location. Work ceased for twenty minutes due to PID readings of 115 ppm in the breathing zone, exceeding the acceptable work concentration limit of 50 ppm. The PID reading of the breathing zone returned to 0.0 ppm after the 20-minute break. A minor PID detection of 6.8 ppm total VOCs was observed fom 11.5 to 12 feet bgs at MW-06. No other PID detections were recorded onsite.

The sample color, odor and PID screening level were noted during drilling on the soil boring logs. The soil was described using the Unified Soil Classification System (USCS). Soil boring logs are provided in **Appendix B**.

Two on-site soil samples collected during the investigation were analyzed for VOCs by EPA Method 8260C. A summary of soil sample parameters is included in **Table 3-1**.

3.3.2 Permanent Monitoring Well Installation

Between July 23 and July 25, 2013 four on-site and four off-site permanent monitoring wells were installed using the HSA drilling method to continue monitoring the extent of the plume.

At all of the 8 well locations, monitoring wells were constructed of two-inch diameter, Schedule 40, flush joint, polyvinyl chloride (PVC) screen and riser with 0.010-inch slotted screen. Each well has a 5 to 10 foot screened interval straddling the identified water table. A summary of the well installation for Phase II of the RI is provided in **Table 3-2.**

Installation was performed at each location by drilling down to the glacial till layer. Drilling stopped before refusal was met and the 2-inch (PVC) well was installed. If augers were advanced down to 12 feet bgs or lower a 10-foot well screen was installed. If augers were not advanced to 12+ feet bgs a 5-foot well screen was installed. Before the augers were pulled a sand pack was placed around the well screen to stabilize the monitoring well and act as a filter pack for the screen. Once the augers were removed, a seal of Bentonite chips was added above the sand pack and grouted up to 0.5 feet bgs using Portland cement. A steel flushmount protective casing was set in place to finalize well construction.

The final well locations were determined in consultation with the NYSDEC project manager and are shown on **Figure 1-2**.

3.3.3 Permanent Monitoring Well Development and Sample Collection

3.3.3.1 Well Development

On July 26, 2013 the new permanent wells were developed by surging and purging at least three well volumes from each well . Well development was performed using a whale pump provided by the drilling contractor. The groundwater parameters pH, specific conductivity, dissolved oxygen, temperature, and redox potential were monitored for stability. If wells were purged dry during development it was noted in the field notebook. These wells were given additional time to recharge before sampling in August.

3.3.3.2 Groundwater Sample Collection

Prior to sampling, a synoptic round of depth to water measurements was collected from the wells using a water level meter. From August 12 to 14, 2013, groundwater samples were collected from all 8 permanent monitoring wells using low-flow sampling methods . The groundwater parameters pH, specific conductivity, dissolved oxygen, temperature, and redox potential were monitored for stability. Samples were not collected until three successive readings met the criteria below for the monitored groundwater parameters.

- pH = +/- .1 Standard Unit of each previous reading
- Specific Conductivity = +/- 3% of each previous reading
- Turbidity = +/- 10% NTUs of each previous reading; Also needs to be below 50 NTUs to meet NYSDEC Standards.
- Dissolved Oxygen = +/- 10% mg/L of each previous reading.
- Temperature = +/- 10% ^{0}C of each previous reading.
- Redox Potential = +/- 10 mV of each previous reading.

A total of 8 groundwater samples were collected during Phase II of the RI.

All 8 groundwater samples were submitted to off-site ELAP certified laboratory ConTest Analytical Labs for analysis of VOCs by EPA Method 8260C; natural attenuation parameters of nitrite, nitrate, ferrous iron, alkalinity, sulfide, sulfate, total organic carbon (TOC), specific conductivity, and chloride; and total iron by EPA Method 6010C.

At locations MW-04, MW-05, MW-06, and MW-07 additional groundwater samples were collected during the groundwater sampling event for microbial analysis. These samples were field filtered and the filter submitted for analysis of dechlorinating bacteria of Dehalococcoides (DHC), tceA reductase (TCE), BAV1 vinyl chloride reductase (BVC), and vinyl chloride reductase (VCR) to Microbial Insights of Rockford, TN by proprietary analysis method CENSUS.

3.4 Field Documentation Procedures

Site dedicated field notebooks were maintained by a field technician overseeing the investigation activities. A copy of all original field notes and photo documentation is provided as **Appendix E**. In addition to the field notebook, all calibration forms populated during the field activities are also included in **Appendix E**.

3.5 Data Quality Assurance/Quality Control

3.5.1 Laboratory Analysis and Validation

In accordance with the Final Scope of Work (CDM Smith 2012), all samples were analyzed by NYSDOH approved Environmental Laboratory Approval Program (ELAP) certified laboratory Con-test Analytical Laboratory, 39 Spruce Street, East Longmeadow, Massachusetts . **Table 3-1** provides a sample summary and the associated analytical parameters analyzed at each location. The analysis for soil and groundwater samples achieved the detection limits discussed in the CDM Smith's Generic QAPP dated May 2011. A NYSDEC Analytical Services Protocols (ASP) Category B data deliverable is provided in **Appendix F.**

All analytical data received from Con-test Lab was validated by independent data validators Environmental Quality Associates (EQA) of Middletown, New York or Environmental Data Services, Inc. (EDS) of Williamsburg, VA. Validation was performed in accordance with NYSDEC Data Usability Summary Report (DUSR) guidance referenced in NYSDEC DER-10. The DUSRs are provided in **Appendix G.** The following paragraphs summarize the findings outlined in the DUSR.

3.5.1.1 Vapor Intrusion Samples

The following qualifiers were added during validation of soil vapor samples:

- Freon-113 results were all flagged with a"J" qualifier, to indicate an estimated value, or 'UJ" qualifier, to indicate an estimated value below detection limits, due to the fact that %D values were above the method limit of 30% with reduced sensitivity during calibration. The percent recovery of laboratory control samples for several soil vapor samples were outside quality assurance limits for 4-metheyl-2-pentanone (MIBK), acetone, isopropanol and 1,1,2,2-tetrachloroethane and thereforeany positive results for these compounds were flagged with the "J" qualifier.

3.5.1.2 Soil Samples

The following qualifiers were added during validation of soil samples:

- Tetrahydrofuran, chloromethane, 1,2,3-trichlorobenzee, 1,2,4-trichlorobenzene, 2,2-dichloropropane, trans-2-butanone, 1,4-dioxane, tert-butyl alcohol, acetone, 1,2-dibromo-3-chloropropane, methylene chloride, naphthalene and trans-1,4-dichlorobutene were flagged with “”J”or “UJ” qualifiers in several soil samples due to low calibration RRF values or high continuing calibration %D values.Dichloro-difluoromethane, naphthalene, 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, benzoic acid, and benzidine were flagged with “J” or “UJ” qualifiers in several soil samples due to MS/MSD and/or LCS recoveries outside of acceptable limits.

3.5.1.3 Groundwater Samples

The following qualifiers were added during validation of groundwater samples:

- Tert-Butyl alcohol and 1.4-dioxane were rejected in all samples due to low initial calibration RRF values.
- Naphthalene, 1,2,3-trichlorobenzene and 1.2.4-trichlorobenzene were rejected in one sample due to low continuing calibration RRF values.
- Several compounds were qualified as estimated in all samples due to high continuing calibration %D values.
- Sulfide was flagged with a“UJ” qualifier in all samples due to low LCS recoveries.
- Sodium in sample B-23 was flagged with a “J” qualifier due to low LCS recoveries.
- An iron detection in sample MW-07_08_13_13 was qualified as not detected and flagged with a “U” qualifier due to a method blank detection.

3.5.2 Duplicate Samples

Quality assurance/quality control (QA/QC) samples include a duplicate sample to evaluate laboratory repeatability. **Table 3-1** presents each duplicate and its parent sample collected during the RI. All duplicate samples were analyzed for VOCs by EPA Method 8260C.

Two duplicate soil samples were collected during Phase I of the RI. The results for duplicate sample DUP-1 compared favorably to the parent sample B-29 10-12 feet bgs. The duplicate sample DUP-2 produced results that compared favorably to the parent sample B-40 10-12 feet bgs.

One duplicate groundwater sample was collected from a temporary monitoring well during Phase I of the RI. Although the results of the duplicate sample DUP-3 appeared to mirror similar compounds as those found in the parent sample B-28, additional analytes were found in the duplicate sample that were not found within the parent sample. Analyte concentrations were much higher in the duplicate sample than in the parent sample. The variability in analytes and concentrations is most likely a result of poor recharge in the temporary well due to low conductivity soils. The results from both samples are discussed in Section 4.

One duplicate groundwater sample, FD-01_3-13-13, was collected from a temporary monitoring well during Phase I Part II of the RI. The duplicate sample and the original sample B-53 did not have any detections, with the exception of Toluene in the duplicate sample. The variability in analytes and concentrations is most likely a result of poor recharge in the temporary well due to low conductivity soils.

One duplicate soil sample, FD-01_07-23-13, was collected during Phase II of the RI. The analytical results of the duplicate sample were very similar to that of the original sample at MW-6B with the exception of analytes PCE and TCE. The duplicate sample resulted in much higher concentrations than the original, however, concentrations of PCE and TCE exceeded the SCOs in both samples, therefore, it does not affect the conclusions of the RI.

One duplicate groundwater sample, FD-01_08-14-13, was collected from a permanent monitoring well during Phase II of the RI. The results for the duplicate sample were very similar to that of the original sample from MW-06.

3.5.3 Field and Trip Blanks

Field blanks are collected to evaluate the efficacy of equipment decontamination and general cleanliness of the field procedures. Trip blanks were provided to evaluate whether samples were contaminated by ambient conditions during transit from the project site to the laboratory. Field blanks and trip blanks were collected during both phases of the RI at a rate of one field blank per sampling event and one trip blank per sample shipment during groundwater sampling.

The field blank for the sample equipment was collected by running the laboratory-supplied, analyte-free water over the sampler tip. A total of three field blanks were analyzed during the investigation. No compounds were detected at concentrations exceeding project evaluation criteria in investigation samples. Therefore, the field blank contamination does not affect the usability of the data.

Trip blanks were used to determine if any on-site atmospheric contaminants seeped into the sample vials or if any cross contamination occurred during handling, storage, and/or shipment of samples. Trip blanks were prepared prior to the sampling event by the analytical laboratory conducting the analysis. Actual sample containers were used for the trip blanks. The trip blanks accompanied the sample containers throughout the sampling event: from the laboratory to the project site, on-site during sample collection, and from the project site to the laboratory. They were handled and transported in the same manner as the samples collected. They were packaged for shipment/delivery with the other samples sent for analysis. At no time after their preparation were the sample containers opened before reaching the laboratory. Trip blanks were prepared for volatile organic analysis of aqueous samples at a frequency of one per sample shipment.

A total of four trip blanks were analyzed during Phase I of the RI, all during Part I. No compounds were detected at concentrations exceeding project evaluation criteria in investigation samples. Therefore the trip blank contamination does not affect the usability of the data.

A total of 3 trip blanks were analyzed during Phase II of the RI. No compounds were detected at concentrations exceeding project evaluation criteria in investigation samples. Therefore the trip blank contamination does not affect the usability of the data.

Field and trip blank detections are discussed in the DUSR provided in **Appendix G**. Complete analytical results for the field and trip blanks collected are provided as a NYSDEC Category B Deliverable in **Appendix F**.

3.5.4 Equipment Calibration and Maintenance

Each piece of field equipment used for measuring, monitoring, or analytical purposes was calibrated and maintained periodically to assure accuracy within specified limits. Calibration and maintenance procedures, in addition to calibration frequency for most field equipment follow both manufacturers' recommendations and those stipulated in the reference analytical methods used. The calibration procedures for all field equipment used during the site investigation were performed in accordance with the manufacturers' recommended methods. Calibration sheets are provided in **Appendix E**.

3.5.5 Sample Packaging, Shipping, and Custody

The shipping containers (coolers) were provided by the laboratory providing the analysis. These containers, once filled, were secured with fiber tape, wrapped entirely around the container, and brought to Fed Ex for shipping. Sample packaging procedures were followed in accordance with the CDM Smith Generic QAPP (May 2011) to guard against sample breakage and to maintain the chain-of-custody.

Each sample submitted for analysis was properly documented to ensure timely, correct, and complete analysis for all parameters requested and to support the use of analytical data in potential enforcement actions. Sample custody procedures were followed in accordance with the CDM Smith Generic QAPP (May 2011).

Section 4

Section 4

Analytical Results

Phase I of the investigation included advancing soil borings and installing temporary monitoring wells to determine the extent of the contaminant plume and identify future locations for the installation of permanent monitoring wells.

This section presents the evaluation of analytical results for the soil and groundwater samples, collected during the RI, relative to applicable standards, criteria and guidance (SCGs).

The analytical results for soil samples were compared to NYSDEC 6 NYCRR Subpart 375-6(a) Unrestricted Use SCOs. The project evaluation criteria are based on the lower of these criterions for a specific compound. The soil sample detections are presented in **Table 4-1**. **Table 4-1** presents only those compounds which were detected in at least one sample at concentrations exceeding their respective Unrestricted Use Soil Cleanup Objective.

The analytical results for groundwater samples were compared to New York State Standards and Guidance Values for Class GA Groundwater (NYSDEC TOGS 1.1.1). The groundwater sample detections are presented in **Table 4-2**.

It should be noted that all detections of acetone were flagged as estimated by the data validator.

Complete analytical results for each matrix are provided as a NYSDEC Category B Deliverable in **Appendix F**.

4.1 Summary of Subsurface Soil Results

During December 5-12, 2012 and again on July 23, 2013, subsurface soil sampling was conducted at a total of 31 locations: 26 sampling locations were on-site (including 3 duplicate samples) and 5 sampling locations were off-site. The off-site sampling locations were comprised of soil borings B-11 through B-15, while the on-site sampling locations included soil borings B-16 through B-35, B-37, B-40 through B-41, B-55, the Cistern,and MW-06. Analytical detections for the subsurface soil investigation are presented in **Table 4-1** and the VOC exceedances are shown on **Figure 4-1**. Soil samples for laboratory analysis were collected from various depths in borings based on PID readings. After reviewing data on the complex hydrogeology of the Site, it was determined that some of these soil samples were collected from the saturated zone. In order to better understand the extent of soil contamination in the vadose zone that may be contributing to groundwater contamination **Figure 4-2** was developed including only VOC exceedances from soil samples collected above the water table. The following VOCs and Pesticides were detected at concentrations exceeding the NYSDEC Subpart 375-6 Remedial Program Soil Clean-up Objectives for Unrestricted Use:

4.1.1 All Subsurface Soil Results

- **PCE**: Exceedances of the unrestricted SCO for PCE of 1.3 mg/kg were detected at B-29 (10 to 12 feet bgs) at 2,400 mg/kg, B-29 (4 to 6 feet bgs) at 1,100 mg/kg, B-37 (10 to 12 feet bgs) at 42 mg/kg, B-40 (10 to 12 feet bgs) at 67 mg/kg, B-55 (10 to 12 feet bgs) at 2600 mg/kg, and MW-06 (10 to 12 feet bgs) at 5.9 mg/kg.

- ***Cis* -1,2-DCE**: Exceedances of the unrestricted SCO for *cis*-1,2-DCE of 0.25 mg/kg were detected at B-37 (10 to 12 feet bgs) at 6.5 mg/kg, B-27 (3 to 4 feet bgs) at 64 mg/kg, B-55 (10 to 12 feet bgs) at 4.1mg/kg, and MW-06 (10 to 12 feet bgs) at 0.27 mg/kg.

- **TCE**: Exceedances of the unrestricted SCO for TCE of 0.47 mg/kg were detected at B-55 (10 to 12 feet bgs) at 12 mg/kg and MW-06 (10 to 12 feet bgs) at 0.49 mg/kg.

- **VC**: An exceedance of the unrestricted SCO for VC of 0.02 mg/kg was detected at B-27 (3 to 4 feet bgs) at 0.096 mg/kg.

- **Acetone**: Detected at B-27 (3 to 4 feet bgs) at 0.27 mg/kg, exceeding the unrestricted SCO of 0.27 mg/kg.

- **4,4'-DDD**: Detected at B-29 (10 to 12 feet bgs) at 0.022 mg/kg, exceeding the unrestricted SCO of 0.0033 mg/kg.

- **4,4'-DDT**: Detected at B-29 (10 to12 feet bgs) at 0.012 mg/kg and B-40 (10 to 12 feet bgs) at 0.0066 mg/kg. The unrestricted SCO is 0.0033 mg/kg.

Soil borings B-29, B-40, and B-55 are located on-site directly outside the area of the building where the dry cleaning machinery was said to be located. Soil boring MW-06 is located just downgradient of the former dry cleaning machinery location. PCE was detected at a concentration below the Unrestricted Use SCO in the soil sample collected from 8 to 10 feet bgs at B-32, the concentration detected did not exceed the project evaluation criteria. Soil boring B-32 was installed within the building in the vicinity of where the dry cleaning equipment once stood.

4.1.2 Shallow Unsaturated Zone Subsurface Soil Results

- **PCE**: Detected at B-29 (4 to 6 feet bgs) at 1,100 mg/kg.

- ***Cis* -1,2-DCE**: Detected at B-27 (3 to 4 feet bgs) at 64 mg/kg. Although this concentration exceeds the Unrestricted Use SCO for *Cis* -1,2-DCE, it is below the Restricted Commercial Use SCOs for Protection of Public Health.

- **VC**: Detected at B-27 (3 to 4 feet bgs) at 0.096 mg/kg. Although this concentration is above the Unrestricted Use SCO for VC, it is below the Commercial SCOs for Protection of Public Health.

4.2 Summary of Sump Sediment/Sludge Sample Results

One sediment/sludge sample was collected from the on-site sump location within the building. Analytical detections for the investigation are presented in **Table 4-1** and **Figure 4-1**. There following VOC was detected at concentrations exceeding the SCOs for Unrestricted Use for the SUMP sediment sample:

- ***Cis* -1,2-DCE**: 170 mg/kg at SUMP exceeding the SCO of 0.25 mg/kg.

4.3 Summary of Groundwater Sampling Results

A total of 30 groundwater samples and 2 duplicates were collected from 14 on-site (B-17,B-18, B-23, B-27, B-28, B-35, B-36, the Cistern, CB-1, MW-03, MW-04, MW-05, MW-06, and MW-07) and 16 off-site (B-11, CB-2, B-14, B-44 through B-48, B-50 through B-54, MW-01, MW-02, and MW-08) temporary and permanent monitoring wells. Analytical detections for the groundwater investigation are presented in **Table 4-2** and exceedances are presented in **Figure 4-3.** A summary of detections by parameter is presented in **Table 6-2**. The following VOCs were detected at concentrations exceeding the NYSDEC TOGS 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent for Class GA Groundwater (AWQS):

4.3.1 On-Site

- **PCE**: Detected at 11.0 µg/L at B-27, 10.0 µg/L at B-28, 22.0 µg/L at B-36, 12.0 µg/L at B-35, 27 µg/L at MW-05, and 9.6 µg/L at MW-07 compared to the AWQS of 5 µg/L.

- **TCE:** Detected at 14.0 µg/L at B-27, 10.0 µg/L at B-28, 7.0 µg/L at B-36, 8.9 µg/L at MW-05, and 6.4 µg/L at MW-07 compared to the AWQS of 5 µg/L.

- ***Cis* -1,2-DCE:** Detected at 920.0 µg/L at B-27, 21.0 µg/L at B-28, 38.0 µg/L at B-36, 59.0 µg/L at B-35,11.0 µg/L at CB-1, 4.9 µg/L at MW-05, 130 µg/L at MW-07, and 22,000 µg/L at MW-06 compared to the AWQS of 5 µg/L.

- **VC:** Detected at 170.0 µg/L at B-27, 6.2 µg/L at B-36, 11.0 µg/L at B-35, and 44 µg/L at MW-07 compared to the AWQS of µg/L.

4.3.2 Off-Site

- ***Cis*-1,2-DCE**: Detected at 360 µg/L at B-14, 53 µg/L at B-50, 15,000 µg/L at MW-04, and 1.4 µg/L at MW-08 compared to the AWQS of 5 µg/L.

- **VC:** Detected at 170 µg/L at B-14, 8.5 µg/L at B-50, and 3,500 µg/L at MW-04 compared to the AWQS of 2 µg/L.

- **Acetone:** Detected at 72 µg/L at B-45 and 68 µg/L at B-52 compared to the AWQS of 50 µg/L.

The highest PCE concentration on-site was detected at 27.0 µg/L in sample MW-07 collected from 10 to 12 feet bgs. PCE concentrations on-site exceeding the AWQS were also located at B-27, B-28, B-35, B-36, and MW-07. PCE was not detected in any of the off-site groundwater samples.

The highest TCE concentration on-site was detected at 14.0 µg/L in monitoring well B-27 from 7.5 to 12.5 feet bgs. This could be due to a potential secondary source of the sump located within the Former Doro Cleaners building. TCE concentrations in groundwater on-site exceeding the AWQS were also located at B-28, B-36, MW-05, and MW-07.

Degradation products of PCE, including TCE, *cis*-1,2-DCE, and VC, were detected at concentrations exceeding AWQS in on-site groundwater at B-27, B-28, B-36, B-35, MW-05, MW-06, and MW-07.

Degradation products of PCE, including TCE, *cis*-1,2-DCE, and VC, were detected at concentrations exceeding AWQS in off-site groundwater samples B-14, B-50, MW-04, and MW-08. These samples were collected down-gradient of the suspected source areas.

4.4 Summary of Sump Liquid Sample Results

One liquid sample was collected from the on-site sump location. Analytical detections for the sump liquid sample are presented in **Table 4-2**. The following VOCs were detected at concentrations exceeding the AWQS:

4.4.1 On-Site

- **PCE**: Detected at 13.0 µg/L at SUMP (sample designation CISTERN) compared to the AWQS of 5 µg/L.

- ***cis* -1,2-DCE:** Detected at 620.0 µg/L at CISTERN compared to the AWQS of 5 µg/L.

The PCE concentration 13.0 µg/L was higher than all but one (B-36) of the groundwater samples collected on-site. *Cis* -1,2-DCE, a degradation product of PCE, was also detected in the sump liquid sample at a concentration exceeding the guidance value.

4.5 Summary of Stormwater Runoff Sample Results

A total of two stormwater runoff samples were collected from off-site locations CB-1 and CB-2. Analytical detections for samples are presented in **Table 4-2** and **Figure 4-3.** The following VOCs were detected at concentrations exceeding the AWQS:

4.5.1 On-Site

- ***Cis* -1,2-DCE:** Detected at 11.0 µg/L at CB-1.

Degradation products of PCE were detected at concentrations exceeding GWQS in off-site catch basin CB-1.

4.6 Summary of Soil Vapor and Ambient Air Sampling Results

Five sub-slab vapor samples, four indoor air samples, three outdoor ambient air samples, and two duplicate samples were analyzed by Con-test by EPA Method TO-15 to determine the extent of soil vapor intrusion and the impacts to air quality.

A total of 16 different VOCs were detected in the 12 samples that were collected. Of the 16 compounds detected, 6 were chlorinated including PCE and TCE, VC and *cis*-1,2-DCE. Two compounds commonly associated with gasoline (ethyl benzene and ethanol) were also detected at varying concentrations in multiple samples collected.

There are currently no standards, criteria or guidance values for sub-slab or general soil vapor samples. Therefore, comparisons made to the NYSDOH Vapor Intrusion guidance and EPA 2001 BASE Database serve as guidelines and are for reference purposes only.

The results for TCE and carbon tetrachloride were compared to Matrix 1 of the NYSDOH soil vapor guidance. The results for PCE, and 1,1,1-trichloroethane (1,1,1-TCA) were compared to Matrix 2 of the NYSDOH soil vapor guidance. Indoor air and ambient air results were also compared to NYSDOH Guidance Appendix C Table C2- *EPA 2001 Building Assessment and Survey Evaluation (BASE) Database, SUMMA canister method, 90th percentile* (EPA BASE 90th percentile). These values provide background concentrations of VOCs expected in typical indoor and outdoor locations. Sub-slab air concentrations were also compared to NYSDOH Table 3.1 *Air Guideline Values*.

The analytical results are presented in **Figure 4-4** and can be found in **Table 4-3** and the analytical summary report is included as **Appendix F**. Below is a summary of the compounds detected by sampling location.

4.6.1 Soil Vapor 1

The SV-1 location samples, sub-slab sample SV-1 SS2 and indoor air sample SV-1 IA2, were collected on the west side of the front on-site building (**Figure 4-4**). The outdoor air sample collected at location SV-2, SV-2 OA, is for the same building as SV-1 and can serve as the outdoor air sample of SV-1.

The sub-slab sample, SV-1 SS2, exceeded the *NYSDOH Air Guideline Value* for PCE (100 µg/m^3) at 150 µg/m^3.

The indoor air sample SV-1 IA2 exceeded the *EPA BASE 90th percentile* concentration for 1,2,4-trimethylbenzene (9.5 µg/m^3) at 11.0 µg/m^3, *cis*-1,2-DCE (1.9 µg/m^3) at 4.50 µg/m^3, ethylbenzene (5.7 µg/m^3) at 7.70 µg/m^3, hexane (10.2 µg/m^3) at 26.00 µg/m^3, m,p-xylene (22.2 µg/m^3) at 28.00 µg/m^3, o-xylene (7.9 µg/m^3) at 10.00 µg/m^3, PCE (15.9 µg/m^3) at 200.00 µg/m^3, toluene (43 µg/m^3) at 46.00 µg/m^3, and TCE (4.2 µg/m^3) at 5.4 µg/m^3.

The results for TCE and carbon tetrachloride were compared to Matrix 1 of the NYSDOH Soil Vapor Guidance. The following actions are suggested by the matrix:

- Based on the concentration of TCE detected in the indoor air sample SV-1 IA2 (5.40 µg/m^3) and detection in the sub-slab greater than 5 µg/m^3, NYSDOH guidance suggests reasonable and practical actions should be implemented to identify source(s) and reduce exposures.
- Based on the concentration of carbon tetrachloride detected in the indoor air sample SV-1 IA2 (0.43 µg/m^3) and detection in the sub-slab less than 5 µg/m^3, NYSDOH guidance suggests reasonable and practical actions should be implemented to identify source(s) and reduce exposures.

The results for PCE and 1,1,1-TCA were compared to Matrix 2 of the NYSDOH soil vapor guidance. The following actions are suggested by the matrix:

- Based on the concentration of PCE detected in the sub-slab sample SV-1 SS2 of 150 µg/m^3 and detection of indoor air greater than 100 µg/m^3, NYSDOH guidance suggests mitigation to minimize potential exposures associated with soil vapor intrusion.

No further action is suggested by the matrix for 1,1,1-TCA (non-detect). **Table 4-4** provides a summary of the recommended action by sample location as compared to the NYSDOH matrices.

4.6.2 Soil Vapor 2

The SV-2 location samples sub-slab sample SV-2 SS1 and outdoor air sample SV-2 OA were collected on the east side of the rear on-site building (**Figure 4-4**). The indoor air sample collected at location SV-1, SV-1 IA2, is in the same building with SV-2, so can serve for comparison with the SV-2 sub-slab sample, SV-2 SS1.

The sub-slab sample exceeded the *NYSDOH Air Guideline Value* for PCE (100 µg/m^3) at 190 µg/m^3 and TCE (5.00 µg/m^3) at 5.9 µg/m^3.

The outdoor air sample exceeded the *EPA BASE 90th percentile* concentration for ethyl acetate (1.5 µg/m^3) at 2.10 µg/m^3.

The results for TCE and carbon tetrachloride were compared to Matrix 1 of the NYSDOH Soil Vapor Guidance. The following actions are suggested by the matrix:

- Based on the concentration of TCE detected in the indoor air sample SV-1 IA2 (5.40 µg/m^3) and detection in the sub-slab greater than 5 µg/m^3, NYSDOH guidance suggests mitigation to minimize potential exposures associated with soil vapor intrusion.
- Based on the concentration of carbon tetrachloride detected in the indoor air sample SV-1 IA2 (0.43 µg/m^3) and detection in the sub-slab less than 5 µg/m^3, NYSDOH guidance suggests reasonable and practical actions should be implemented to identify source(s) and reduce exposures.

The results for PCE and 1,1,1-TCA were compared to Matrix 2 of the NYSDOH soil vapor guidance. The following actions are suggested by the matrix:

- Based on the concentration of PCE detected in the sub-slab sample SV-2 SS1 of 190 µg/m^3 and detection of indoor air greater than 100 µg/m^3, NYSDOH guidance suggests mitigation to minimize potential exposures associated with soil vapor intrusion.

No further action is suggested by the matrix for 1,1,1-TCA (non-detect). **Table 4-4** provides a summary of the recommended action by sample location as compared to the NYSDOH matrices.

4.6.3 Soil Vapor 3

The SV-3 samples were collected from the central west part of the commercial building located adjacent to the Site to the east at 3470 Genesee St. (**Figure 4-4**). Indoor air sample SV-3 IA and sub-slab sample SV-3 SS were collected at the SV-3 location. The outdoor air sample collected at location SV-2, SV-2 OA, is located in between the on-site building (3466 Genesee St) and the off-site building (3470 Genesee St.). Therefore, SV-2 OA can serve for as the outdoor air sample for location SV-3.

The indoor air sample SV-3 IA exceeded the *EPA BASE 90th percentile* concentration for ethyl acetate (5.4 µg/m^3) at 6.8 µg/m^3 and naphthalene (5.1 µg/m^3) at 5.3 µg/m^3.

The sub-slab sample, SV-3 SS, did not exceed the *NYSDOH Air Guideline Value* for any contaminants.

The results for TCE and carbon tetrachloride were compared to Matrix 1 of the NYSDOH Soil Vapor Guidance. The following actions are suggested by the matrix:

- Based on the concentration of carbon tetrachloride detected in the indoor air sample SV-3 IA (0.45 µg/m^3) and detection in the sub-slab less than 5 µg/m^3, NYSDOH guidance suggests reasonable and practical actions should be implemented to identify source(s) and reduce exposures.

The results for PCE and 1,1,1-TCA were compared to Matrix 2 of the NYSDOH Soil Vapor Guidance. No further action is suggested by the matrices for 1,1,1-TCA (non-detect), PCE (non-detect), and TCE (non-detect). **Table 4-4** provides a summary of the recommended action by sample location as compared to the NYSDOH matrices.

4.6.4 Soil Vapor 4

The SV-4 samples were collected from a private residence - located northwest of the Site (**Figure 4-4**). Indoor air sample SV-4 IA, outdoor air sample SV-4 OA, and sub-slab sample SV-4 SS were collected at the SV-4 location.

The outdoor air sample SV-4 OA exceeded the *EPA BASE 90th percentile* concentration for ethyl acetate (1.5 µg/m^3) at 8.70 µg/m^3.

The indoor air sample SV-4 IA exceeded the *EPA BASE 90th percentile* concentration for ethanol (210.0 µg/m^3) at 220.0 µg/m^3 and ethyl acetate (5.4 µg/m^3) at 44 µg/m^3.

The sub-slab air sample SV-4 SS exceeded the *EPA BASE 90th percentile* concentration for ethyl acetate (5.4 µg/m^3) at 14 µg/m^3 and was detected at the *EPA BASE 90th percentile* concentration limit for ethanol (210.0 µg/m^3).

The results for TCE and carbon tetrachloride were compared to Matrix 1 of the NYSDOH Soil Vapor Guidance. The following actions are suggested by the matrix:

- Based on the concentration of carbon tetrachloride detected in the indoor air sample SV-4 IA (0.46 µg/m^3) and detection in the sub-slab less than 5 µg/m^3, NYSDOH guidance suggests reasonable and practical actions should be implemented to identify source(s) and reduce exposures.

The results for PCE and 1,1,1-TCA were compared to Matrix 2 of the NYSDOH Soil Vapor Guidance. No further action is suggested by the matrices for 1,1,1-TCA (non-detect), PCE (non-detect), and TCE (non-detect). **Table 4-4** provides a summary of the recommended action by sample location as compared to the NYSDOH matrices.

4.6.5 Soil Vapor 5

The SV-5 samples were collected from a private residence located northwest of the Site (**Figure 4-4**). Indoor air sample SV-5 IA, outdoor air sample SV-5 OA, and sub-slab sample SV-5 SS were collected at the SV-5 location.

The indoor air sample SV-5 IA exceeded the *EPA BASE 90th percentile* concentration for ethanol (210.0 µg/m^3) at 500.0 µg/m^3.

The outdoor air sample exceeded the *EPA BASE 90th percentile* concentration for ethyl acetate (1.5 µg/m^3) at 1.7 µg/m^3.

The sub-slab results did not exceed the *NYSDOH Air Guideline Value* for any of the contaminants.

The results for TCE and carbon tetrachloride were compared to Matrix 1 of the NYSDOH Soil Vapor Guidance. The following actions are suggested by the matrix:

- Based on the concentration of carbon tetrachloride detected in the indoor air sample SV-5 IA (0.46 µg/m^3) and detection in the sub-slab less than 5 µg/m^3, NYSDOH guidance suggests reasonable and practical actions should be implemented to identify source(s) and reduce exposures.

The results for PCE and 1,1,1-TCA were compared to Matrix 2 of the NYSDOH soil vapor guidance. The following actions are suggested by the matrix:

- Based on the concentration of 1,1,1-TCA detected in the indoor air sample SV-5 IA (7.1 µg/m^3) and detection in the sub-slab sample less than 100 µg/m^3, NYSDOH guidance suggests reasonable and practical actions should be implemented to identify source(s) and reduce exposures.

No further action is suggested by the matrices for PCE (non-detect) and TCE (non-detect). **Table 4-4** provides a summary of the recommended action by sample location as compared to the NYSDOH matrices.

4.7 Summary of Microbial Sampling Results

On August 13 and 14, 2013 samples were collected from monitoring wells MW-04, MW-05, MW-06, and MW-07 for microbial analysis. These samples were field filtered and the filter submitted for analysis of dechlorinating bacteria of Dehalococcoides (DHC), tceA reductase (TCE), BAV1 vinyl chloride reductase (BVC), and vinyl chloride reductase (VCR) to Microbial Insights by proprietary analysis method CENSUS. The analytical results can be found in **Table 4-5** and the analytical summary report is included as **Appendix F.** The following summarizes the results of the microbial sampling:

- **DHC:** Detected in 3 of the 4 samples at concentrations of 9.5 cells/mL, 11.5 cells/mL, and 0.55 cells/mL in wells MW-07, MW-04, and MW-06, respectively.

- **tceA reductase:** Detected in wells MW-04 and MW-06 and concentrations of 3.9 cells/mL and 8.5 cells/mL, respectively.

- **BAV1 Vinyl Chloride Reductase:** Detected in wells MW-04 and MW-06 and concentrations of 61.1 cells/mL and 0.337 cells/mL, respectively.

- **Vinyl Chloride Reductase:** Detected in well MW-04 at a concentration of 0.2 cells/mL.

According to the Microbial Insights interpretation guide, included with the lab report in **Appendix F**, a DHC concentration of greater than 10,000 cells/mL indicates reductive dechlorination will yield a useful biodegradation rate, while a moderate DHC concentration of between 10 and 10,000 cells/mL, indicates reductive dechlorination of PCE and TCE may still occur if DHC functional genes are also detected. A DHC concentration of less than 10 cells/mL indicates reductive dechlorination of PCE and TCE is unlikely to occur under existing conditions. DHC concentrations were below 10 cells/mL in all wells except MW-04, which had a DHC concentration of 11.5 cells/mL and detections of DHC functional genes. Given the low concentrations of DHC and the aerobic conditions in groundwater at the Site, reductive dechlorination is not likely to occur under current conditions.

Section 5

Section 5

Nature and Extent of Contamination

As identified in Section 4, PCE was detected in soil at a concentration exceeding the unrestricted SCOs at locations B-29, B-37, B-40, MW-06, and B-55; TCE exceeded unrestricted SCOs at MW-06 and B-55; *cis*-1,2-DCE exceeded unrestricted SCOs at B-37, B-27, MW-06, B-55, and the SUMP and VC exceeded unrestricted SCO's at B-27. Groundwater concentrations of PCE, TCE, DCE, and VCexceeding the AWQS were detected in multiple locations on-site and off-site. Several VOCs were also detected in soil vapor subslab samples collected underneath the former Doro Cleaners building and in nearby structures; the primary contaminant of concern in vapor is PCE.

The analytical results have delineated contamination horizontally identifying a small plume in groundwater under and around the former Doro Cleaners building and extending south across Genesee Street and northwest to Colden Court. After a chemical is released to the environment, it may be transported; transformed physically, chemically, or biologically; or accumulated in one or more media. The physical/chemical and environmental fates of the contaminants were evaluated in the context of the site-specific characteristics that may influence their fate and transport.

The fate and transport of those constituents identified as potentially of concern at the Site were evaluated to aid in predicting future exposures, and to help link sources with currently contaminated media.

5.1 Physical/Chemical Properties

The major class of constituents found in soil, groundwater, and soil vapor at the Site is CVOCs. In soil, 4 CVOCs (PCE, TCE, *cis*-1,2-DCE, and VC) were detected above SCOs. In groundwater, 4 CVOCs (PCE, TCE, *cis*-1,2-DCE, and VC) were detected above the AWQSs. In soil vapor, 1,1,1-TCA, carbon tetrachloride, methylene chloride, PCE and TCE were identified. Additionally, p-cymene was detected in a sediment sample collected from the bottom of the sump inside the former Doro Cleaners building and 4,4'-DDT and 4,4'-DDE were detected at concentrations exceeding the SCOs for unrestricted use in soil samples from B-29 and B-40. P-cymene and DDT were not detected in the groundwater at the Site and are not constituents of the contaminant plume and as such are not considered contaminants of concern associated with the Site. 4,4'-DDT and 4,4'-DDE are break-down products of DDT, which was used widely between the 1940's and 1970's in the United States as an insecticide for both agricultural and residential uses.

Table 5-1 lists the physical/chemical and environmental fate properties of the contaminants of concern associated with the Site. The physical and chemical properties of these constituents were taken from the document entitled *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Volume 2, Appendix A* (EPA 1999) and the Risk Assessment Information System (RAIS). The properties are defined in the following paragraphs and the physical/chemical properties of the individual contaminants are discussed in the next two sections.

The K_{OC} provides a measure of the extent of chemical partitioning between organic carbon and water at equilibrium. The higher the K_{OC}, the more likely a chemical is to bind to soil or sediment rather than remain dissolved in water.

The soil distribution coefficient (K_d) provides a soil- or sediment-specific measure of the extent of chemical partitioning between soil or sediment and water, unadjusted for dependence upon organic carbon. The K_d is calculated by adjusting the K_{oc} by the fraction organic carbon (f_{OC}) of the soil/sediment as shown in the formula $K_d = K_{OC} \times f_{OC}$. A higher K_d, indicates that a chemical is more likely to bind to soil or sediment rather than remaining in the dissolved phase, thereby reducing the transport capability.

The octanol-water partition coefficient (K_{OW}) provides a measure of the extent of chemical partitioning between water and octanol at equilibrium. The greater the K_{OW}, the more likely a chemical is to partition to octanol rather than to remain in water. Octanol is used as a surrogate for lipids, and K_{OW} is used to predict bioconcentration in living organisms.

The solubility limit of a chemical is an upper limit of its dissolved-phase concentration in pure water at a specified temperature. Aqueous concentrations in excess of a solubility limit may indicate the presence of a non-aqueous phase liquid.

Henry's Law constant provides a measure of the extent of chemical partitioning between air and water at equilibrium. The higher the Henry's Law constant, the more likely a chemical is to volatilize rather than to remain in water.

Vapor pressure is the pressure exerted by a chemical vapor in equilibrium with its solid or liquid form at any given temperature. It is used to calculate the rate of volatilization of a pure substance from a surface or in estimating a Henry's Law constant for chemicals with low water solubility. The higher the vapor pressure, the more likely a chemical is to exist in a gaseous state.

Chemical half-lives ($t_{1/2}$) are media specific and provide a relative measure of the persistence of a chemical in a given medium, although actual values can vary greatly depending on site-specific conditions. The greater the half-life, the more persistent a chemical is likely to be. The degradation rate constant (Ksg) due to biotic and abiotic degradation is related to the chemical half-life as follows:

$$Ksg = \frac{0.693}{\mathrm{t}\,1/2}$$

5.2 Environmental Fate

The contaminants found in soil and groundwater at the Site are chlorinated ethenes and ethanes and are considered relatively mobile. They do not bind to soil or sediment, and they have moderate to high water solubility, low to moderate K_{OC} values, moderate to high Henry's Law constant and low K_d.

The specific compounds detected in soil and groundwater at the Site, as well as their fate and transport characteristics are discussed below.

5.2.1 *cis*-1,2-Dichloroethene

In the atmosphere, *cis*-1,2-DCE is expected to be present in the vapor phase rather than sorbed to particulate matter based on a vapor pressure of 0.23 atmosphere (atm) (= 175 mm Hg) and a K_{oc} value of 498 (EPA 1999). Removal by scavenging during wet precipitation is expected because of the high solubility of *cis*-1,2-DCE (water solubility = 6.41 grams per Liter (g/L)) (EPA 1999). The predominant degradation process of *cis*-1,2-DCE in the atmosphere is photo-oxidation by hydroxyl radicals with a predicted half-life of 8 days (EPA 2001b).

Some *cis*-1,2-DCE may leach downward in the soil column because of the high water solubility and low K_{oc} values. *Cis*-1,2-DCE may also be formed under anaerobic conditions by reductive dechlorination of the chlorinated solvents TCE and PCE. In both anaerobic and aerobic groundwater with a suitable microbial community, *cis*-1,2-DCE will further degrade to VC.

5.2.2 Tetrachloroethene

In the atmosphere, PCE is expected to be present primarily in the vapor phase and not sorbed to particulates because of its high vapor pressure of 0.0242 atm (= 18 mm Hg) (EPA 1999). Vapor-phase PCE will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 96 days. Direct photolysis is not expected to be an important environmental fate process since PCE only absorbs light weakly in the environmental ultraviolet (UV) spectrum (HSDB 2008).

The dominant fate of PCE in soils is volatilization. Based on its K_{oc} value of 265 mg/L, PCE is moderately mobile in soils. Consequently, PCE has the potential to migrate through the soil into groundwater. Biodegradation under anaerobic conditions in soil and groundwater may occur at a relatively slow rate with half-lives on the order of months or longer (EPA 2001).

Under anaerobic conditions with suitable microbes present, PCE can be progressively dechlorinated via reductive dechlorination to TCE, *cis*-1,2- DCE or *trans*-1,2-DCE and then to VC. VC can further degrade to ethylene. PCE is not known to degrade under aerobic conditions.

5.2.3 Trichloroethene

In the atmosphere, TCE is expected to be present primarily in the vapor phase rather than sorbed to particulates because of its high vapor pressure of 0.0948 atm (= 72 mm Hg) at 25 degrees Celsius (ºC) (EPA 1999). Some removal by scavenging during wet precipitation is expected because of the moderate solubility of TCE in water (1.28 g/L) (EPA 1999). The major degradation process affecting vapor phase TCE is photo-oxidation by hydroxyl radicals; the half-life for this reaction in air is estimated to be 7 days (HSDB 2008).

The dominant fate of TCE released to surface soils is volatilization. Because of its moderate to high mobility in soils, TCE has the potential to migrate through the soil into groundwater. Biodegradation in soil and groundwater may occur at a relatively slow rate with half-lives on the order of months to years (EPA 2001).

TCE is resistant to aerobic biodegradation although biodegradation may proceed co-metabolically. Under anaerobic conditions, as might be seen in soil microsites, flooded soils or aquifer sites, TCE is slowly biodegraded via reductive dechlorination; the extent and rate of degradation are dependent upon the strength of the reducing environment (HSDB 2008) and the presences of suitable bacteria. Bioconcentration and sorption to suspended solids and sediments of TCE are not thought to be significant based on the reported BCF of 16 and K_{oc} value of 94 (EPA 1999).

5.2.4 Vinyl Chloride

In the atmosphere, VC is expected to be present solely in the vapor phase rather than sorbed to particulates because of its very high vapor pressure of 3.68 atm (= 2,797 mm Hg) at 25 degrees Celsius (ºC) (EPA 1999). Some removal during wet precipitation is expected because of the fairly high solubility of VC in water (8.8 g/L) (EPA 1999). The major degradation process affecting vapor phase TCE is photo-oxidation by hydroxyl radicals; the half-life for this reaction in air is estimated to be 55 hours (HSDB 2008).

The dominant fate of VC released to surface soils is volatilization. Because of its high mobility in soils, VC has the potential to migrate through the soil into groundwater. Biodegradation in soil and groundwater may occur at a relatively slow rate with half-lives on the order of months to years (EPA 2001).

VC is known to biodegrade under aerobic conditions via both direct oxidtation and co-metabolic pathways. Under anaerobic conditions, as might be seen in soil microsites, flooded soils or aquifer sites, VC is slowly biodegraded via reductive dechlorination; the extent and rate of degradation are dependent upon the strength of the reducing environment (HSDB 2008) and the presence of suitable bacteria. Bioconcentration and sorption to suspended solids and sediments of VC are not thought to be significant based on the reported BCF of 5.47 and K_{oc} value of 1.11mL water/g soil (EPA 1999).

5.2.5 Natural Attenuation

The dominant degradation processes in groundwater are hydrolysis and biodegradation. Breakdown products of PCE (*cis*-1,2-DCE and VC) were detected in groundwater samples downgradient from the Site both on Genesee Street and Colden Court. This indicates that either some attenuation of PCE has taken place in the groundwater at the Site, or that the degradation products formed prior to entering groundwater.

During Phase II of the RI field investigation, natural attenuation parameters were collected from the 8 permanent monitoring wells located on- and off-site. The results of this sampling, presented in **Table 5-2** indicate that groundwater in the vicinity of the site is aerobic with dissolved oxygen readings typically greater than 2 mg/L in onsite wells. Groundwater samples had pH values between 6.7 and 7.3 and generally contained little organic carbon, between 2.2 mg/L and 18 mg/L. Thus, the predominant groundwater environment is oxygen rich and pH neutral with minimal organic carbon present. Aerobic groundwater might support aerobic biodegradation of the chlorinated VOCs that are not fully saturated with chlorine atoms, particularly *cis*-1,2-DCE and VC (Bradley and Chapelle, 2000).

Groundwater samples from 4 permanent monitoring wells were submitted for analysis of DHC and DHC functional genes tceA, bvcA, and vcrA. Sample results, included in **Table 4-5**, indicated that DHC concentrations are generally low on-site. The sample from MW-04 contained a moderate concentration of DHC and VC reductase genes were also detected, however, aerobic conditions in the groundwater on-site are not favorable for reductive dechlorination. The DHC lab report is included in **Appendix F**.

5.3 Transport of Contaminants

5.3.1 Groundwater

Transport of dissolved phase contamination in groundwater from the contaminant source due to advection appears to be the dominant transport pathway at the Site. Data collected during the RI field investigation identified a small plume extending from the source areas on the west and east sides of the former Doro Cleaners building to the west and south of the Site. Due to the limited extent of the aquifer in the area and the low conductivity soils, lateral migration of VOCs in groundwater has been limited to approximately 150 feet from the Site. Based on the average velocity calculated for the Site (0.043 ft/day) and a retardation factor of 7.01, the current extent of the plume suggests that the release at the Site occurred approximately 54 years ago, during Doro Cleaners operational period.

The retardation factor was calculated using the following formula:

$$R = 1 + (Koc*Foc*pb/n)$$

Where:
R= retardation factor
K_{oc} = organic carbon partition coefficient (265 mL/g for PCE) (Fetter, 2001)
F_{oc} = fraction organic carbon (estimated at 0.002) (IDEM, 2007)
Pb = bulk density (assumed to be 1.7 g/cm^3)
n = effective porosity, assumed to be 15% or 0.15

Using these values R is calculated as follows:

$$R = 1 + ((265*0.002*1.7)/0.15)$$

$$R = 7.01$$

During groundwater transport, the dissolved contaminants may interact with aquifer solids encountered along the flow path via adsorption, partitioning, ion-exchange reactions, and other chemical and physical processes which remove the dissolved constituent from groundwater. These interactions distribute the contaminant between the aqueous phase and the aquifer solids, diminish concentrations of the contaminants in the aqueous phase, and retard the movement of the contaminant relative to groundwater flow (MacKay et al., 1985). The Doro Cleaners plume shows some lateral dispersion and little vertical dispersion is occurring. The leading edge of the plume extends beyond the advective transport due to longitudinal dispersion. **Figures 5-1** through **5-4** show the groundwater plumes for PCE, TCE, *cis*-1,2-DCE, and VC.

5.3.2 Vapors

Diffusion of vapors from sources in groundwater occurs as a result of a concentration gradient between the source and the surrounding area. This can result in the upward or lateral migration of vapors through the vadose zone. Since the groundwater at the Site has elevated levels of CVOCs (maximum *cis*-1,2-DCE concentration of 15,000 µg/L in MW-04), upward diffusion due to the concentration gradient between the contaminated groundwater table interface and the uncontaminated unsaturated zone is occurring at this Site.

Limited soil vapor sampling has been completed at the Site. Results of sub-slab soil vapor sampling completed in structures on and near the Site in spring 2013 revealed PCE concentrations of up to 200 µg/m^3 and TCE up to 5.4 µg/m^3 in sub-slab samples. The horizontal and vertical movement of vapors located near the building foundation is affected via advective transport mechanisms. Volatilized chemicals are drawn into the on-site building via soil gas advection which is the result of a negative pressure that the building interior exhibits on sub-slab vapors.

5.4 Summary of Constituent Fate and Transport

The fate of a constituent in the environment is a function of its chemical properties and the physical and microbiological nature of the Site. The potential for environmental transport was examined by reviewing the topographic and hydrogeologic characteristics of the Site and a review of the available physical constants and chemical characteristics of each constituent. The following summarizes the most significant fate and transport processes for the Site:

- The greatest potential for transport of contaminants at the Site is via groundwater migration. CVOCs (PCE, TCE, *cis*-1,2-DCE, and VC), have been detected in the groundwater plume indicating their ongoing transport.
- Aerobic groundwater at the Site might support aerobic biodegradation of the chlorinated VOCs that are not fully saturated with chlorine atoms, particularly *cis*-1,2-DCE and VC.
- Dilution and dispersion may be mechanisms for reduction in concentrations of CVOCs
- Little lateral or vertical dispersion is occurring and groundwater velocity is slow due to low-conductivity soils, resulting in a small plume that extends approximately 150 feet south and west from the Site.
- Volatilization is considered significant on-site based on the results of the soil gas and sub-slab vapor results. Vapor intrusion is primarily PCE and appears to be resulting from the source area on the west side of the building.

5.5 Conceptual Site Model

A conceptual site model (CSM) was developed to understand the Site's dynamics. The four primary goals of the CSM are the following:

- to describe the Site and its environs
- to present hypotheses on the suspected sources and types of constituents of concern
- to define the potentially affected media
- to determine constituent-specific release and transport mechanisms,

A graphic illustrating the CSM is presented in **Figure 5-5**. The Site is located in a mixed use residential/industrial/commercial area and is bordered to the east by commercial/industrial buildings, to the north and west by residential homes and to the south by commercial properties. Based upon the data collected to date, three suspected source areas of CVOC contamination were identified. First, the major source of subsurface contamination appears to be CVOCs that entered the subsurface from dry cleaning chemicals leaking out of the dry cleaning machine along the west wall of the building and seeping through the concrete floor or through cracks along the western wall. Soil concentrations of up to 2,600 mg/kg PCE (B-55_07-23-13) were detected in this source area.

Secondly, CVOCs may also have entered the subsurface through the sump located in the floor of the rear portion of the building. *Cis*-1,2-DCE was detected at a concentration of 170 mg/kg in the sump sediment sample and 620 µg/L in the sump liquid sample. CVOCs may have reached the subsurface by seeping through the concrete bottom of the sump or from underground piping connected to the sump.

A third source area just outside the building on the east side is suspected to be an unlined trench used to dispose of sludge from the dry cleaning machines when the facility was operating. *Cis*-1,2-DCE at a concentration of 64 mg/kg was detected in soil sample B-27 (3-4') collected in this area. The predominance of *cis*-1,2-DCE and VC in soil and groundwater samples on the east side of the Site may be due to a degraded source material. The sludge that was reportedly buried in a trench on the east side of the building may have mixed with organic material and degraded partially in the dry cleaning machines before disposal.

A portion of the CVOCs that were spilled evaporated to the atmosphere, and a portion entered the subsurface, carried by percolating rain water. The subsurface geology consists of a layer of relatively permeable fill or topsoil, underlain by a layer of dense clay and a layer of soft, loose, sandy clay. Boring log and monitoring well gauging data indicate that the sandy clay is the water bearing zone and it is at least partially confined. Underlying the clay is a stiff glacial till, which was generally dry. As contamination percolated down through the clay to the water bearing zone, a portion of the contaminant mass diffused into the soils in the vadose zone. The remaining contaminant mass mixed in with the groundwater in the sandy clay water-bearing unit. The two till layer soil samples collected from borings B-55 and MW-06 showed PCE concentrations of 2,600 mg/kg and 5.9 mg/kg, respectively, indicating some mass of contaminant traveled by matrix diffusion into the glacial till and potentially the underlying bedrock. PCE may be back-diffusing from the till layer into the water-bearing sandy clay layer.

Potentiometric contours developed from gauging the permanent monitoring wells (**Figure 2-5**) indicate groundwater moves both to the northwest and southwest from the Site. Groundwater data collected during the RI field investigation show a plume in the sandy clay extending from both the west and east sides of the building. The plume extends approximately 150 feet to the west and south of the Site. **Figures 5-1, 5-2, 5-3, and 5-4** show plume maps for PCE, TCE, *cis*-1,2-DCE, and VC, respectively. The lateral extent of the plume is consistent with the expected extent of the plume using the estimated linear velocity of 0.043 ft/day and retardation factor of 7.01, considering Doro Cleaners operated as a dry cleaning facility at the Site from 1950 until the early 1990s. *Cis*-1,2-DCE and VC were also detected in groundwater on the south side of Genesee Street in B-50 and PCE and TCE were detected in front of the on-site building in MW-05 indicating that PCE and break-down products have migrated at least 50 feet off-site to the south.

A CVOC groundwater plume extends under the Site building. During the investigation for this RI/FS, PCE and TCE were detected in groundwater on-site at levels up to 44 ug/L. However, during a previous investigation (see Section 1), PCE and TCE were detected on the western side of the building at concentraitons up to 44,000 ug/L and 3,100 ug/L, respectively. The PCE and TCE are near the former location of the dry cleaning machine. C*is*-1,2-DCE and VC, secondary degradation products of PCE, are also groundwater contaminants at the Site. The presence of *cis*-1,2-DCE and VC in groundwater samples may be due to burial of dry cleaning machine sludge in an unlined trench on the upgradient side of the building when the facility was operating. These compounds are present in concentrations over 1ppm on-site (up to 15,000 µg/L of *cis*-1,2-DCE and 3,500 µg/L of VC) as well as off-site to the northwest and south of the Site at lower concentrations. The groundwater is aerobic, and as such is not conducive to biodegradation of the PCE. However, *cis*-1,2-DCE and VC—and TCE to a much lesser extent—are known to be biodegradable under aerobic conditions.

Site-related CVOCs were detected in indoor air and sub-slab vapor intrusion samples collected from the site building at levels where NYSDOH guidance suggests mitigation. The predominant COC detected in vapor intrusion samples on-site was PCE, suggesting the source of the vapors is soil contamination located in the source area on the west side of the building. COCs were not detected in vapor intrusion samples collected from off-site structures during the RI and significant volatilization from the contaminanted groundwater downgradient is not expected since groundwater contamination concentrations are relatively low off-site.

Soil contamination beneath the on-site building is assumed to be negligible based on the analytical results and PID screening results from soil samples collected beneath the building. **Figure 2-4** shows a cross-section under the building showing soil sample results and PID readings of up to 8,569 ppm in B-29, located just outside the west wall of the building and PID readings of only 4.9 ppm inside the building. These results indicate the soil contamination outside the west wall of the building does not extend under the building. Soil samples collected from beneath this area of the building during the 2010 Phase II ESA were collected from the saturated zone and likely reflect groundwater contamination. The detection of *cis*-1,2-DCE and VC in groundwater samples northwest of the Site indicates groundwater contamination is traveling by advection from the trench on the east side of the on-site building to the west side of the Site. Therefore, groundwater contamination likely exists below the on-site building.

Potential receptors to the elevated levels of contamination in the groundwater and vapor at the Site are further discussed in Section 6.

Section 6

Section 6

Qualitative Human Health Exposure Assessment

The purpose of the human health exposure assessment is to qualitatively evaluate potential risks to human health associated with site-specific compounds in soil, groundwater, and vapor at and adjacent to the Former Doro Cleaners Site under no remedial action and institutional control conditions. This section includes identification of areas of concern and chemicals of concern (COCs), evaluation of actual or potential exposure pathways, characterization of potentially exposed receptors, and identification of how any unacceptable exposures might be eliminated/mitigated. The qualitative human health exposure assessment follows the general guidelines set forth in the DER-10. A review of Subpart b of Section 3.10.1 of DER-10 indicated that a Fish and Wildlife Resources Impact Analysis was not needed for the Site since there are no fish and wildlife resources on or adjacent to the Site or area of concern. There is also very limited vegetation present on the Site or in the immediate vicinity; thus, there is negligible potential environmental risk at the Site. Consequently, the main focus of the exposure assessment is human health.

The Site is currently owned by Elakor Inc. and operates as a storage warehouse. In the future, Elakor Inc. plans to build a clean room for electronics manufacturing within the on-site building. Those renovations are reportedly on hold at this time, due to the ongoing RI.

Off-site properties include industrial, commercial, and residential properties. A residential area is located immediately to the northwest of the Site. SweetWorks, a candy manufacturing facility, and a commercial building (currently being used for storage by SweetWorks) are located on the east side of the Site. Tread City Tire and Wheel is located on Genesee Street to the west of the Site and a small shopping plaza and another residential area are located across Genesee Street to the south of the Site.

6.1 Identification of Chemicals of Concern

Screening of analytical data is conducted to determine which chemicals should be further evaluated in the risk assessment. Screening helps to focus the assessment on chemicals that could pose a human health risk. All detected chemicals in soil are screened based on comparison with the NYSDEC Subpart 375-6: Remedial Program SCOs for unrestricted use. Groundwater sample results are compared to NYSDEC TOGS 1.1.1 AWQS. Sub-slab soil vapor sample results are compared to the values specified in the NYSDOH Soil Vapor/Indoor Air *Matrix 1* and *Matrix 2* guidance. Indoor air sample results are compared to the 90th percentile values provided in the *NYSDOH Guidance Appendix C, Table C2 - EPA 2001 Building Assessment and Survey Evaluation (BASE) Database, SUMMA canister method*.

A chemical is considered a COC if the maximum detected concentration exceeds the applicable screening level; if not, the chemical is eliminated from further evaluation. COCs identified in each area for further evaluation in the risk assessment are discussed below.

6.1.1 On-Site Soil

PCE: PCE detections in soil range from 0.0028 to 2,600 mg/kg. Since the maximum concentration of 2,600 mg/kg exceeds the SCO for unrestricted use of 1.3 mg/kg, PCE is selected as a COC in soils (**Table 6-1**).

TCE: TCE detections in soil range from 0.003 to 12 mg/kg. Since the maximum concentration of 12 mg/kg exceeds the SCO for unrestricted use of 0.47 mg/kg, TCE is selected as a COC in soils (**Table 6-1**).

Cis-1,2-DCE: *cis*-1,2-DCE detections in soil range from 0.0027 to 64 mg/kg. Since the maximum concentration of 64 mg/kg exceeds the SCO for unrestricted use of 0.25 mg/kg, *cis*-1,2-DCE is selected as a COC in soils (**Table 6-1**).

VC: VC detections in on-site soil range from 0.016 to 0.096 mg/kg. The maximum concentration of 0.096 mg/kg exceeds the SCO for unrestricted use of 0.02 mg/kg, VC is selected as a COC in soils (**Table 6-1**).

6.1.2 Groundwater

PCE: PCE was detected in groundwater at concentrations ranging from 1.4 to 33 µg/L. The maximum concentration exceeds the AWQS of 5 µg/L.

TCE: TCE was detected in groundwater at concentrations ranging from 2.2 to 44 µg/L. The maximum concentration exceeds the AWQS of 5 µg/L.

Cis-1,2-DCE: *cis*-1,2-DCE was detected in groundwater at concentrations ranging from 11 to 22,000 µg/L. The maximum concentration exceeds the AWQS of 5 µg/L.

VC: VC was detected in groundwater at concentrations ranging from 6.2 to 3,500 µg/L. The maximum concentration exceeds the AWQS of 5 µg/L.

Since the maximum concentrations of PCE, TCE, *cis*-1,2-DCE, and VC exceed their respective groundwater guidance values, they are selected as COCs. The decision process for identifying COCs in groundwater is described in **Table 6-2**.

6.1.3 Sub-Slab Vapor and Indoor Air Sampling Results

6.1.3.1 On-Site

Concentrations of PCE, TCE, *cis*-1,2-DCE, VC, carbon tetrachloride, methylene chloride, 1,2,4-trimethylbenzene, benzene, ethanol, ethyl acetate, ethylbenzene, hexane, m,p-xylene, o-xylene, and toluene were detected at concentrations exceeding applicable guidelines and statistical values in on-site soil vapor and indoor air samples collected during the remedial investigation (**Table 6-3**). PCE was detected in sub-slab soil vapor at concentrations ranging from 0.31 to 190 µg/m^3 and in indoor air from 0.38 to 210 µg/m^3. TCE was detected in sub-slab soil vapor at concentrations of 4.5 to 5.9 µg/m^3 and in indoor air at a concentration of 5.4 µg/m^3. *Cis*-1,2,-DCE was detected in sub-slab soil vapor at a concentrations of 4.2 and 8.6 µg/m^3 and in indoor air from 4.5 µg/m^3.

Mitigation is required for soil vapor concentrations of PCE (indoor air concentration >100 µg/m^3) and TCE (indoor air concentration >5 µg/m^3) based on comparison to the NYSDOH Soil Vapor/Indoor Air Matrices 1 and 2. For carbon tetrachloride and *cis*-1,2-DCE, taking reasonable and practical actions to identify the source and reduce exposures is recommended.

Since concentrations of PCE, TCE, *cis*-1,2-DCE, VC, carbon tetrachloride, methylene chloride, 1,2,4-trimethylbenzene, benzene, ethanol, ethyl acetate, ethylbenzene, hexane, m,p-xylene, o-xylene, and toluene in soil vapor on-site exceeded screening levels, they are selected as COCs for on-site soil vapor. Please refer to **Table 4-3** for details on individual soil vapor sampling results and applicable screening levels.

6.1.3.2 Off-Site

Concentrations of PCE, 1,1,1-TCA, carbon tetrachloride, VC, carbon tetrachloride, methylene chloride, ethanol, ethyl acetate, and napthalene were detected in off-site sub-slab soil vapor and indoor air samples collected during the remedial investigation (**Table 6-4).** Ethanol, acetone, ethyl acetate, 1,1,1-TCA, and naphthalene concentrations exceeded the applicable guidelines and statistical values in sub-slab, indoor air, and outdoor air off-site. 1,1,1-TCA concentrations exceeded guidelines and statistical values in the sub-slab and indoor air samples collected at SV-5 at concentrations of 5.4 and 7.1 μg/m^3, respectively.

According to the NYSDOH matrix, mitigation is not recommended for any off-site locations sampled during the RI. For carbon tetrachloride, taking reasonable and practical actions to identify the source and reduce exposures is recommended.

Since concentrations of ethanol, acetone, ethyl acetate, 1,1,1-TCA, and naphthalene in soil vapor off-site exceeded screening levels, they are selected as COCs for off-site soil vapor. The remaining detected compounds (PCE, carbon tetrachloride, VC, carbon tetrachloride, and methylene chloride) are not considered COCs for off-site soil vapor because the concentrations at which they were detected did not exceed their respective screening levels. Please refer to Table 4-3 for details on individual soil vapor sampling results and applicable screening levels.

6.2 Exposure Pathways

The presence of a contaminant does not, by itself, create a risk of exposure. Exposure is only a possibility if someone (i.e. a receptor) may be potentially exposed to a contaminant, and if a complete or potentially complete exposure pathway exists. An exposure pathway describes the means by which a potential receptor may be exposed to contaminants originating from the Site. An exposure pathway has five elements:

- A source of contamination;
- Environmental media and transport mechanisms;
- A point of exposure;
- A route of exposure; and
- A receptor population.

An exposure pathway is complete if all five elements of an exposure pathway are documented. An exposure pathway is potentially complete if none of the five elements can be refuted (i.e. no documentation exists, but the element cannot be ruled out). An exposure pathway is incomplete, and may be eliminated from further evaluation, when one of the five elements did not exist in the past, does not exist in the present, and is not likely to exist in the future.

6.2.1 Sources of Contamination and Transport Mechanisms

As discussed in the Conceptual Site Model in Section 5.5, during the operation of a dry cleaner at the site from approximately 1950 until approximately 1990, CVOCs are thought to have entered the subsurface from dry cleaning chemicals leaking out of a dry cleaning machine along the west wall of the building and seeping through the concrete floor or through cracks along the western wall. Secondly, CVOCs may also have entered the subsurface through the sump located in the floor of the rear portion of the building. A third source area just outside the building on the east side is suspected to be an unlined trench used to dispose of sludge from the dry cleaning machines when the facility was operating.

The fate of PCE is dominated by its moderate water solubility, high volatility, and degradation. PCE is denser than water and as such belongs to the group of dense non-aqueous phase liquids. The unsaturated zone at the Site is approximately 2 to 5 feet thick and consists primarily of sandy fill material which is highly permeable. PCE would migrate unimpeded downward through the soil column to the underlying perched groundwater, encountered from approximately 3 to 12 feet bgs. During its transport some of the mass will be stuck to the porous medium as smears, and these smears will, together with the pools, constitute a source for continuous dissolution of contaminants to the water phase. PCE in the smear zones and in the uppermost groundwater near the water table has the potential to diffuse into the air spaces in the unsaturated zone, accumulate beneath foundations and migrate into structure interiors via advection/convection transport mechanisms and migration through preferential pathways. Once liquid phase PCE encounters the water table, some of the solvent will become dissolved in the groundwater and can be transported rather long distances.

PCE can be progressively dechlorinated via reductive dechlorination to TCE, which subsequently degrades to *cis*-1,2- DCE or *trans*-1,2-DCE and then to VC under anaerobic conditions. VC can further degrade to ethylene. Methylene chloride and carbon tetrachloride have also been detected in soil vapor samples collected on-site. All these chlorinated organic compounds can cause significant indoor air contamination due to residual unsaturated soil contamination or vaporization directly from the groundwater table interface.

6.2.2 Potential Exposure Pathways

Subsurface soil on site, groundwater both on-site and off-site, and soil vapor both on-site and off-site are impacted from PCE and its degradation products. There are three general routes through which individuals could potentially be exposed to chemicals in these media: ingestion, inhalation, and dermal contact. An identified pathway does not imply that exposure is actually occurring, only that the potential exists for the pathway to be complete. Potential exposure pathways associated with specific mediums are discussed below. The potential exposure pathways are summarized in **Table 6-5**.

- **Soil Pathways** – PCE is identified as a COC in subsurface soil at the site. PCE was detected at a maximum concentration of 2,600 µg/kg in B-55 (10 to 12 feet bgs), which is considered a source level concentration. *Cis*-1,2-DCE and VC were also detected in subsurface soils at lower concentrations and are also identified as COCs in subsurface soil. The soil contamination is beneath asphalt, therefore workers and site visitors will not come in contact with contaminated soil as long as the soil is not disturbed. Construction workers could come into direct contact with the impacted subsurface soil while performing excavation activities in the localized identified source areas west and east of the building where CVOCs were detected in soils. The impacted areas are small, and the impacted soils are beneath asphalt, therefore, there is little risk of exposure to PCE or other CVOCs in subsurface soil via direct contact.

- **Groundwater Pathways** - Groundwater is not currently used for drinking water or any other purposes at the Site and in the vicinity. Future potable use of groundwater is unlikely since a municipal water supply is readily available and serves the Site and vicinity. Residents of Cheektowaga, New York obtain their potable water from the Erie County Water Authority. Groundwater is shallow (2 to 5 feet bgs) and could be accessible to construction workers or residents while performing excavation activities. Therefore, there could potentially be exposure to PCE or other CVOCs in groundwater via direct contact.

- **Soil Vapor Pathways** – PCE and its degradation products in soil and groundwater are likely to evaporate into the air spaces in the unsaturated zone, accumulate beneath structures or foundations and migrate into interiors of structures via vapor intrusion. On-site workers and visitors are exposed to volatile contaminants emanating from the subsurface into enclosed structures, as evidenced by concentrations of PCE and TCE in indoor air exceeding NYSDOH Indoor Air Guideline Values. Indoor air samples collected in off-site structures during Phase 1 of the field investigation did not show VOC detections above applicable screening criteria. Thus, based on the results of RI sampling, there is no potential for residents to be exposed to volatile contaminants in indoor air as a result of subsurface vapor contamination. However, during the soil vapor intrusion investigation performed by GES in 2011, levels of PCE, TCE, and 1,2-DCE were found in sub-slab samples taken at an off-site residence. A sub-slab depressurization system was installed at this residence in 2011. With continued operation of this sub-slab system, residents should not be exposed to volatile contaminants in indoor air as a result of subsurface vapor contamination.

6.2.3 Point of Exposure

The Site is zoned for commercial use and is currently occupied by Elakor Inc. Current and future potential on-site receptors include on-site workers, and visitors. The potential on-site exposure route is inhalation of indoor air via vapor intrusion or direct exposure to impacted soils or groundwater during excavation.

Off-site properties include industrial, commercial, and residential properties. A residential area is located immediately adjacent to the northwest of the Site. A vacant commercial building and SweetWorks are located to the east of the Site. Tread City Tire and Wheel is located on Genesee Street to the west of the Site and a small shopping plaza and another residential area are located across Genesee Street to the south of the Site. Current and future off-site receptors include residents, workers, and visitors. The potential off-site exposure route is direct contact with impacted groundwater during excavation.

6.2.4 Characterization of Potential Receptors

The following potential receptors are identified based on current and anticipated future uses of the site: workers, visitors, and residents. Not all of these populations are expected to be present in all of the areas. Potential exposure pathways associated with each specific receptor are discussed below.

- **Workers** – Current and future workers may be exposed to COCs in indoor air resulting from vapor intrusion into on-site structures. Workers may also be directly exposed to COCs in soil and groundwater during excavation.

- **Visitors** – Since the site is currently used for storage and structures in the vicinity are also used for commercial purposes, adult and child visitors may visit the Site and businesses surrounding the Site. Current and future visitors may be exposed to COCs via direct contact with soils and groundwater during excavation. On-site visitors may also be exposed to COCs via inhalation of vapors in indoor air resulting from vapor intrusion into the on-site building.

- **Residents** – Current and future adult and child residents may be exposed to COCs via direct contact with soils and groundwater during excavation.

6.3 Qualitative Assessment of Risk

Potential risks associated with exposure to COCs in soil, groundwater, or air are qualitatively evaluated for each receptor through comparison of the maximum detected concentration with the applicable standard or guidance value. Results of this evaluation are discussed below.

6.3.1 Workers and Visitors

The maximum PCE and TCE concentrations exceeded their respective sub-slab soil vapor screening levels for mitigation in samples collected at 2 on-site locations. Additionally, the maximum PCE and TCE concentrations in indoor air in the on-site building exceeded their respective screening levels. These results indicate that contamination in the subsurface may pose a potential risk to on-site workers and visitors.

In RI samples, COCs were not detected in off-site sub-slab soil vapor samples at concentrations exceeding the sub-slab soil vapor levels for mitigation and monitoring. A sub-slab depressurization system is currently operating in one off-site structure north of the Site where elevated concentrations of COCs were detected in sub-slab samples. Therefore, the presence of volatile contaminants in subsurface is not expected to affect current and future indoor air quality for off-site buildings. Vapor intrusion is not a potential concern for current and future off-site workers and visitors.

6.3.2 Residents

- **Off-Site** – In RI samples COCs were not detected in off-site sub-slab soil vapor samples at concentrations exceeding the sub-slab soil vapor levels for mitigation and monitoring. A sub-slab depressurization system is currently operating in one off-site residence where elevated concentrations of COCs were detected in sub-slab samples. Therefore, the presence of volatile contaminants in subsurface is not expected to affect current and future indoor air quality for off-site buildings. Vapor intrusion is not a potential concern for current and future off-site workers and visitors. It should be noted that there is one residence between the Site and the residence with the sub-slab depressurization system. The owner of this residence has refused vapor intrusion sampling, but based on its location, the residence may potentially have a vapor intrusion issue that may need to addressed in the future if access is granted.

6.4 Conclusions and Recommendations

PCE, TCE, *cis*-1,2-DCE, and VC are identified as the COCs in subsurface soil. PCE, TCE, *cis*-1,2-DCE, and VC are also identified as COCs in groundwater. PCE, TCE, *cis*-1,2-DCE, VC, carbon tetrachloride, methylene chloride, 1,2,4-trimethylbenzene, benzene, ethanol, ethyl acetate, ethylbenzene, hexane, m,p-xylene, o-xylene, 1,1,1-TCA, naphthalene, and toluene were detected at concentrations exceeding applicable guidelines and statistical values in on-site and off-site soil vapor and indoor air samples collected during the remedial investigation and are identified as COCs.

On-site current and future workers may be exposed to COCs in indoor air resulting from vapor intrusion into on-site structures. Workers may also be directly exposed to COCs in soil and groundwater during excavation. Since the site is currently used for storage and structures in the vicinity are also used for commercial purposes, adult and child visitors may visit the Site and businesses surrounding the site. Current and future visitors may be exposed to COCs via direct contact with soils and groundwater during excavation. On-site visitors may also be exposed to COCs via inhalation of vapors in indoor air resulting from vapor intrusion into the on-site building. Current and future adult and child residents may be exposed to COCs via direct contact with soils and groundwater during excavation.

A mitigation system is recommended for the on-site building to keep the volatile organic vapors beneath the building from impacting workers and visitors in the building. The sub-slab depressurization system installed in the one off-site residence should continue to run to keep volatile organic vapors beneath the building from impacting residents and visitors. An institutional control should be considered to protect residents and workers from coming into contact with impacted soils and/or groundwater during excavation in the vicinity of the Site.

Section 7

Section 7

Remedial Investigation Conclusions and Recommendations

7.1 Conclusions

Three potential source areas of CVOCs have been identified at the Site based on soil sampling performed during the RI field investigation. The source area east of the on-site building, which is suspected to be a former disposal trench for sludge from dry cleaning machines, is characterized by *cis*-1,2-DCE and VC. The source area west of the on-site building, which seems to be the result of CVOCs leaking out of a dry cleaning machine inside the building, is characterized by PCE. *Cis*-1,2-DCE was detected in sediment and water samples collected from the sump inside the on-site building, which is a third potential source of CVOCs to the subsurface.

Groundwater was encountered in a thin sandy-clay layer between approximately 8 and 12 feet bgs across the Site. The till layer encountered in the area of the Site appears to act as an aquitard, creating a perched water table that is fairly consistent in thickness and depth across the investigation area and a clay layer above acts to partially confine the groundwater. Groundwater elevation data show groundwater flowing northwest and southwest from the former Doro Cleaners building. Using literature values for sandy clay for hydraulic conductivity and effective porosity, the groundwater flow rate was estimated to be 0.043 ft/day.

A small plume of CVOC contaminated groundwater has been identified extending from the on-site source areas to the west and south of the Site. Little lateral dispersion is occurring, and vertical dispersion has been limited by the confined nature of the aquifer. Groundwater velocity is slow due to low-conductivity soils, resulting in a plume that extends only approximately 150 feet from the Site. While PCE and TCE are present in groundwater on-site at concentrationsup to 44 µg/L, secondary degradation products of PCE, cis-1,2-DCE and VC are the principle groundwater contaminants. Since vadose zone samples collected from the source area west of the building do not contain these compounds—but the source area to the east of the building does—the data indicate that the principle source of groundwater contamination is the source area east of the building. Given that this source is on the upgradient side of the building, it is presumed that advection has caused cis-1,2-DCE and VC to migrate into groundwater under the building. The groundwater sample collected from beneath the building in the former location of the dry cleaning machine during the 2010 Phase II ESA contained high concentrations of PCE (3400 µg/L) and break-down products. Dispersion may be transporting PCE from the source area identified west of the building to the groundwater below this portion of the building.

Six soil samples exceeded the NYSDEC Subpart 375-6 Remedial Program Soil Clean-up Objectives for Unrestricted Use for PCE, at concentrations of 2,400 mg/kg from B-29 from 10 to 12 feet bgs, 1,100 mg/kg from B-29 from 4-6 feet bgs, 67 mg/kg from B-40 from 10 to 12 feet bgs, 42 mg/kg from B-37 from 10 to 12 feet bgs, 2,600 mg/kg from B-55 from 10 to 12 feet bgs, and 5.9 mg/kg from MW-06 from 10 to 12 feet bgs. Most of these soil samples were collected below the water table, located at 2 to

5 feet bgs. These concentrations indicate a contaminant source around B-29 found on-site during the RI. Site-wide, breakdown products of PCE were more prevalent in groundwater samples than PCE. These soil and groundwater results indicate an old source or sources of PCE that is degrading naturally on-site. Low conductivity soils and a low hydraulic gradient have kept the groundwater plume from spreading extensively.

The soil samples collected from beneath the building during the 2010 Phase II ESA, which showed PCE concentrations of up to 92 mg/kg were collected from below the water table and may reflect groundwater impacts reaching the western portion of the building from the source area west of the building. Soil samples collected from the vadose zone beneath the building during the RI did not show significant VOC impacts. Therefore, the major soils impacts appear to be located outside the building to the west and east.

Results of vapor intrusion sampling completed in structures on and near the Site in spring 2013 revealed that PCE is the principle contaminant in sub-slab vapor and indoor air (up to 200 ug/m3). The other site-related contaminants had concentrations two orders of magnitude less. The significant presence of PCE and relative absence of cis-1,2-DCE and VC indicates that volatilized chemicals are principly being drawn into the on-site building from the contaminated soil located west of the building (the dry cleaning machine source) via soil gas advection, and not from the disposal trench source. COCs were not detected in vapor intrusion samples collected from off-site structures during the RI and significant volatilization from the contaminanted groundwater downgradient is not expected since groundwater contamination concentrations are relatively low off-site.

The major risk of exposure to COCs appears to be by vapor intrusion into the on-site building. On-site current and future workers may be exposed to COCs in indoor air resulting from vapor intrusion into on-site structures. Workers may also be directly exposed to COCs in soil and groundwater during excavation. Since the site is currently used for storage and structures in the vicinity are also used for commercial purposes, adult and child visitors may visit the Site and businesses surrounding the site. Current and future visitors may be exposed to COCs via direct contact with soils and groundwater during excavation. On-site visitors may also be exposed to COCs via inhalation of vapors in indoor air resulting from vapor intrusion into the on-site building. Current and future adult and child residents may be exposed to COCs via direct contact with soils and groundwater during excavation.

The results of the Remedial Investigation are sufficient to develop remedial alternatives for the site.

7.2 Recommendations

Vapor intrusion to the on-site building poses the most immediate potential for exposure of sensitive receptors. A mitigation system is recommended for the on-site building to keep the volatile organic vapors beneath the building from impacting workers and visitors in the building. The sub-slab depressurization system installed in the one off-site residence should also continue to run to keep volatile organic vapors beneath the building from impacting residents and visitors. The residence on Colden Court closest to the Site, which has refused vapor intrusion sampling, may have vapor intrusion impacts and should be sampled in the future if access is granted by the property owner.

Active remediation of on-site contaminated soils and groundwater may be warranted. At a minimum, an institutional control should be considered to protect residents and workers from coming into contact with impacted soils and/or groundwater during any future excavation activities in the vicinity of the Site.

Section 8

Section 8

Remedial Goals and Remedial Action Objectives

Remedial action objectives (RAOs) are media-specific goals for protecting human health and the environment that serve as guidance for the development of remedial alternatives. The process of identifying the RAOs follows the identification of affected media and contaminant characteristics; evaluation of exposure pathways, contaminant migration pathways and exposure limits; and the evaluation of chemical concentrations that will result in acceptable exposure. The RAOs are based on regulatory requirements that may apply to the various remedial activities being considered for the site. This section of the FS reviews the affected media and contaminant exposure pathways and identifies Federal, State, and local regulations that may affect remedial actions.

Preliminary remediation goals (PRGs) were selected based on federal or state SCGs and with consideration also given to other requirements such as analytical detection limits. These PRGs were then used as a benchmark in the technology screening, alternative development, and detailed evaluation of alternatives presented in the subsequent sections of the FS report.

8.1 Remedial Action Objectives

Based on the evaluation of the nature and extent of contamination in soil, groundwater and vapor, the following sections present the preliminary RAOs that were developed for the Site and surrounding areas.

8.1.1 Remedial Action Objectives for Soil

The recommended RAOs for soil on-site and off-site are as follows:

- Prevent ingestion/direct contact with contaminated soils;
- Prevent inhalation of or exposure from contaminants volatizing from contaminants in soil;
- Prevent migration of contaminants that would result in groundwater contamination.

8.1.2 Remedial Action Objectives for Groundwater

The recommended RAOs for groundwater on-site and off-site are as follows:

- Prevent ingestion of groundwater with contaminant levels exceeding AWQS;
- Prevent contact with, or inhalation of volatiles, from contaminated groundwater;
- Restore groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable; and
- Remove the source of groundwater contamination.

8.1.3 Remedial Action Objectives for Soil Vapor

The recommended RAOs for soil vapor on-site and off-site are as follows:

- Mitigate impacts to public health resulting from existing or potential soil vapor intrusion into buildings at the Site.

8.2 Standards, Criteria, and Guidance

To determine whether the soil, groundwater, and soil vapor contain contamination at levels of concern, State and Federal SCGs were assessed for each medium. The regulatory SCGs identified for each medium and the applicability of these SCGs to the Site and surrounding areas are summarized in the following sections.

Potential SCGs are divided into three groups:

- Chemical-specific SCGs
- Location-specific SCGs
- Action-specific SCGs

8.2.1 Chemical-Specific Standards, Criteria, and Guidance

Chemical-specific SCGs are health- or technology-based numerical values that establish concentration or discharge limits for specific chemicals or classes of chemicals.

8.2.1.1 Federal Standards, Criteria, and Guidance

Federal Drinking Water Standards

- National Primary Drinking Water Standards (40 CFR 141). Potentially applicable if an action involves future use of groundwater as a public supply source.

8.2.1.2 New York Standards, Criteria, and Guidance

Soil Standards and Criteria

- NYSDEC 6 NYCRR Part 375 Subpart 375-6, Environmental Remediation Programs, Unrestricted Use Soil Cleanup Objectives (SCOs), December 14, 2006. Used as the primary basis for setting numerical criteria for soil cleanups.
- NYSDEC CP-51 Supplemental SCOs are utilized when there are no Part 375 SCOs.

Groundwater Standards and Guidance

- New York State Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (Technical and Operational Guidance Series (TOGS) 1.1.1). Used for setting numerical criteria for groundwater cleanups.
- New York State Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations (6 New York Environmental Conservation Rules and Regulations (NYCRR) Part 703). Applicable for assessing water quality on-site and off-site during remedial activities.

Drinking Water Standards

- NYSDOH Drinking Water Standards (10 NYCRR Part 5). Potentially applicable if an action involves future use of groundwater as a public supply source.

Soil Vapor Guidance

- Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH 2006) is considered relevant and appropriate to soil vapor at the Site. The 2006 NYSDOH Vapor Intrusion guidance indicates that the State of New York does not have any standards, criteria, or guidance values for subsurface vapors.

8.2.2 Location-Specific Standards, Criteria, and Guidance

Location-specific SCGs are those that are applicable or relevant and appropriate due to the location of the Site or area to be remediated. Based on the historic site information, there is no location specific criteria that could be applicable. If a location specific criterion exists, it may be superseded by chemical-specific or action-specific criteria listed in this section.

8.2.3 Action-Specific Standards, Criteria, and Guidance

Action-specific SCGs are requirements which set controls and restrictions to particular remedial actions, technologies, or process options. These regulations do not define site cleanup levels but do affect the implementation of specific remedial technologies. These action-specific SCGs are considered in the screening and evaluation of various technologies and process options in subsequent sections of this report.

8.2.3.1 Federal Standards, Criteria, and Guidance

General - Site Remediation

- Occupational Safety and Health Administration (OSHA) Worker Protection (29 CFR 1904, 1910, 1926)

- Federal Resource Conservation and Recovery Act - Identification and Listing of Hazardous Waste (40 CFR 261); Standards Applicable to Generators of Hazardous Waste (40 CFR 262); Standards Applicable to Owners and Operators of Treatment, Storage, and Disposal Facilities (40 CFR 264)

Transportation of Hazardous Waste

- Hazardous Materials Transportation Regulations (49 CFR 107, 171, 172, 177, and 179)

- Federal Resource Conservation and Recovery Act - Standards Applicable to Transporters of Hazardous Waste (40 CFR 263)

Disposal of Hazardous Waste

- Federal Resource Conservation and Recovery Act - Land Disposal Restrictions (40 CFR 268)

Discharge of Groundwater

- Federal Clean Water Act - National Pollutant Discharge Elimination System (40 CFR 100 et seq.); Effluent Guidelines and Standards for the Point Source Category (40 CFR 414); Ambient Water Quality Criteria (40 CFR 131.36)

- Federal Safe Drinking Water Act - Underground Injection Control Program (40 CFR 144, 146)

Off-Gas Management

- Federal Clean Air Act - National Ambient Air Quality Standards (40 CFR 50); National Emission Standards for Hazardous Air Pollutants (40 CFR 61)
- Federal Directive - Control of Air Emissions from Superfund Air Strippers (OSWER Directive 9355.0-28)

8.2.3.2 New York Standards, Criteria, and Guidance

New York Solid and Hazardous Waste Management Regulations (6 NYCRR)

- Hazardous Waste Management System - General (Part 370)
- Solid Waste Management Regulations (Part 360)
- Identification and Listing of Hazardous Waste (Part 371)

Transportation of Hazardous Waste (6 NYCRR)

- Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities (Part 372)
- Waste Transporter Permit Program (Part 364)

Disposal of Hazardous Waste (6 NYCRR)

- Standards for Universal Waste (Part 374-3)
- Land Disposal Restrictions (Part 376)

Discharge of Groundwater (6 NYCRR)

- The New York Pollutant Discharge Elimination System (NYPDES) (Part 750-757)
- New York State Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations (6 NYCRR Part 703)
- New York State Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (TOGS 1.1.1)

Off-Gas Management

- New York General Provisions (6 NYCRR Part 211)
- New York Air Quality Standards (6 NYCRR Part 257)
- New York State Department of Environmental Conservation (DAR-1) Air Guide 1, Guidelines for the Control of Toxic Ambient Contaminants
- New York State Department of Health Generic Community Air Monitoring Plan

8.3 Preliminary Remediation Goals

PRGs were selected based on federal or state promulgated SCGs, background concentrations, and with consideration also given to other requirements such as analytical detection limits and guidance values. There are no chemical-specific Federal SCGs for cleanup of contaminated soil, but there is State SCG for soil. Therefore, NYSDEC Unrestricted Use Soil Cleanup Objectives are applicable requirements according to NYSDEC Site Remedial Program under 6 NYCRR Part 375 Subpart 375-6.

Groundwater in the vicinity of the Site currently is not being used as a source of drinking water, but NYSDEC classifies fresh groundwater in the state as “Class GA fresh groundwater”, for which the assigned best usage is as a source of potable water supply. Therefore, although there are no known current users of groundwater at or near the Site, the groundwater is assumed to be a source of drinking water in the future. Therefore, New York State Groundwater Quality Standards are applicable requirements and the Federal and New York State primary drinking water standards are applicable if an action involves future use of groundwater as a public supply source. The site-related constituents of concern are PCE, TCE, *cis*-1,2-DCE, and VC.

8.3.1 Groundwater Preliminary Remediation Goals

Groundwater PRGs are based on New York State Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (TOGS 1.1.1).

- Tetrachloroethene: 5 µg/L
- Trichloroethene: 5 µg/L
- *Cis*-1,2-dichloroethene: 5 µg/L
- Vinyl chloride: 2 µg/L

8.3.2 Soil Vapor Preliminary Remediation Goals

The Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH 2006) is considered relevant and appropriate to soil vapor at the Site. The 2006 NYSDOH Vapor Intrusion guidance indicates that the State of New York does not have any SCG values for subsurface vapors. However, air guideline values and the sub-slab vapor/indoor air matrices in the 2006 NYSDOH Vapor Intrusion guidance are compared to soil vapor concentrations that do not have a set standard, in order to identify if soil gas and sub-slab vapor should be mitigated. Refer to Section 4.6 for a summary of sample results and corresponding actions suggested by the guidance.

8.3.3 Soil Preliminary Remediation Goals

Soil PRGs are based on the NYSDEC Soil Cleanup Objectives 6 NYCRR 375-6. The remedy will attempt to achieve pre-release conditions or at a minimum achieve remediation that will prevent off-site migration of contaminated groundwater, prevent inhalation of or exposure from contaminants volatizing from contaminants in soil, and prevent migration of contaminants that would result in groundwater contamination.

8.4 Identification of Target Remediation Zones

Plan and profile views of the target remediation zones are presented on **Figure 8-1** and **Figure 8-2**. Three target remediation zones are displayed on the figures. Target Remediation Zone 1 is the source zone associated with the former location of the dry cleaning machine on the west side of the building. Target Remediation Zone 3 is the source zone associated with the unlined trench used to dispose of sludge from the dry cleaning machines when the facility was operating. It should be noted that these two Zones extend from ground surface to bedrock, encompassing the underlying sandy clay water bearing zone. Estimates of the mass of total VOCs in each target remediation zone (calculated using a statistical interpolation of sample results) is presented in Table 8-1.

Target Remediation Zone 2 is the sandy clay water bearing zone in between Target Remediation Zones 3 and 1. The rationale for the drawing of this zone is that contamination entered groundwater on the upgradient side of the building—Target Remediation Zone 3—and due to the westerly groundwater gradient, migrated by advection through the water bearing zone under the building. It is assumed that the entire thickness of the water bearing zone in Target Remediation Zone 2 is contaminated.

The distal portions of the plume, where groundwater contaminant concentrations are low (less than 1 ppm), are not included in the Target Remediation Zones as it is assumed that contamination will be addressed through natural attenuation and long-term monitoring (and not active remediation).

Note that NYSDOH guidance suggests that mitigation be undertaken to minimize potential exposures associated with soil vapor intrusion at the Site buildings. The Target Remediation Zones are designed to address the underlying cause of vapor intrusion. Therefore, no separate target remediation zone for vapor is warranted.

Section 9

Section 9

General Response Actions

Based on the established RAOs and site conditions, general response actions (GRAs) were identified. GRAs are those actions that, alone or in combination, satisfy the RAOs for the identified media by reducing the concentrations of hazardous substances or reducing the likelihood of contact with hazardous substances. The GRAs appropriate for addressing contamination at the Site include:

- No Action
- Institutional/Engineering Controls
- Monitoring Natural Attenuation
- Containment
- Removal/Extraction
- Treatment, and
- Disposal/Discharge

These GRAs are discussed in the following sections.

9.1 No Action

The National Contingency Plan (NCP) and CERCLA require the evaluation of a No Action alternative as a basis for comparison with other remedial alternatives. Under the No Action alternative, remedial actions are not implemented, the current status of the Site remains unchanged, and no action would be taken to reduce the potential for exposure to contamination.

9.2 Institutional/Engineering Controls

Institutional/Engineering Controls (I/EC) typically are restrictions placed to minimize access (e.g., fencing) or future use of the site (e.g., well drilling restriction). These limited measures are implemented to provide some protection of human health and the environment from exposure to site contaminants. They are also used to continue monitoring contaminant migration (e.g., long-term monitoring). I/EC are generally used in conjunction with other remedial technologies; alone they are not effective in preventing contaminant migration or reducing contamination.

9.3 Monitor Natural Attenuation

Monitor Natural Attenuation (MNA) is a response action by which the volume and toxicity of contaminants are reduced by naturally occurring processes in the groundwater. Processes which reduce contamination levels in groundwater include dilution, dispersion, volatilization, adsorption, biodegradation, and chemical reactions with other subsurface constituents. This naturally occurring attenuation is expected to reduce contaminant levels to the PRGs within a reasonable timeframe and/or within a reasonable physical boundary.

9.4 Containment

Containment actions use physical, low permeability barriers and/or groundwater extraction wells to minimize or eliminate contaminant migration. Containment technologies do not involve treatment to reduce the toxicity or volume of contaminants. The response actions require long-term monitoring to determine whether containment actions are performing successfully. The NCP does not prefer containment response actions since they do not provide permanent remedies.

9.5 Removal/Extraction

Removal response actions refer to methods typically used to excavate and handle soil, sediment, waste, and/or other solid materials. An extraction-based response action provides reduction in mobility and volume of contaminants by removing the contaminated groundwater from the subsurface using such means as groundwater extraction wells or interceptor trenches. Groundwater extraction can provide hydraulic control to prevent migration of dissolved contaminants. Groundwater extraction is usually used in conjunction with other technologies, such as treatment or disposal options, to achieve the RAOs for the removed media. The extraction response action does not reduce the concentrations of contaminants in groundwater. It merely transfers the contaminants to be managed under another response action.

9.6 Treatment

Treatment involves the destruction of contaminants in the affected media, transfer of contaminants from one media to another, or alteration of the contaminants thereby making them innocuous. The result is a reduction in toxicity, mobility, or volume of the contaminants. Treatment technologies vary among environmental media and can consist of chemical, physical, thermal, and biological processes. Treatment can occur in place (in-situ) or aboveground (ex-situ), in which case would require coupling with removal/extraction. This GRA is usually preferred unless site- or contaminant-specific characteristics make it infeasible from an engineering or implementation perspective, or too costly.

9.7 Disposal/Discharge

Discharge response actions for groundwater involve the discharge of extracted groundwater via on-site injection, on-site surface recharge or surface water discharge following treatment to meet regulatory discharge and disposal requirements. Disposal of soils after removal or in conjunction with removal and treatment requires compliance with State and Federal Hazardous Waste Transportation and Disposal regulations if levels present in media require such compliance.

Section 10

Section 10

Identification and Screening of Remedial Technologies

Potential remedial technologies and process options associated with each general response action for soil, vapor, and groundwater will be identified and screened in this section. Representative remedial technologies and process options that are retained will be used to develop remedial action alternatives.

The technology screening approach is based upon the procedures outlined in DER-10. The evaluation process uses three criteria: Effectiveness, Implementability, and Relative Cost. Among these three, the effectiveness criterion outweighs the implementability and relative cost criteria. These criteria are described below:

- **Effectiveness:** This evaluation criterion focuses on the effectiveness of process options to reduce the toxicity, mobility, or volume of contamination for long term protection and for meeting the RAOs and RGs. It also evaluates the potential impacts to human health and the environment during construction and implementation, and how proven and reliable the process is with respect to site-specific conditions.

- **Implementability:** This evaluation criterion encompasses both the technical and administrative feasibility of the technology or process option. It includes an evaluation of pretreatment requirements, residuals management, and the relative ease or difficulty in performing the operation and maintenance (O&M) requirements. Process options that are clearly ineffective or unworkable at the site are eliminated by this criterion.

- **Relative Cost:** Cost plays a limited role in the screening process. Both capital costs as well as O&M costs are considered. The cost analysis is based on engineering judgment and each process is evaluated as to whether costs are low, moderate, or high relative to the other options within the same technology type.

Tables 10-1, 10-2, and 10-3 present the effectiveness, implementability, and relative cost of remedial technologies considered for groundwater, soil, and vapor, respectively. Retained remedial technologies and process options are used to develop remedial action alternatives, either alone or in combination with other technologies.

Section 11

Section 11

Development and Analysis of Remedial Alternatives

Representative remedial technologies and process options that have been retained during the screening in Section 10 were used to develop the remedial action alternatives described in this section.

11.1 Evaluation Criteria for Detailed Screening of Technologies

The technology screening approach is based upon the procedures outlined in "DER-10 Technical Guidance for Site Investigation and Remediation" (NYSDEC 2010). These criteria are classified into the following 3 groups and are described below:

11.1.1 Threshold Criteria

Threshold criteria are requirements that each alternative must meet in order to be considered for selection.

Overall Protection of Human Health and the Environment: This criterion is an evaluation of the remedy's ability to protect public health and the environment, assessing how risks posed through each existing or potential pathway of exposure are eliminated, reduced or controlled through removal, treatment, engineering controls or institutional controls. The remedy's ability to achieve each of the RAOs is evaluated.

Compliance with SCGs: Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria. In addition, this criterion includes the consideration of guidance which the Department has determined to be applicable on a case-specific basis.

11.1.2 Primary Balancing Criteria

These criteria are used to distinguish the relative effectiveness of each alternative so that decision makers compare the positive and negative aspects of each of the remedial strategies.

Long-term Effectiveness and Permanence: This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.

Reduction of Toxicity, Mobility or Volume: Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

Short-term Effectiveness: The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

Implementability: The technical and administrative feasibility of implementing each alternative is evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.

Cost-Effectiveness: Capital costs and annual operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where 2 or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision.

11.1.3 Modifying Criterion

This criterion is taken into account after evaluating those above. It is evaluated after public comments on the FS and Proposed Remedial Action Plan (PRAP) have been received. This criterion is not evaluated in this FS.

Community Acceptance. Concerns of the community regarding the RI/FS report and the PRAP are evaluated. A responsiveness summary will be prepared that describes public comments received and the manner in which the Department will address the concerns raised. If the selected remedy differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

Note that “Land Use” is not an applicable criterion since the remedial goal is unrestricted use.

11.2 Development and Detailed Analysis of Remedial Action Alternatives

Remedial action alternatives have been developed based on the potential for these alternatives to meet the SCGs, RAOs, and RGs described in Section 8. In Section 10, a preliminary screening of available remedial action technologies was performed. The technologies and processes retained are used to develop remedial action alternatives in this Section.

11.2.1 Assumptions and Common Components

In order to meet the RAOs, the technologies and process options retained after the screening step were combined into the following 5 alternatives. Conceptual designs for these alternatives were developed and costed, and are presented in this section.

- Alternative 1 – No Action
- Alternative 2 – Return to pre-disposal conditions
- Alternative 3 – Excavation

- Alternative 4 – Containment
- Alternative 5 – Limited Excavation

The No Action alternative was retained in accordance with DER-10 to serve as a baseline for comparison with the other alternatives for the site. Additionally, Alternative 2 was retained to comply with the DER-10 requirement to develop an alternative that returns the site to "pre-disposal conditions."

Some alternatives may require pre-design investigations, modeling, site-specific treatability studies, and/or pilot studies to confirm that selected technologies will adequately address contamination.

It is assumed that the common elements listed below will be included as part of each of the remedial alternatives (except Alternatives 1):

- Vapor mitigation - Site-related contaminants were detected in indoor air in the site buildings at levels where NYSDOH guidance suggests mitigation. Vapor mitigation will be installed at the on-site building until the sources of vapor contamination have been remediated.
- Storm drain and sump cleanout – Site-related contaminants were detected in the sump in the building and in the storm sewer east of the building. The sump and the storm sewer would be cleaned out, and the sump would be closed and cemented in.
- Long-term monitoring – Periodic monitoring would be implemented when contaminants remain above levels that allow for unrestricted use. The monitoring program should continue until concentrations have stabilized or met remedial goals.
- Institutional controls – Institutional controls such as environmental easements would restrict the future use of the Site and groundwater. They would require precautions to be taken to protect human health in the event remedial measures are disturbed.

11.2.2 Alternative 1 – No Action

The No Action alternative was retained for comparison purposes as required by DER-10. No remedial actions would be implemented as part of the No Action alternative. Groundwater would continue to migrate and the contamination would continue to attenuate through dilution, dispersion, limited biodegradation, etc. This alternative does not include vapor mitigation, institutional controls or long-term monitoring of soil, vapor, or groundwater.

11.2.2.1 Overall Protection of Human Health and the Environment

The No Action alternative does not provide overall protection of human health and the environment and does not meet the RAOs. Currently, contaminated groundwater is not used as drinking water. However, this alternative does not prevent future use of contaminated groundwater, which poses potential human risks above EPA threshold values through direct contact, ingestion, and inhalation. Because no remedial action would be implemented under this alternative, no means would be available to prevent current and future exposure.

11.2.2.2 Compliance with SCGs

Due to the presence of chlorinated VOCs above the soil, groundwater, and indoor air quality standards, this alternative would not comply with the chemical-specific SCGs for groundwater for a sustained period. As this alternative involves no action, location- and action-specific SCGs are not applicable.

11.2.2.3 Long-Term Effectiveness and Permanence

The No Action alternative is not considered a permanent remedy. The contaminants would not be destroyed, yet concentrations would be reduced only gradually through natural processes. This alternative, however, would not provide adequate control of risks to human health or the environment because there are no mechanisms to prevent current and future exposure. Under this alternative there would be no mechanism in place to prevent future risk to human health; therefore, this alternative would not be considered effective in the long term.

11.2.2.4 Reduction of Toxicity, Mobility or Volume through Treatment

The implementation of this alternative would not affect the toxicity, mobility, or volume of the contamination.

11.2.2.5 Short-Term Effectiveness

This alternative would not include a remedial action. Therefore, it would have no short-term impact to workers or the community. There would be no adverse environmental impacts to habitats or vegetation.

11.2.2.6 Implementability

This alternative is easily implemented, since no services or permits would be required.

11.2.2.7 Cost

There would be no cost under this alternative.

11.2.3 Alternative 2 – Return to Pre-Disposal Conditions

This alternative has been included in accordance with DER-10 Section 4.4 (b) 3 (ii), which states that 1 or more alternatives capable of achieving cleanup to pre-disposal or unrestricted use condition must be developed as part of the FS.

The Doro Cleaners site is characterized by contamination in both the unsaturated soils, saturated soils, and diffusion-driven contamination in the underlying unsaturated till and bedrock. Significant (e.g., ppm-level) groundwater contamination is limited to the area under and immediately adjacent to the site building. Under Alternative 2, cleanup to pre-disposal or unrestricted condition at the site is achieved through removal of contaminated soil, saturated soil, and bedrock by excavation and off-site disposal in Target Remediation Zones 1 and 3, in-situ treatment of the ppm-level (greater than 999 µg/L) groundwater contamination (Target Remediation Zone 2), and natural processes in the distal parts of the plume.

Pre-Design Investigation. In order to develop a cost-effective remedial design, environmental, microbiological, geotechnical, and structural data would be collected. Soil borings would be advanced to determine the horizontal extent of contamination as well as the vertical extent of contamination in the bedrock. The RI data indicated that PCE was present in the bedrock, but the depth of impact was not delineated fully. Contaminant concentrations in groundwater directly under the building would also be investigated with sampling. For groundwater outside the target remediation zone, samples would be collected to verify the presence or absence of microbes capable of degrading the 2 major groundwater contaminants, *cis*-1,2-DCE and VC. Additionally, an evaluation of the site building would be conducted to inform the evaluation and design of structural support of the on-site building required during the excavations.

Excavation and Disposal. For this alternative, the soils in Target Remediation Zones 1 and 3 would be excavated and disposed of off-site. The Site work would include structural stabilization of the on-site building. The depth of the excavation would be confirmed by the pre-design investigation. For costing purposes, it is assumed that contamination extends 6 inches into the bedrock (to a total depth of 14 feet bgs). The removal of all contaminated soils would be confirmed by performing post-excavation sampling in the excavated areas. During excavation and backfill activities, dewatering would be performed in order to maintain the water levels below the depths of excavation/backfill activities. The contaminated water generated during the dewatering activities would be tested for toxicity characteristics and disposed of off-site. The contaminated soils that are classified as hazardous would be disposed of in an appropriate Subtitle C landfill. The remainder of the contaminated materials that are classified as non-hazardous would be disposed of in a Subtitle D landfill. The determination of whether the contaminated material is hazardous or non-hazardous would be based on toxicity characteristic analysis of the excavated soils. For purposes of cost estimation, this FS assumes that 10% of the materials disposed of offsite would be classified as hazardous.

Backfill with amendments. An amendment that promoted degradation of remaining low-level contamination in groundwater would be added to the soils used to backfill the excavation. For cost-estimating purposes, it is assumed that an oxygen releasing amendment would be added to the backfill, though alternative amendments such as zero valent iron or ISCO should also be considered during design. Over time, contaminants would be degraded as they are carried via advection and stormwater infiltration into the reactive zone created by the amended backfill.

In situ chemical oxidation treatment of groundwater. The contaminated groundwater in Target Remediation Zone 2 would be treated in-situ. A bench-scale treatability study and a pilot study would be conducted to determine the most cost-effective method to reduce contaminant concentrations in the groundwater. For cost-estimating purposes, it is assumed that chemical oxidation (ISCO) would be used to destroy contaminants in situ. If ISCO is used, the bench scale study would determine the natural soil oxidant demand at the site.

As with all ISCO applications, the amendment must make contact with the contaminant in order for the oxidation reaction to occur. The target remediation zone to be treated with ISCO is a low-permeability sandy clay. Distributing ISCO via injection is not recommended because the radius of influence would be minimal in the sandy clay. Environmental fracturing and emplacement is also not recommended because the zone is not thick (only a few feet); how fractures propagate cannot be controlled effectively, and it would be difficult to effectively target such a thin zone. An innovative technology, electrokinetics, would likely be the most effective way to distribute ISCO amendment at this site, and is thus the assumed method in this alternative for costing purposes.

With electrokinetics and ISCO, 4 inch monitoring wells would be installed on 14 foot centers in the target remediation zone, and electrodes would be placed at the elevation of the contamination (approximately a 5 foot thickness). Additional injection wells would be installed in between the electrodes such that each electrode was no more than 7 feet from an injection well. For cost-estimating purposes, it is assumed that permanganate would be the oxidant added to the injection wells. The electrodes would be wired to create an array of anodes and cathodes. A DC current would be applied at approximately 0.22 watts per electrode to create an electric field in the subsurface between cathodes and anodes. Since permanganate exists in solution as a negatively charged ion, it is drawn to the positively charged cathode by electromigration in the electric field. The rate of migration of the oxidant would have to be determined in a pilot test, but for cost-estimating purposes it is assumed to be 3 centimeters per day (a rate observed by the electrokinetics technology vendor at other sites). The critical benefit of this technique is that the oxidant can be distributed into the low-permeability sandy clay (something that cannot be said for injection, and is hit-or-miss for fracturing). With electrokinetics, the oxidant can make contact with contaminants that have diffused into low-permeability soils. This in situ contact in the sandy clay at the site will mitigate the "rebound" problem seen with other ISCO delivery techniques.

For cost-estimating purposes, it is assumed that 3 rounds of distribution of permanganate with electrokinetics will be completed. Since the rate of migration is 3 centimeters per day and the migration has to cover 7 feet (213 centimeters), each round of distribution will take approximately 71 days.

11.2.3.1 Overall Protection of Human Health and the Environment

This alternative would protect human health and the environment. The likely sources of indoor air contamination (soil contamination) would be removed from the site and disposed of in a secure, permitted landfill. In groundwater, active, in-situ remediation would be conducted in the zone of highest groundwater contamination under the site building, and monitoring would be conducted in the distal portions of the plume. This alternative would meet the RAOs.

11.2.3.2 Compliance with SCGs

This alternative would achieve chemical-specific SCGs at the Site because the contamination would be either removed, destroyed in-situ, or be reduced through natural processes.

11.2.3.3 Long-Term Effectiveness and Permanence

Excavation and disposal would be permanent and effective over the long-term since the contamination would be removed and disposed of in a secure, permitted landfill. Confirmation sampling would be conducted at the bottom of the excavated pit to ensure that negligible residual contamination above SCGs remained. For in-situ treatment of groundwater, effectiveness co-relates to the ability to distribute amendment in the treatment zone. Effectiveness of in-situ treatment should be confirmed with a pilot test prior to implementing a full-scale system. Confirmation sampling would also be conducted after in-situ treatment of the groundwater to ensure that contamination was destroyed. The distal portions of the plume would be monitored over the long-term to document that the plume would be shrinking.

11.2.3.4 Reduction of Toxicity, Mobility or Volume through Treatment

The toxicity, volume and mobility of contamination at the site would be reduced significantly since contamination would either be destroyed in-situ or be excavated and removed from the site.

11.2.3.5 Short-Term Effectiveness

This alternative would include significant site work and would cause disruption to the on-site business. For a period of approximately 36 months, the in situ groundwater treatment would require remediation infrastructure covering a significant indoor part of the site building. Use of engineering controls and personal protective equipment (PPE) during groundwater sampling would minimize contaminant exposure to workers.

11.2.3.6 Implementability

Due to the proximity of the target remediation zone to the site buildings, shoring would likely be required for excavation to proceed safely. The scope and scale of shoring is unknown at this time because a geotechnical and structural evaluation was not in the scope of the RI. This evaluation would be completed during a pre-design investigation. Excavation must be combined with engineering controls during implementation—including vapor emissions control—to provide protection to workers and the environment.

To be effective, in-situ treatment of Target Remediation Zone 2 would likely require an innovative technique—electrokinetics—to distribute amendment in the low-permeability sandy clay. As of the writing of this FS, CDM Smith has identified one technology vendor in the US and one in Canada with experience in electrokinetics. The limited supply of electrokinetics vendors may impact implementability.

11.2.3.7 Cost

The total present worth for Alternative 2 is $3,902,000. The estimated capital cost is $3,368,000. The estimated monitoring cost over 30 years is $534,000. Detailed cost estimates are presented in **Appendix H**.

11.2.4 Alternative 3 – Excavation

Under this alternative, excavation, disposal, and backfill with an amendment that promoted degradation would be conducted as described in Alternative 2; the major difference is that no in situ chemical oxidation treatment of groundwater would be conducted for this alternative. For the amended backfill, amendments should be evaluated separately for each of the two excavations during design, considering that the upgradient backfill will likely receive minimal influx of contamination after the excavation, whereas the downgradient backfill will receive influx from the groundwater contamination under the building. Natural processes would be relied upon to attenuate contaminants in groundwater at the Site, including the groundwater under the site building.

11.2.4.1 Overall Protection of Human Health and the Environment

This alternative would protect human health by removing the likely sources of indoor air contamination (soil contamination) from the site and disposing of it in a secure, permitted landfill. The majority of the soil contamination that would result in further groundwater contamination would be removed; however, the ppm-level concentrations of contaminants detected in groundwater during the RI would not be actively treated. Vapor rising from the groundwater would not impact occupants of the site building as long as the vapor mitigation system remained operational. While aerobic conditions in the groundwater under the site building may be conducive to the biodegradation of *cis*-1,2-DCE and VC, attenuation rates are not known and any PCE present would not be expected to degrade—although degradation of these contaminants could be possible as they flow into the amended backfill zone if a suitable amendment is used. Long-term monitoring would be conducted to ensure that the plume did not further expand and concentrations reduce by natural processes over time.

11.2.4.2 Compliance with SCGs

This alternative would achieve chemical-specific SCGs at the Site because the contamination would be either removed or be reduced through natural processes.

11.2.4.3 Long-Term Effectiveness and Permanence

Excavation and disposal would be permanent and effective over the long-term since the contamination would be removed and disposed of in a secure, permitted landfill. Confirmation sampling would be conducted in the excavation to ensure that only negligible residual contamination above SCGs remained. The excavation would remove the sources of groundwater contamination; groundwater monitoring would be conducted over the long-term to document that the plume shrinks. Microbial analysis is recommend to ensure that appropriate bacteria and genes are present for degradation of the groundwater contaminants present at ppm levels (*cis*-1,2-DCE and VC). The backfill will be amended with an amendment with the intent of enhancing and maintaining degradation of the contaminants. In the distal portions of the plume, natural processes such as dilution and dispersion are expected to reduce low-level concentrations over time. Given the slow groundwater velocity, these processes in groundwater are expected to take decades.

11.2.4.4 Reduction of Toxicity, Mobility or Volume through Treatment

The toxicity, volume and mobility of contamination at the site would be reduced significantly since vadose zone contamination would be excavated and disposed of in a permitted facility. The toxicity, volume and mobility of groundwater contaminants would not be reduced through treatment. However, *cis*-1,2-DCE and VC can degrade in the aerobic conditions at the site if a suitable microbial population is present. Amendments in the backfill will promote degradation, but only in the immediate vicinity of the backfill, as advection would be relied upon to either distribute amendment or transport contaminants into a reactive zone formed by the amendment. Groundwater flow velocity is slow, and thus the rate at which the residual contaminant mass is degraded would be slow. Contaminants in groundwater are also expected to dilute and disperse over time.

11.2.4.5 Short-Term Effectiveness

This alternative would include significant site work and would cause disruption to the on-site business. The excavation would disrupt the site for approximately 3 months. Use of engineering controls and PPE during groundwater sampling would minimize contaminant exposure to workers.

11.2.4.6 Implementability

Due to the proximity of the target remediation zone to the site buildings, shoring would likely be required for excavation to proceed safely. The scope and scale of shoring is unknown at this time because a geotechnical and structural evaluation was not in the scope of the RI. This evaluation would be completed during a pre-design investigation. Excavation must be combined with engineering controls during implementation—including vapor emissions control--to provide protection to workers and the environment.

11.2.4.7 Cost

The total present worth for Alternative 3 is $2,734,000. The estimated capital cost is $2,175,000. The estimated monitoring cost over 30 years is $559,000. Detailed cost estimates are presented in **Appendix H**.

11.2.5 Alternative 4 – Containment

Under this alternative, caps would be installed to cover Target Remediation Zones 1 and 3 as shown on **Figure 8-1**. The purpose of the caps would be to reduce rainwater infiltration as much as possible through contaminated soils. The existing building on site would also need to be retained to serve as an effective cap because it diverts rainwater from the Target Remediation Zone 2 under the building. For cost estimating purposes, it is assumed that the cap to be installed would consist of concrete overlying the native clay soils or existing pavement.

Cap Installation. Cap installation would be completed with widely available construction techniques and equipment. The cap would cover the outdoor area in and around the target remediation zone. Approximately 6 inches of concrete would be laid to form the cap. The cap would cover a surface area of approximately 3,500 square feet, which is anticipated to be larger than the remediation target zone in order to limit any horizontal infiltration of water. The cap would be engineered to limit any infiltration of rainwater into the contaminated soils, meaning that durable, low-permeability material would be used, and rainwater would be directed away from the remediation zone. It is assumed that installation would take place over an estimated one month period.

Cap Monitoring and Maintenance. The cap would require yearly inspection to look for cracks or other areas where water could seep through and into the soils. For costing purposes, it is assumed that maintenance would be needed every 7 years to seal cracks or replace deteriorated concrete.

11.2.5.1 Overall Protection of Human Health and the Environment

This alternative would provide conditional protection of the environment. The cap would be a barrier to direct exposure of contaminated soil to humans and biota and would minimize infiltration of rainwater into the ground. Vadose zone contamination could impact groundwater in the future if the cap is disturbed and precipitation is allowed to infiltrate into the contaminated soils.

PPM-level concentrations of contaminants detected in groundwater during the RI would not be actively treated. Vapor rising from the groundwater would not impact occupants of the site building as long as the vapor mitigation system remained operational. While aerobic conditions in groundwater are likely conducive to the degradation of *cis*-1,2-DCE and VC (the principle contaminants in groundwater), attenuation rates are not known. Long-term monitoring would be conducted to ensure that the plume did not further expand and concentrations reduce by natural processes over time. Installation of the vapor mitigation system would mitigate risks from vapor intrusion.

11.2.5.2 Compliance with SCGs

Chemical-specific SCGs at the Site for soil would not be expected to be achieved in the short- or medium-term because the contamination would remain in place. Natural processes would be relied upon to achieve chemical-specific SCGs for groundwater.

11.2.5.3 Long-Term Effectiveness and Permanence

This alternative could be effective in the long-term but may not provide a permanent remedy. The contamination would be left in place and potentially could continue to migrate to the underlying groundwater, albeit at a slower rate because of the cap. Due to the elevated concentrations of contaminants left in place, the land use would be limited. Any redevelopment would require additional remediation to be performed. Capping and deed notices would provide adequate control of the contaminants left in place if the cap is well-maintained and monitored, and the deed notices are heeded. In order for it to be effective over the long term, the cap would need to be regularly maintained. Over decades, concentrations under the cap may decrease slightly due to volatilization and biodegradation, but not likely enough to meet SCGs.

Groundwater monitoring would be conducted over the long-term to document that the plume shrinks. Microbial analysis is recommend to ensure that appropriate bacteria and genes are present for direct oxidation of the groundwater contaminants present at ppm levels (*cis*-1,2-DCE and VC). In the distal portions of the plume, natural processes such as dilution and dispersion are expected to permanently reduce low-level concentrations over time. Given the slow groundwater velocity, these processes would take on the order of decades.

11.2.5.4 Reduction of T/M/V through Treatment

Capping should reduce the mobility of the contamination by limiting migration of contamination via rainwater percolation through the soil. Capping would not reduce toxicity or volume. The toxicity, volume and mobility of groundwater contaminants would not be reduced through treatment.

11.2.5.5 Short-Term Effectiveness

This alternative would include limited site work and would cause limited impacts to the workers and surrounding buildings, approximately 1 month. Use of PPE by workers during remedial operations and sampling would minimize contaminant exposure.

11.2.5.6 Implementability

This alternative is technically implementable with available equipment, contractors, and materials.

11.2.5.7 Cost

The total present worth of Alternative 4 is $1,075,000. The estimated architecture/engineering and capital cost for Alternative 4 is $447,000. The estimated present worth of O&M and monitoring is $628,000.

11.2.6 Alternative 5 – Limited Excavation

This alternative has the same components as Alternative 3—excavation, disposal, and backfill with an amendment that promotes degradation. The difference is that the excavation would stop at the water table (approximately 7 feet bgs) and the amendment would be applied to the bottom of the excavation prior to backfilling. For cost estimating purposes, the amendment is assumed to be chemical oxidant (permanganate). The data collected during the RI indicate that Target Remediation Zone 1 may be the principal source of the indoor air contamination seen in the on-site building. Thus, removing this source will have the most effect for reducing indoor air contamination. Natural processes would be relied upon to attenuate contaminants in groundwater at the Site, including the groundwater under the site building.

11.2.6.1 Overall Protection of Human Health and the Environment

This alternative would protect human health by removing the likely sources of indoor air contamination (soil contamination) from the site and disposing of it in a secure, permitted landfill. The majority of the soil contamination that would result in further groundwater contamination would be removed; in addition, amendment applied to the bottom of each excavation prior to backfilling would provide some degradation capabilities in the immediate vicinity of the backfill. Vapor rising from the groundwater would not impact occupants of the site building as long as the vapor mitigation system remained operational. While aerobic conditions in groundwater may be conducive to the biodegradation of *cis*-1,2-DCE and VC (the principle contaminants in groundwater), attenuation rates are not known and PCE is not known to degrade under aerobic conditions. Long-term monitoring would be conducted to ensure that the plume did not further expand and concentrations reduce by natural processes over time.

11.2.6.2 Compliance with SCGs

This alternative would achieve chemical-specific SCGs at the Site because the contamination would be either removed or be reduced through natural processes.

11.2.6.3 Long-Term Effectiveness and Permanence

Excavation and disposal would be permanent and effective over the long-term since the contamination would be removed and disposed of in a secure, permitted landfill. Confirmation sampling would be conducted in the excavation to ensure that only negligible residual contamination above SCGs remained. The excavation would remove the sources of groundwater contamination; groundwater monitoring would be conducted over the long-term to document that the plume shrinks. Microbial analysis is recommend to ensure that appropriate bacteria and genes are present for degradation of the groundwater contaminants present at ppm levels (*cis*-1,2-DCE and VC). In the distal portions of the plume, natural processes such as dilution and dispersion are expected to reduce low-level concentrations over time. Given the slow groundwater velocity, these processes in groundwater are expected to take on the order of decades.

11.2.6.4 Reduction of Toxicity, Mobility or Volume through Treatment

The toxicity, volume and mobility of contamination at the site would be reduced significantly since vadose zone contamination would be excavated and disposed of in a permitted facility. The toxicity, volume and mobility of groundwater contaminants may be reduced through the application of the amendment. Although this amendment is expected to assist degradation in the immediate vicinity of the backfill, advection would be relied upon to distribute amendment, and groundwater flow velocity is slow. Contaminants are expected to dilute and disperse over time (not through treatment).

11.2.6.5 Short-Term Effectiveness

This alternative would include significant site work and would cause disruption to the on-site business. The excavation would disrupt the site for approximately 3 months. Use of engineering controls and PPE during groundwater sampling would minimize contaminant exposure to workers.

11.2.6.6 Implementability

Due to the proximity of the target remediation zones to the site buildings, shoring would likely be required for excavation to proceed safely. The scope and scale of shoring is unknown at this time because a geotechnical and structural evaluation was not in the scope of the RI. This evaluation would be completed during a pre-design investigation. Excavation must be combined with engineering controls during implementation—including vapor emissions control--to provide protection to workers and the environment.

11.2.6.7 Cost

The total present worth for Alternative 5 is $2,396,000. The estimated design costs are $500,000, estimated capital cost is $1,337,000 and the monitoring cost over 30 years is $559,000. Detailed cost estimates are presented in **Appendix H**.

11.2.7 Comparative Analysis of Alternatives

The 5 alternatives are:

- Alternative 1 – No Action
- Alternative 2 – Return to pre-disposal conditions

- Alternative 3 – Excavation
- Alternative 4 – Containment
- Alternative 5 – Limited Excavation

11.2.7.1 Overall Protection of Human Health and the Environment

Alternative 1, the no-action alternative, would not provide protection of human health and the environment since contamination would remain in place and no mechanism would be implemented to prevent exposure. The remaining alternatives are active treatment methods that either destroy mass in-situ or remove contamination from the subsurface, thereby meeting the RAOs and providing protection to human health and the environment.

Alternatives 2, 3, and 5 would provide the greatest overall protection of human health since they involve excavation of the presumed source of indoor air contamination (Target Remediation Zone 1). Alternative 4 would provide conditional protection of human health as long as the vapor mitigation system for the building was maintained.

For protection of the environment, Alternative 2 would provide the most protection since groundwater would be actively treated. The remaining alternatives rely on natural processes to reduce groundwater concentrations, and thus there is less certainty regarding protection of the environment. Of these three remaining alternatives, the excavation alternatives would provide the most protection since sources of continuing groundwater contamination would be removed. Containment (Alternative 4) would provide conditional protection as long as the cap was maintained.

11.2.7.2 Compliance with SCGs

The no-action alternative would not meet SCGs. The remaining four active remedy alternatives are designed to meet SCGs; the main differentiator is the amount of time required. Alternative 2 would be the most rapid since ppm-level groundwater would be treated; however, natural processes would still be relied upon in the distal portions of the plume to meet SCGs, and this is expected to take on the order of decades given the slow groundwater velocity. Alternatives 3, 4, and 5 also rely on natural processes in the distal portion of the plume and will require a significant time period to meet SCGs. Additionally, these alternatives rely on natural processes in the ppm-level groundwater under the building, and thus will take longer.

11.2.7.3 Long-Term Effectiveness and Permanence

The no-action alternative is not considered to be an effective or permanent remedy. The active alternatives (2 – 5) all rely on natural processes to achieve SCGs. Each relies on natural processes in the distal part of the plume; as long as the processes continue unabated, the alternatives will provide effectiveness and permanence (this would be confirmed with long-term monitoring). However, Alternative 2 would treat the ppm-level contamination under the building, and Alternative 3, 4, and 5 would rely on natural processes to reach SCGs in this zone. The ppm-level contamination would take a significantly longer time frame to attenuate to SCGs than the low-level (sub-100ppb) contamination in the distal portion. Thus Alternative 2 would achieve permanence faster than Alternatives 3, 4, and 5.

Alternative 4 relies on capping to protect human health and the environment. Capping would be conditionally effective upon regular maintenance of the vapor mitigation system and the cap. Capping may not provide a permanent remedy since contamination in the vadose zone would remain in place, and natural processes in the vadose zone are not expected to cause significant attenuation of contaminant mass.

11.2.7.4 Reduction of Toxicity, Mobility, or Volume through Treatment

The no-action alternative would not reduce toxicity, mobility, or volume of contamination through treatment. All the active alternatives (2 – 5) rely on natural processes to achieve SCGs in the distal part of the plume; long term monitoring is required to ensure that toxicity, mobility, and volume do not increase over time. Alternative 2 would cause the greatest reduction in these factors because soil contamination would be excavated and groundwater contamination in Target Remediation Zone 2 would be destroyed in-situ. The excavation alternatives would reduce the volume of contamination through treatment. Alternative 4 (containment) would be designed to reduce the mobility of contamination from the vadose zone into groundwater by reducing rainwater infiltration through the contamination. However, this reduction in mobility is contingent upon the continued maintenance of the cap.

11.2.7.5 Short-Term Effectiveness

Alternative 1 would have no short-term impact to workers or the community since remedial actions would not be performed. The key element that differentiates Alternatives 2, 3, 4 and 5 for short-term effectiveness is the amount of time that remedial construction operations would be required on-site. These time periods are:

- Alternative 2 – Approximately 36 months
- Alternative 3 – Approximately 3 months
- Alternative 4 – Approximately 1 month
- Alternative 5 – Approximately 3 months

11.2.7.6 Implementability

Alternative 1 is easily implemented since no services or permits would be required. Alternative 4, Containment, would be the next easiest to implement since the only site work would be capping of surface soils. The excavation portion of Alternatives 2, 3, and 5 would be potentially difficult to implement since shoring of the site building would likely be required to excavate safely.

Geotechnical and structural evaluation would need to be completed during a pre-design investigation. Alternative 2 would be the most difficult to implement because of the shoring requirements and the need to procure a specialty vendor to implement an innovative technology for in situ treatment of groundwater.

11.2.7.7 Cost

A comparative summary table of the present worth cost of each alternative is shown below.

Alternative 1 – No Action	$0
Alternative 2 – Return to Pre-Disposal Conditions	$3,902,000

Alternative 3 – Excavation and In Situ Treatment	$2,734,000
Alternative 4 – Containment	$1,075,000
Alternative 5 – Limited Excavation and In Situ Treatment	$2,396,000

Section 12

Section 12

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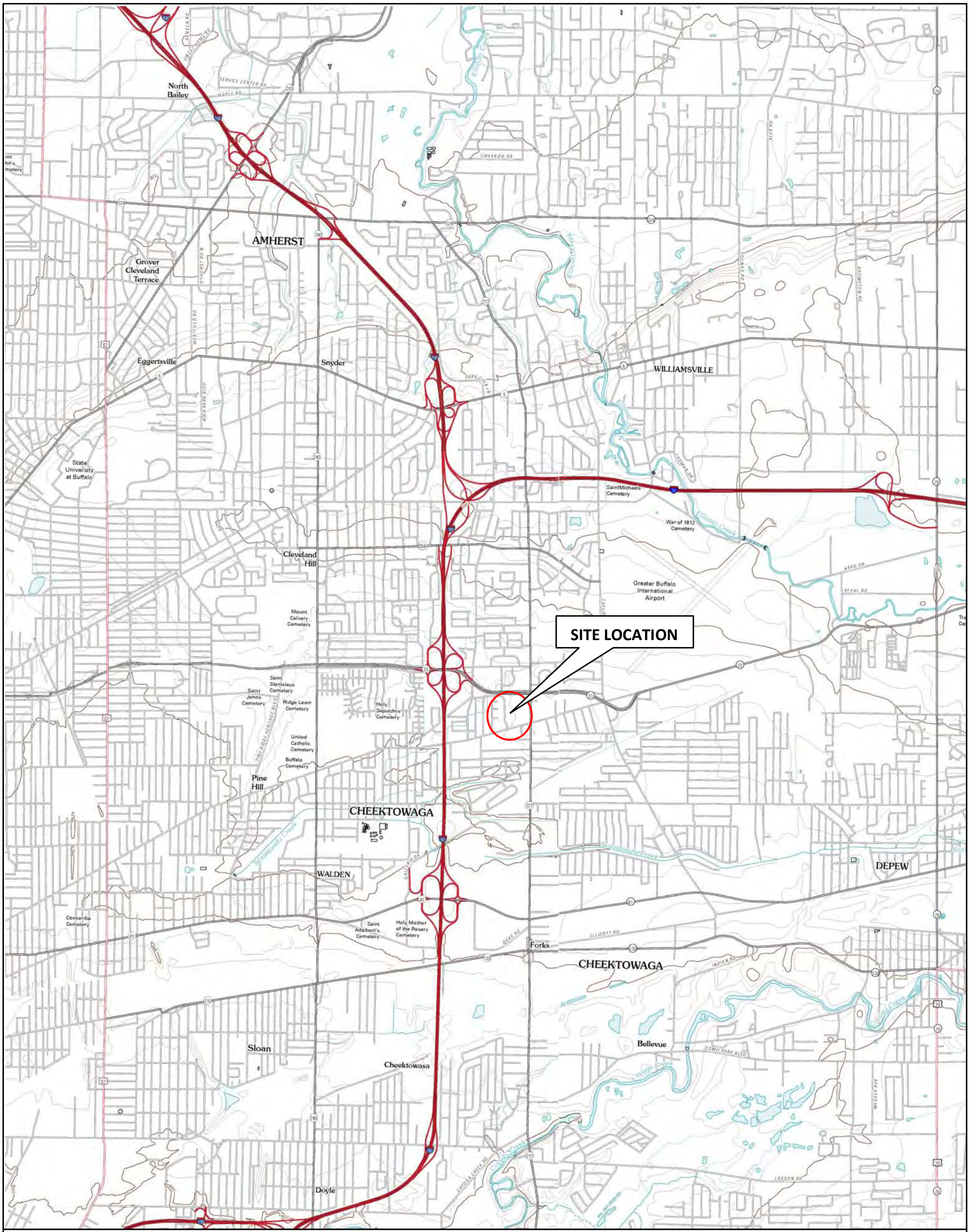
Figures



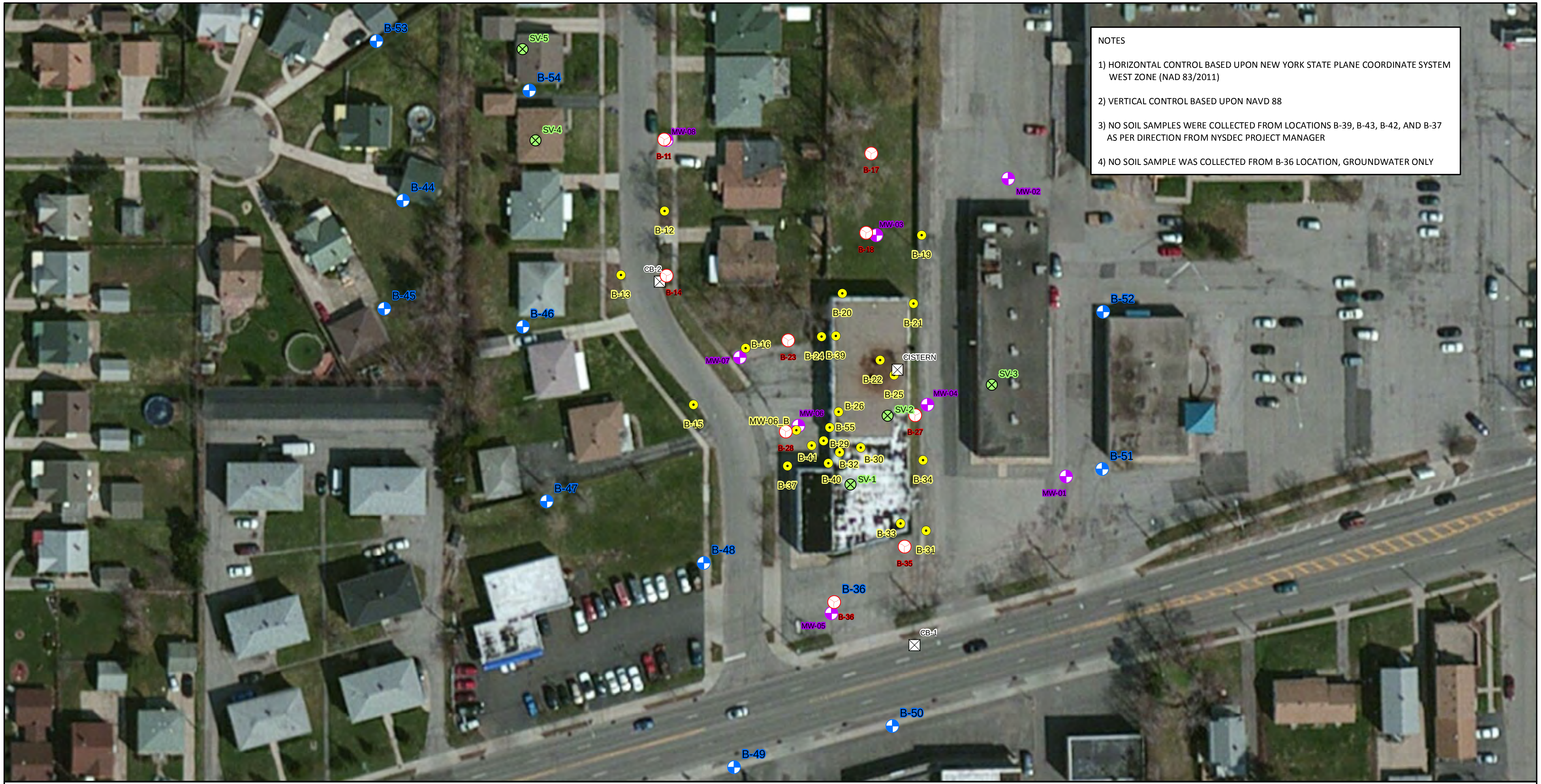
Source: USGS Topography Map, Buffalo, NY, 2010.

Site Location Map

*Map is not to scale

Figure 1-1
Former Doro Dry Cleaners
Cheektowaga, NY

CDM Smith



NOTES

1) HORIZONTAL CONTROL BASED UPON NEW YORK STATE PLANE COORDINATE SYSTEM WEST ZONE (NAD 83/2011)

2) VERTICAL CONTROL BASED UPON NAVD 88

3) NO SOIL SAMPLES WERE COLLECTED FROM LOCATIONS B-39, B-43, B-42, AND B-37 AS PER DIRECTION FROM NYSDEC PROJECT MANAGER

4) NO SOIL SAMPLE WAS COLLECTED FROM B-36 LOCATION, GROUNDWATER ONLY

N

Legend

◯	Temporary Monitoring Well and Soil Boring Sampling Locations
⊙	Soil Boring Locations
⊗	Soil Vapor Intrusion Sampling Locations
☒	Sump and Catch Basin Sampling Locations
◑	Temporary Monitoring Well Locations
◑	Permanant Monitoring Well Locations

Sample Location Plan

90 45 0 90 Feet

Figure 1-2
Former Doro Dry Cleaners
Cheektowaga, NY

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These coordinates were estimated from figures included in the following reports. Lat/Long coordinates were taken from Google Earth from approximate sample locations:

MS Analytical, LLC. 2010. Phase II Environmental Site Assessment Former Doro Cleaners Facility, 3460-3466 Genesee Street, Cheektowaga, New York.

Matrix Environmental Technologies (Matrix). 2012. Phase II Environmental Site Assessment 3470 Genesee Street, Cheektowaga, New York.

N

Legend

● Previous Sample Locations

Previous Investigation Sample Location Plan

75 37.5 0 75 Feet

Figure 1-3
Former Doro Dry Cleaners
Cheektowaga, NY

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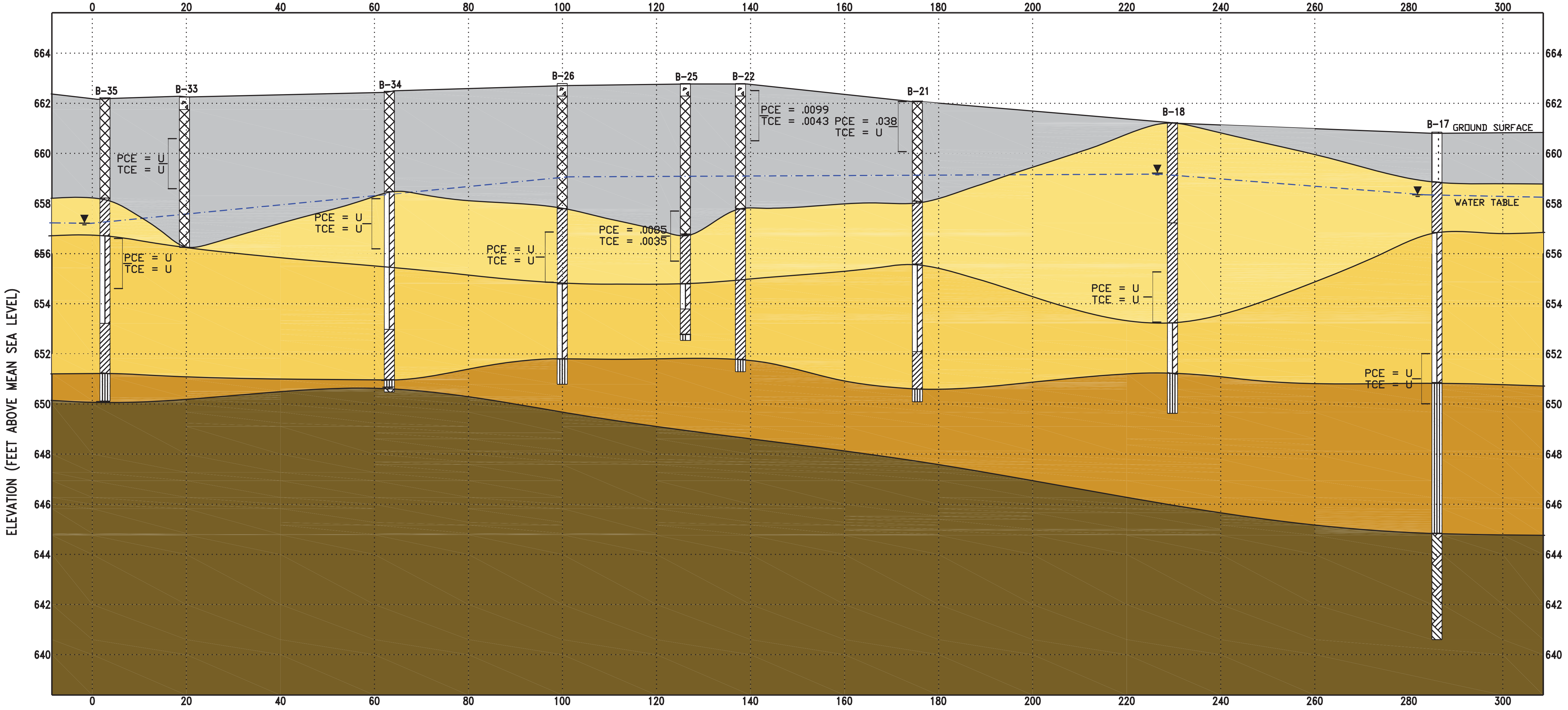
HALLETTHL \\albsvr1\Alb2_Projects\NYSDEC D007621\WA#6 - Former Doro Dry Cleaners\Reports & Studies - 03\GIS Data\Figure 1-3_102913.mxd 10/30/2013



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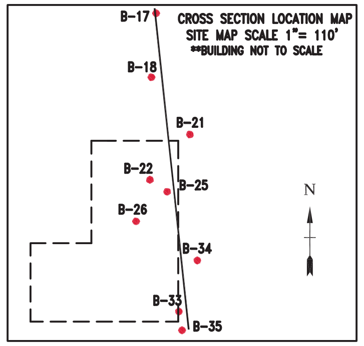


BOREHOLE LITHOGRAPHY LEGEND:

- USCS LOW PLASTICITY ORGANIC SILT OR CLAY
- USCS SILTY CLAY
- USCS POORLY-GRADED SAND WITH CLAY
- FILL MATERIAL
- USCS LOW PLASTICITY CLAY
- BEDROCK
- CONCRETE

INTERPRETED LITHOGRAPHY LEGEND:

- FILL MATERIAL
- FILL MATERIAL
- BEDROCK
- NATURAL CLAY
- GLACIAL TILL
- WATER TABLE

NOTES:

1. ALL RESULTS IN MG/KG.

2. PLEASE NOTE THAT LITHOLOGOIC INTERPRETATIONS ARE BASED ON OBSERVATIONS IN THE FIELD.

3. ANALYTES WITH U QUALIFIER ARE NOT DETECTED.

4. TCE IS TRICHLOROETHENE AND PCE TETRACHLOROETHENE.

5. VERTICAL EXAGERATION 5X

CDM Smith

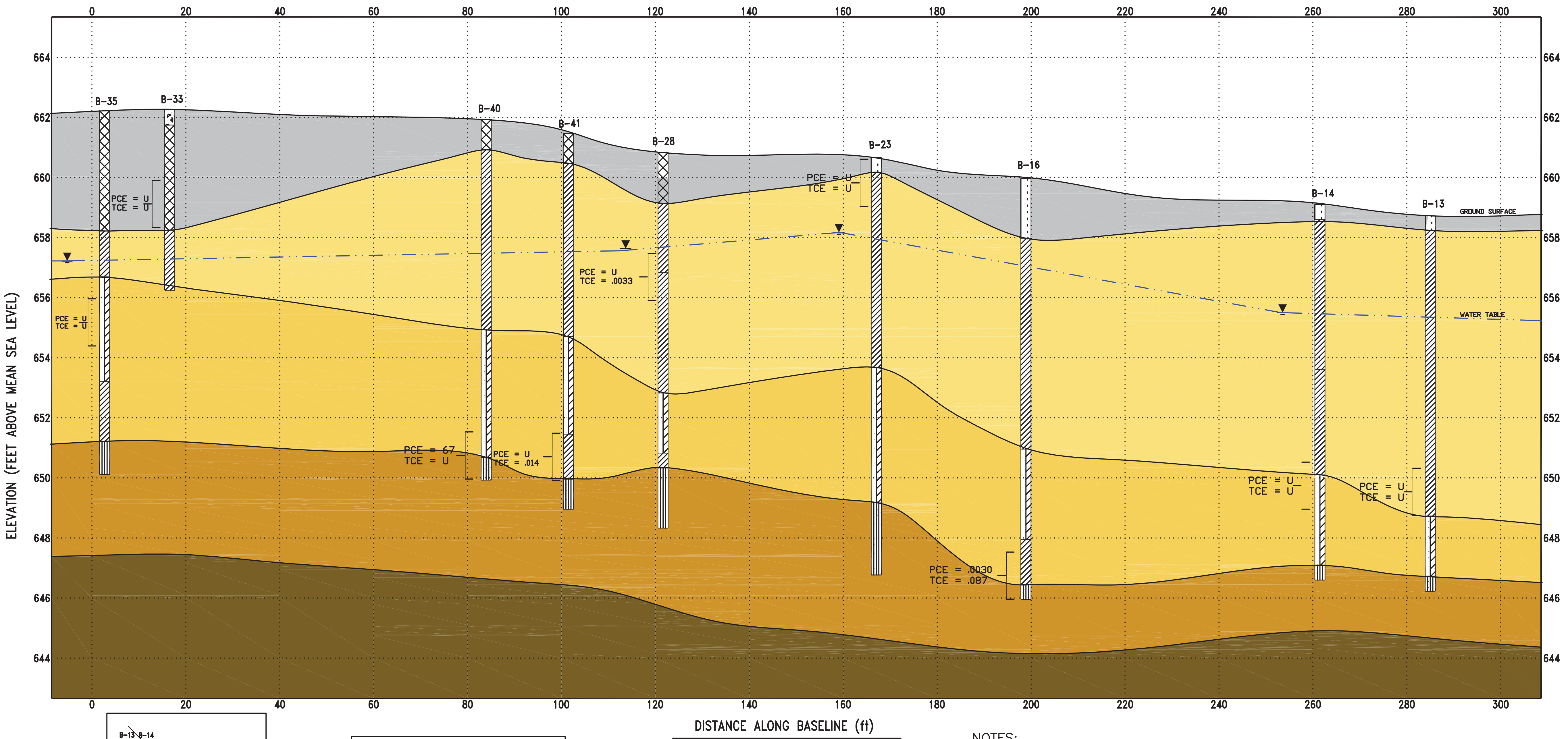
Camp Dresser McKee & Smith

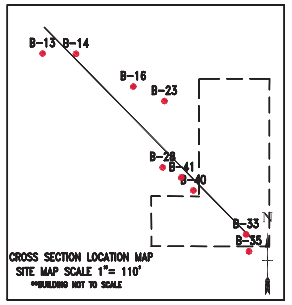
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
REMEDIAL INVESTIGATION
FORMER DORO DRY CLEANERS
TOWN OF CHEEKTOWAGA, NY

LITHOLOGIC CROSS SECTION 1
DATE: FEB 2014

FIGURE NO.
2-1

STANDARD CROSS-SECTION: NYSDEC TEST_1.GPJ STANDARD_ENVIRONMENTAL_PROJECT.GDT 1/29/13 REV.





CROSS SECTION LOCATION MAP
SITE MAP SCALE 1"= 110'
**BUILDING NOT TO SCALE

BOREHOLE LITHOGRAPHY LEGEND:

- ▥ USCS LOW PLASTICITY ORGANIC SILT OR CLAY
- ▨ USCS LOW PLASTICITY CLAY
- ▥ GLACIAL TILL
- ▩ BEDROCK
- ▨ USCS POORLY-GRADED SAND WITH CLAY
- ∴ CONCRETE
- ▦ FILL MATERIAL

INTERPRETED LITHOGRAPHY LEGEND:

- ■ FILL MATERIAL
- ■ NATURAL CLAY
- ■ SAND - CLAY
- ■ GLACIAL TILL
- ■ BEDROCK
- -·- WATER TABLE

NOTES:

1. ALL RESULTS IN MG/KG.
2. PLEASE NOTE THAT LITHOLOGOIC INTERPRETATIONS ARE BASED ON OBSERVATIONS IN THE FIELD.
3. ANALYTES WITH U QUALIFIER ARE NOT DETECTED.
4. TCE IS TRICHLOROETHENE AND PCE TETRACHLOROETHENE.
5. VERTICAL EXAGERATION 6.5X

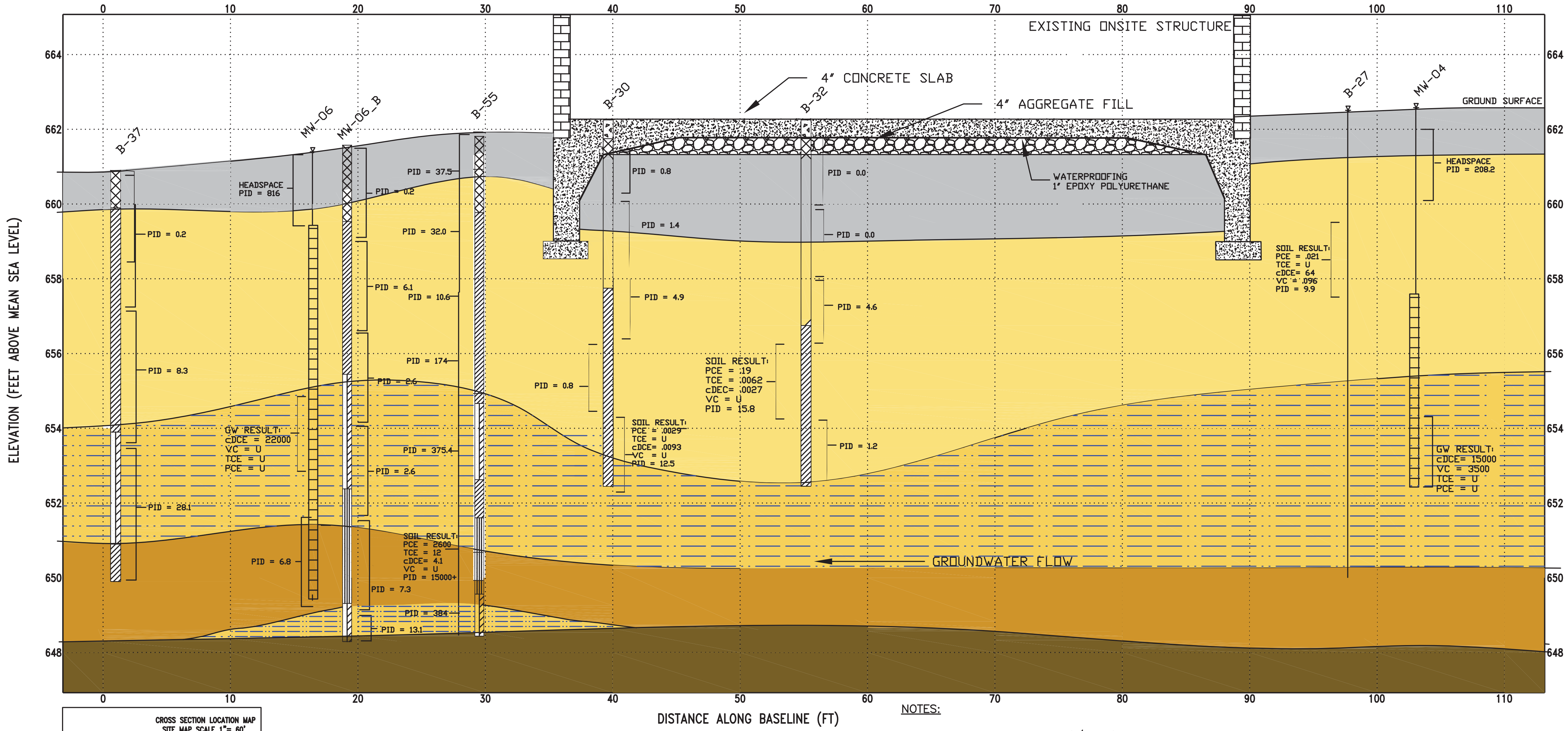
CDM Smith
Camp Dresser McKee & Smith

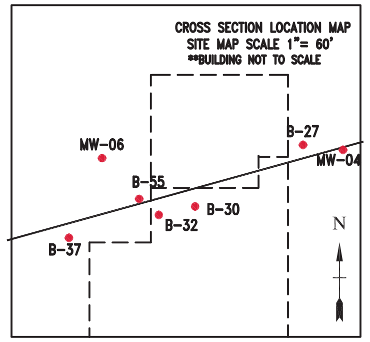
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
PHASE I ENVIRONMENTAL ASSESSMENT
FORMER DORO DRY CLEANERS
TOWN OF CHEEKTOWAGA, NY

LITHOLOGIC CROSS SECTION 2
DATE: FEB 2014

FIGURE NO.
2-2

STANDARD CROSS-SECTION: NYSDEC TEST_1.GPJ STANDARD_ENVIRONMENTAL_PROJECT.GDT 1/29/13 REV.





BOREHOLE LITHOGRAPHY LEGEND:

┆	USCS LOW PLASTICITY ORGANIC SILT OR CLAY	▨	USCS LOW PLASTICITY CLAY
▥	USCS SILTY CLAY	▩	BEDROCK
▧	USCS POORLY-GRADED SAND WITH CLAY	⁘	CONCRETE
▩	FILL MATERIAL		

INTERPRETED LITHOGRAPHY LEGEND:

▒	FILL MATERIAL	▒	GLACIAL TILL
▒	NATURAL CLAY	■	BEDROCK
▒	SANDY-CLAY	☰	WATER BEARING ZONE

NOTES:

1. SOIL RESULT ARE IN MG/KG, GW RESULTS OF MW-04 AND MW-06 ARE IN UG/L, AND ALL PID RESULTS ARE IN PPM.

2. PLEASE NOTE THAT LITHOLOGOIC INTERPRETATIONS ARE BASED ON OBSERVATIONS IN THE FIELD.

3. ANALYTES WITH U QUALIFIER ARE NOT DETECTED.

4. TCE = TRICHLOROETHENE; PCE = TETRACHLOROETHENE; cDCE = cis-1,2-DICHLOROETHENE; VC = VINYL CHLORIDE; PID = PHOTO-IONIZATION DETECTOR

5. NO LITHOLOGIC DATA IS RECORDED FOR B-27. SAMPLE WAS LOST IN THE FIELD DUE TO COMPLICATIONS WITH PID. SAMPLE WAS COLLECTED ABOVE WATER TABLE

6. VERTICAL EXAGERATION 2.5X

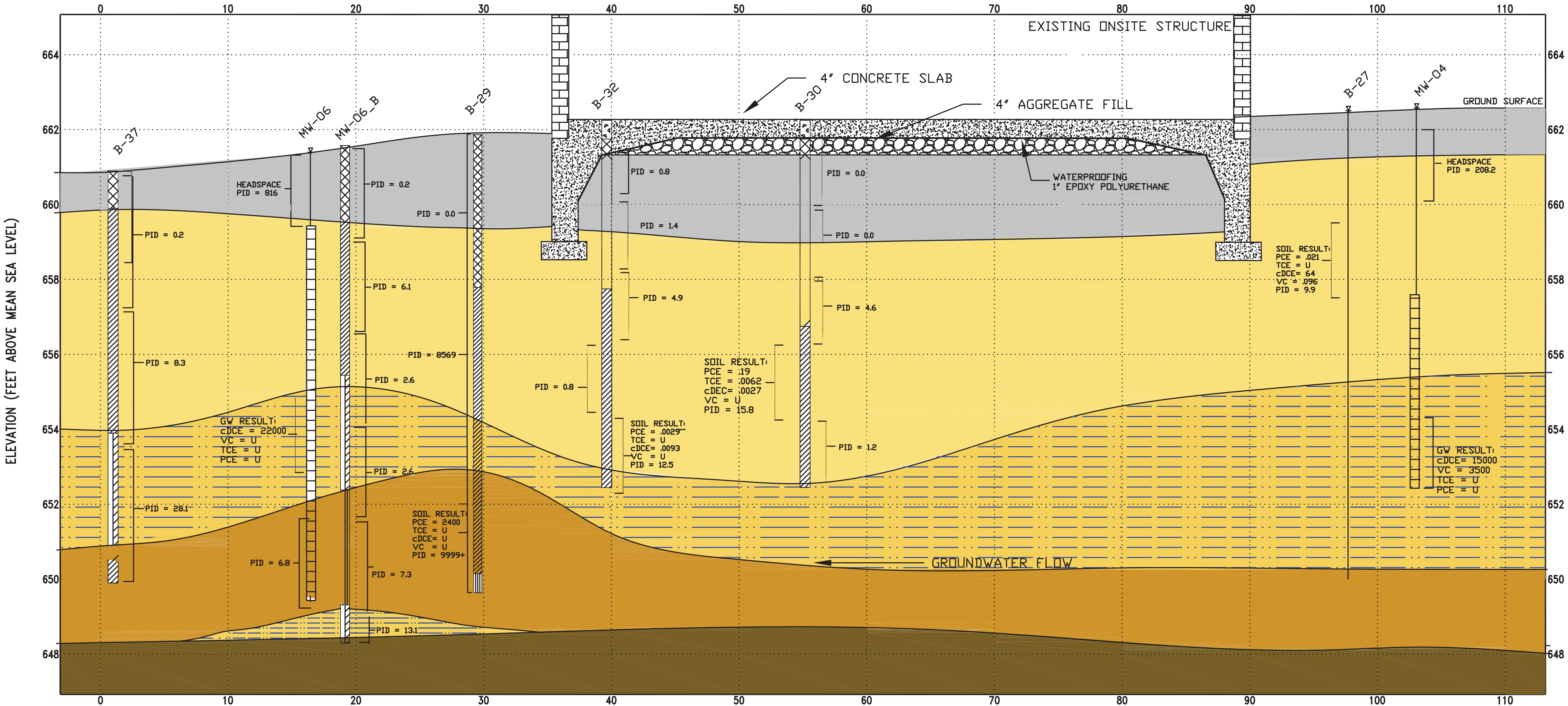
CDM Smith
Camp Dresser McKee & Smith

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
REMEDIAL INVESTIGATION
FORMER DORO DRY CLEANERS
TOWN OF CHEEKTOWAGA, NY

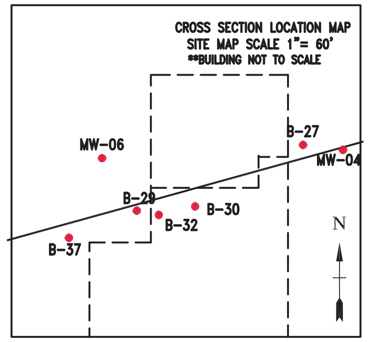
LITHOLOGIC CROSS SECTION 3
DATE: FEB 2014

FIGURE NO.
2-3

STANDARD CROSS-SECTION: NYSDEC DORO_GINTDATA.GPJ STANDARD_ENVIRONMENTAL_PROJECT.GDT 9/6/13 REV.



DISTANCE ALONG BASELINE (FT)



BOREHOLE LITHOGRAPHY LEGEND:

⋮ USCS LOW PLASTICITY ORGANIC SILT OR CLAY	▨ USCS LOW PLASTICITY CLAY
▥ USCS SILTY CLAY	▩ BEDROCK
▧ USCS POORLY-GRADED SAND WITH CLAY	⁘ CONCRETE
▩ FILL MATERIAL	

INTERPRETED LITHOGRAPHY LEGEND:

⬜ FILL MATERIAL	🟧 GLACIAL TILL
🟨 NATURAL CLAY	🟫 BEDROCK
🟨 SANDY-CLAY	☰ WATER BEARING ZONE

NOTES:

1. SOIL RESULT ARE IN MG/KG, GW RESULTS OF MW-04 AND MW-06 ARE IN UG/L, AND ALL PID RESULTS ARE IN PPM.

2. PLEASE NOTE THAT LITHOLOGOIC INTERPRETATIONS ARE BASED ON OBSERVATIONS IN THE FIELD.

3. ANALYTES WITH U QUALIFIER ARE NOT DETECTED.

4. TCE = TRICHLOROETHENE; PCE = TETRACHLOROETHENE; cDCE = cis-1,2-DICHLOROETHENE; VC = VINYL CHLORIDE; PID = PHOTO-IONIZATION DETECTOR

5. NO LITHOLOGIC DATA IS RECORDED FOR B-27. SAMPLE WAS LOST IN THE FIELD DUE TO COMPLICATIONS WITH PID. SAMPLE WAS COLLECTED ABOVE WATER TABLE

6. VERTICAL EXAGERATION 2.5X

CDM Smith
Camp Dresser McKee & Smith

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
REMEDIAL INVESTIGATION
FORMER DORO DRY CLEANERS
TOWN OF CHEEKTOWAGA, NY

LITHOLOGIC CROSS SECTION
DATE: FEB 2014

FIGURE NO.
2-4

STANDARD CROSS-SECTION: NYSDEC DORO_GINTDATA.GPJ STANDARD_ENVIRONMENTAL_PROJECT.GDT 9/6/13 REV.

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend

● Permanent_MW_Locations

— Groundwater Contour 0.5 ft.

— Property Boundary

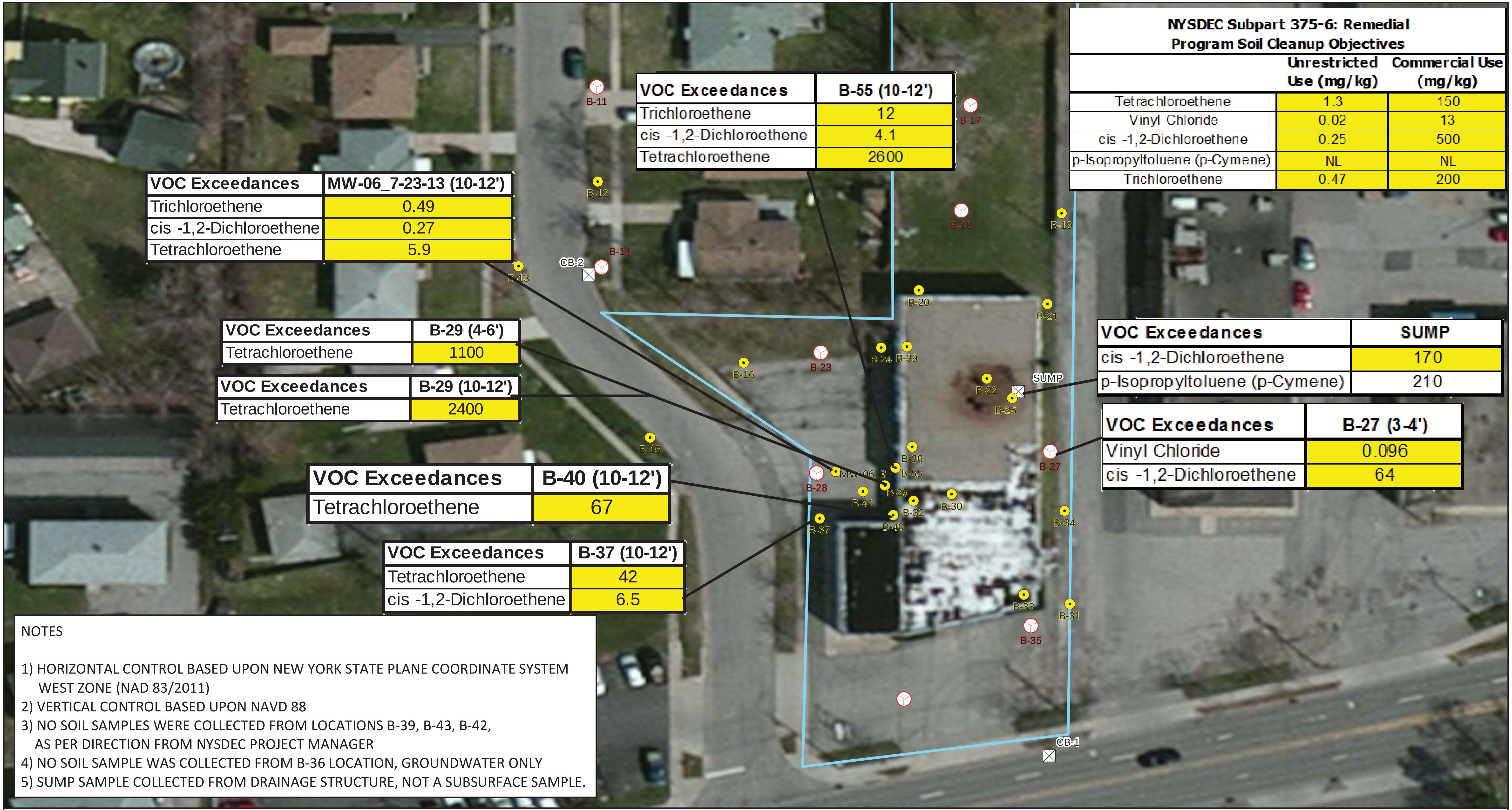
Figure 2-5
Former Doro Dry Cleaners
Cheektowaga, NY

Potentiometric Surface Map - August 2013

75 37.5 0 75 Feet

CDM Smith

[illegible]



NYSDEC Subpart 375-6: Remedial Program Soil Cleanup Objectives		
	Unrestricted Use (mg/kg)	Commercial Use (mg/kg)
Tetrachloroethene	1.3	150
Vinyl Chloride	0.02	13
cis -1,2-Dichloroethene	0.25	500
p-Isopropyltoluene (p-Cymene)	NL	NL
Trichloroethene	0.47	200

VOC Exceedances	B-55 (10-12')
Trichloroethene	12
cis -1,2-Dichloroethene	4.1
Tetrachloroethene	2600

VOC Exceedances	MW-06_7-23-13 (10-12')
Trichloroethene	0.49
cis -1,2-Dichloroethene	0.27
Tetrachloroethene	5.9

VOC Exceedances	B-29 (4-6')
Tetrachloroethene	1100

VOC Exceedances	B-29 (10-12')
Tetrachloroethene	2400

VOC Exceedances	SUMP
cis -1,2-Dichloroethene	170
p-Isopropyltoluene (p-Cymene)	210

VOC Exceedances	B-27 (3-4')
Vinyl Chloride	0.096
cis -1,2-Dichloroethene	64

VOC Exceedances	B-40 (10-12')
Tetrachloroethene	67

VOC Exceedances	B-37 (10-12')
Tetrachloroethene	42
cis -1,2-Dichloroethene	6.5

NOTES

1) HORIZONTAL CONTROL BASED UPON NEW YORK STATE PLANE COORDINATE SYSTEM WEST ZONE (NAD 83/2011)
2) VERTICAL CONTROL BASED UPON NAVD 88
3) NO SOIL SAMPLES WERE COLLECTED FROM LOCATIONS B-39, B-43, B-42, AS PER DIRECTION FROM NYSDEC PROJECT MANAGER
4) NO SOIL SAMPLE WAS COLLECTED FROM B-36 LOCATION, GROUNDWATER ONLY
5) SUMP SAMPLE COLLECTED FROM DRAINAGE STRUCTURE, NOT A SUBSURFACE SAMPLE.

N

Legend

⊙	Soil Boring Sampling Locations
○	Soil Boring and Temporary Monitoring Well Locations
☒	Sump and Catch Basin Sampling Locations
▭	Site Boundary

*All results are in mg/kg.

Soil and Sludge Exceedances for Volatile Organic Compounds

40 20 0 40 Feet

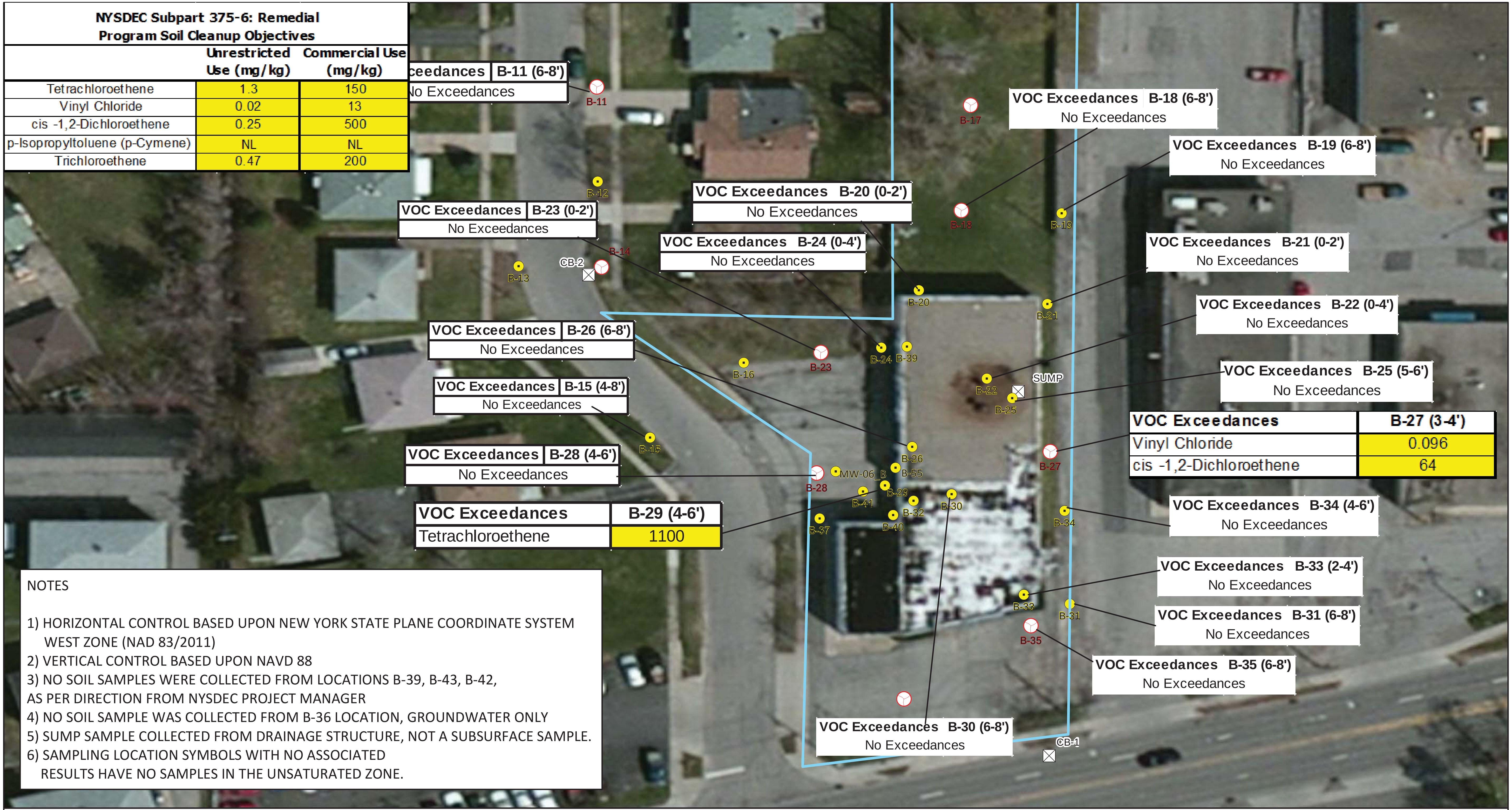
Figure 4-1
Former Doro Dry Cleaners
Cheektowaga, NY

CDM Smith

newelljd \\albsvr1\Alb2_Projects\NYSDEC D007621\WA#6 - Former Doro Dry Cleaners\Reports & Studies - 03\GIS Data\Figure 4-1_102913.mxd 2/21/2014

NYSDEC Subpart 375-6: Remedial Program Soil Cleanup Objectives

	Unrestricted Use (mg/kg)	Commercial Use (mg/kg)
Tetrachloroethene	1.3	150
Vinyl Chloride	0.02	13
cis -1,2-Dichloroethene	0.25	500
p-Isopropyltoluene (p-Cymene)	NL	NL
Trichloroethene	0.47	200



VOC Exceedances	B-27 (3-4')
Vinyl Chloride	0.096
cis -1,2-Dichloroethene	64

VOC Exceedances	B-29 (4-6')
Tetrachloroethene	1100

NOTES

1) HORIZONTAL CONTROL BASED UPON NEW YORK STATE PLANE COORDINATE SYSTEM WEST ZONE (NAD 83/2011)
2) VERTICAL CONTROL BASED UPON NAVD 88
3) NO SOIL SAMPLES WERE COLLECTED FROM LOCATIONS B-39, B-43, B-42, AS PER DIRECTION FROM NYSDEC PROJECT MANAGER
4) NO SOIL SAMPLE WAS COLLECTED FROM B-36 LOCATION, GROUNDWATER ONLY
5) SUMP SAMPLE COLLECTED FROM DRAINAGE STRUCTURE, NOT A SUBSURFACE SAMPLE.
6) SAMPLING LOCATION SYMBOLS WITH NO ASSOCIATED RESULTS HAVE NO SAMPLES IN THE UNSATURATED ZONE.

N

Legend

- ⊗ Soil Boring and Temporary Monitoring Well Locations
- ☒ Sump and Catch Basin Sampling Locations
- ● Soil Boring Sampling Locations
- ▭ Site Boundary

*All results are in mg/kg.

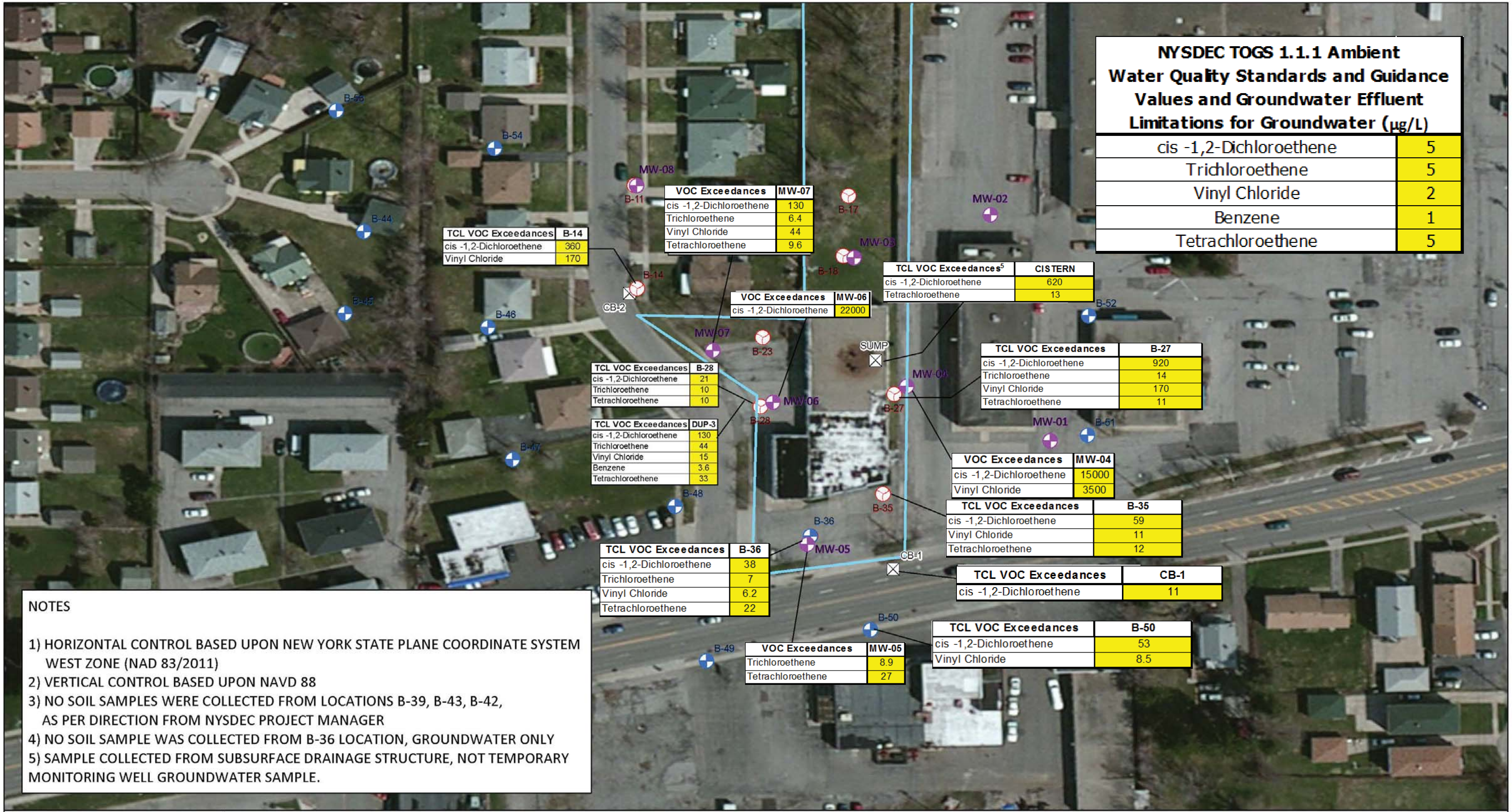
Unsaturated Soil Exceedances for Volatile Organic Compounds

40 20 0 40 Feet

Figure 4-2
Former Doro Dry Cleaners
Cheektowaga, NY

CDM Smith

newelljd \\albsvr1\Alb2_Projects\NYSDEC D007621\WA#6 - Former Doro Dry Cleaners\Reports & Studies - 03\GIS Data\Figure 4-2_103013.mxd 2/21/2014



NYSDEC TOGS 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations for Groundwater (µg/L)	
cis -1,2-Dichloroethene	5
Trichloroethene	5
Vinyl Chloride	2
Benzene	1
Tetrachloroethene	5

TCL VOC Exceedances	B-14
cis -1,2-Dichloroethene	360
Vinyl Chloride	170

VOC Exceedances	MW-07
cis -1,2-Dichloroethene	130
Trichloroethene	6.4
Vinyl Chloride	44
Tetrachloroethene	9.6

VOC Exceedances	MW-06
cis -1,2-Dichloroethene	22000

TCL VOC Exceedances[5]	CISTERN
cis -1,2-Dichloroethene	620
Tetrachloroethene	13

TCL VOC Exceedances	B-28
cis -1,2-Dichloroethene	21
Trichloroethene	10
Tetrachloroethene	10

TCL VOC Exceedances	DUP-3
cis -1,2-Dichloroethene	130
Trichloroethene	44
Vinyl Chloride	15
Benzene	3.6
Tetrachloroethene	33

TCL VOC Exceedances	B-27
cis -1,2-Dichloroethene	920
Trichloroethene	14
Vinyl Chloride	170
Tetrachloroethene	11

VOC Exceedances	MW-04
cis -1,2-Dichloroethene	15000
Vinyl Chloride	3500

TCL VOC Exceedances	B-35
cis -1,2-Dichloroethene	59
Vinyl Chloride	11
Tetrachloroethene	12

TCL VOC Exceedances	B-36
cis -1,2-Dichloroethene	38
Trichloroethene	7
Vinyl Chloride	6.2
Tetrachloroethene	22

TCL VOC Exceedances	CB-1
cis -1,2-Dichloroethene	11

VOC Exceedances	MW-05
Trichloroethene	8.9
Tetrachloroethene	27

TCL VOC Exceedances	B-50
cis -1,2-Dichloroethene	53
Vinyl Chloride	8.5

NOTES

1) HORIZONTAL CONTROL BASED UPON NEW YORK STATE PLANE COORDINATE SYSTEM WEST ZONE (NAD 83/2011)
2) VERTICAL CONTROL BASED UPON NAVD 88
3) NO SOIL SAMPLES WERE COLLECTED FROM LOCATIONS B-39, B-43, B-42, AS PER DIRECTION FROM NYSDEC PROJECT MANAGER
4) NO SOIL SAMPLE WAS COLLECTED FROM B-36 LOCATION, GROUNDWATER ONLY
5) SAMPLE COLLECTED FROM SUBSURFACE DRAINAGE STRUCTURE, NOT TEMPORARY MONITORING WELL GROUNDWATER SAMPLE.

N

Legend

- ◐ Permanant Monitoring Well Locations
- ◐ Temporary Monitoring Well Locations
- ○ Soil Boring and Temporary Monitoring Well Locations
- ☒ Sump and Catch Basin Locations
- ▭ Site Boundary

*All results are in ug/L.

Groundwater, Sump, and Stormwater Exceedances for Volatile Organic Compounds

50 25 0 50 Feet

Figure 4-3
Former Doro Dry Cleaners
Cheektowaga, NY

CDM Smith

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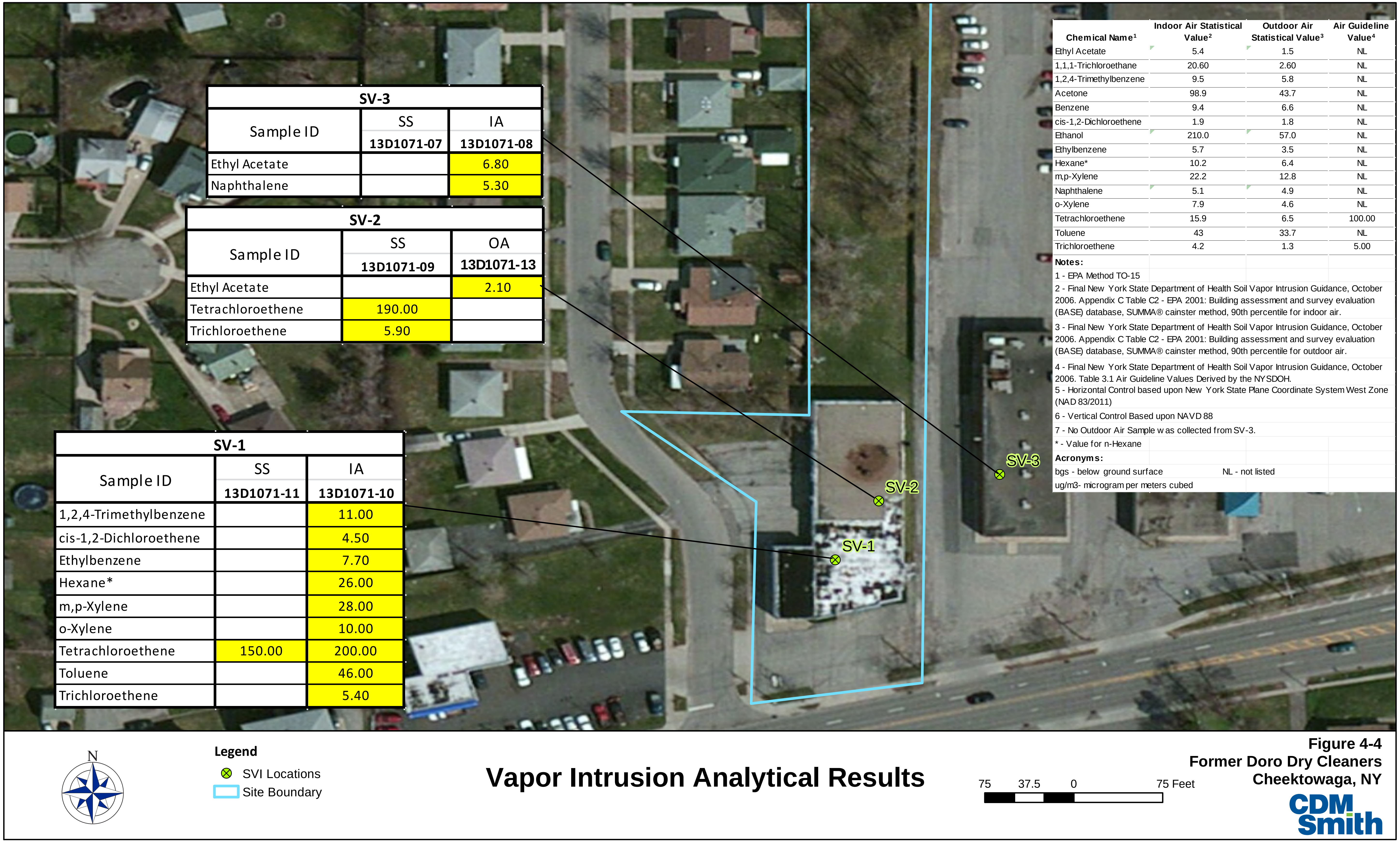
ewelljd\Desktop\doro\Figure 4-3_102913.mxd 2/21/2014



SV-3		
Sample ID	SS	IA
	13D1071-07	13D1071-08
Ethyl Acetate		6.80
Naphthalene		5.30

SV-2		
Sample ID	SS	OA
	13D1071-09	13D1071-13
Ethyl Acetate		2.10
Tetrachloroethene	190.00	
Trichloroethene	5.90	

SV-1		
Sample ID	SS	IA
	13D1071-11	13D1071-10
1,2,4-Trimethylbenzene		11.00
cis-1,2-Dichloroethene		4.50
Ethylbenzene		7.70
Hexane*		26.00
m,p-Xylene		28.00
o-Xylene		10.00
Tetrachloroethene	150.00	200.00
Toluene		46.00
Trichloroethene		5.40

Chemical Name[1]	Indoor Air Statistical Value[2]	Outdoor Air Statistical Value[3]	Air Guideline Value[4]
Ethyl Acetate	5.4	1.5	NL
1,1,1-Trichloroethane	20.60	2.60	NL
1,2,4-Trimethylbenzene	9.5	5.8	NL
Acetone	98.9	43.7	NL
Benzene	9.4	6.6	NL
cis-1,2-Dichloroethene	1.9	1.8	NL
Ethanol	210.0	57.0	NL
Ethylbenzene	5.7	3.5	NL
Hexane*	10.2	6.4	NL
m,p-Xylene	22.2	12.8	NL
Naphthalene	5.1	4.9	NL
o-Xylene	7.9	4.6	NL
Tetrachloroethene	15.9	6.5	100.00
Toluene	43	33.7	NL
Trichloroethene	4.2	1.3	5.00

Notes:

1 - EPA Method TO-15

2 - Final New York State Department of Health Soil Vapor Intrusion Guidance, October 2006. Appendix C Table C2 - EPA 2001: Building assessment and survey evaluation (BASE) database, SUMMA® cainster method, 90th percentile for indoor air.

3 - Final New York State Department of Health Soil Vapor Intrusion Guidance, October 2006. Appendix C Table C2 - EPA 2001: Building assessment and survey evaluation (BASE) database, SUMMA® cainster method, 90th percentile for outdoor air.

4 - Final New York State Department of Health Soil Vapor Intrusion Guidance, October 2006. Table 3.1 Air Guideline Values Derived by the NYSDOH.

5 - Horizontal Control based upon New York State Plane Coordinate System West Zone (NAD 83/2011)

6 - Vertical Control Based upon NAVD 88

7 - No Outdoor Air Sample was collected from SV-3.

* - Value for n-Hexane

Acronyms:

bgs - below ground surface
NL - not listed
ug/m3- microgram per meters cubed

Legend

⊗ SVI Locations
▭ Site Boundary

Vapor Intrusion Analytical Results

Figure 4-4
Former Doro Dry Cleaners
Cheektowaga, NY

CDM Smith

newelljd Y:\NYSDEC D007621\WA#6 - Former Doro Dry Cleaners\Reports & Studies - 03\GIS Data\Figure 4-4_103013.mxd 2/21/2014

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure 5-1
Former Doro Dry Cleaners
Cheektowaga, NY

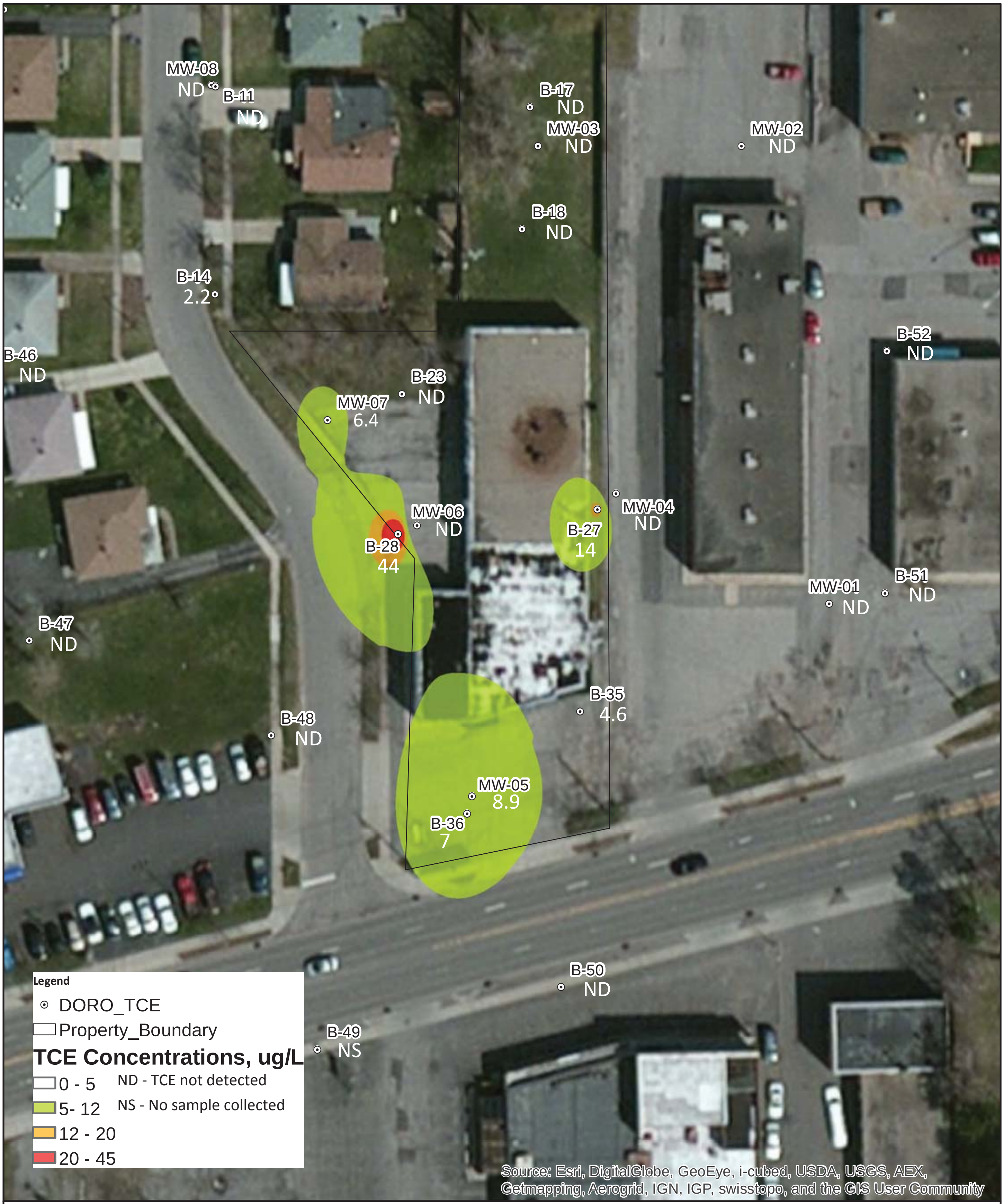
PCE Groundwater Contamination Plume

N

0 40 80 160 Feet

CDM Smith

PassaroML C:\Users\passaroml\Documents\Doro Concentrations\Figure 5-1_log.mxd 10/10/2013



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

N

TCE Groundwater Contamination Plume

0 35 70 140 Feet

Figure 5-2
Former Doro Dry Cleaners
Cheektowaga, NY

CDM Smith

PassaroML C:\Users\passaroml\Documents\Doro Concentrations\Figure 5-2.mxd 10/10/2013

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure 5-3

Former Doro Dry Cleaners

Cheektowaga, NY

cis-1,2-Dichloroethene Groundwater Contamination Plume

N

0 70 140 280 Feet

CDM Smith

PassaroML C:\Users\passaroml\Documents\Doro Concentrations\Figure 5-3.mxd 10/10/2013

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

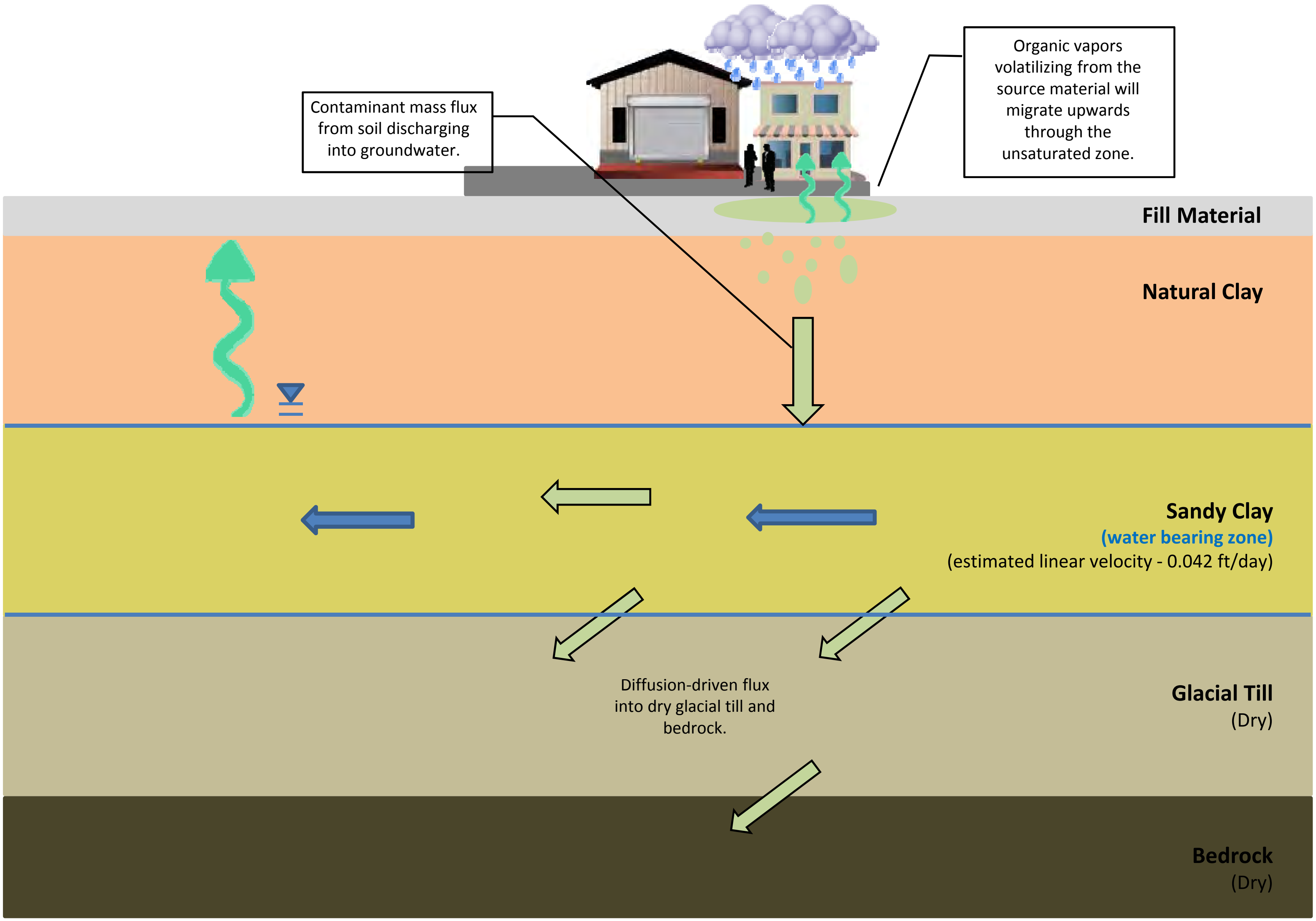
Figure 5-4
Former Doro Dry Cleaners
Cheektowaga, NY

Vinyl Chloride Groundwater Contamination Plume

N

0 50 100 200 Feet

CDM Smith



Contaminant mass flux from soil discharging into groundwater.

Organic vapors volatilizing from the source material will migrate upwards through the unsaturated zone.

Diffusion-driven flux into dry glacial till and bedrock.

Legend

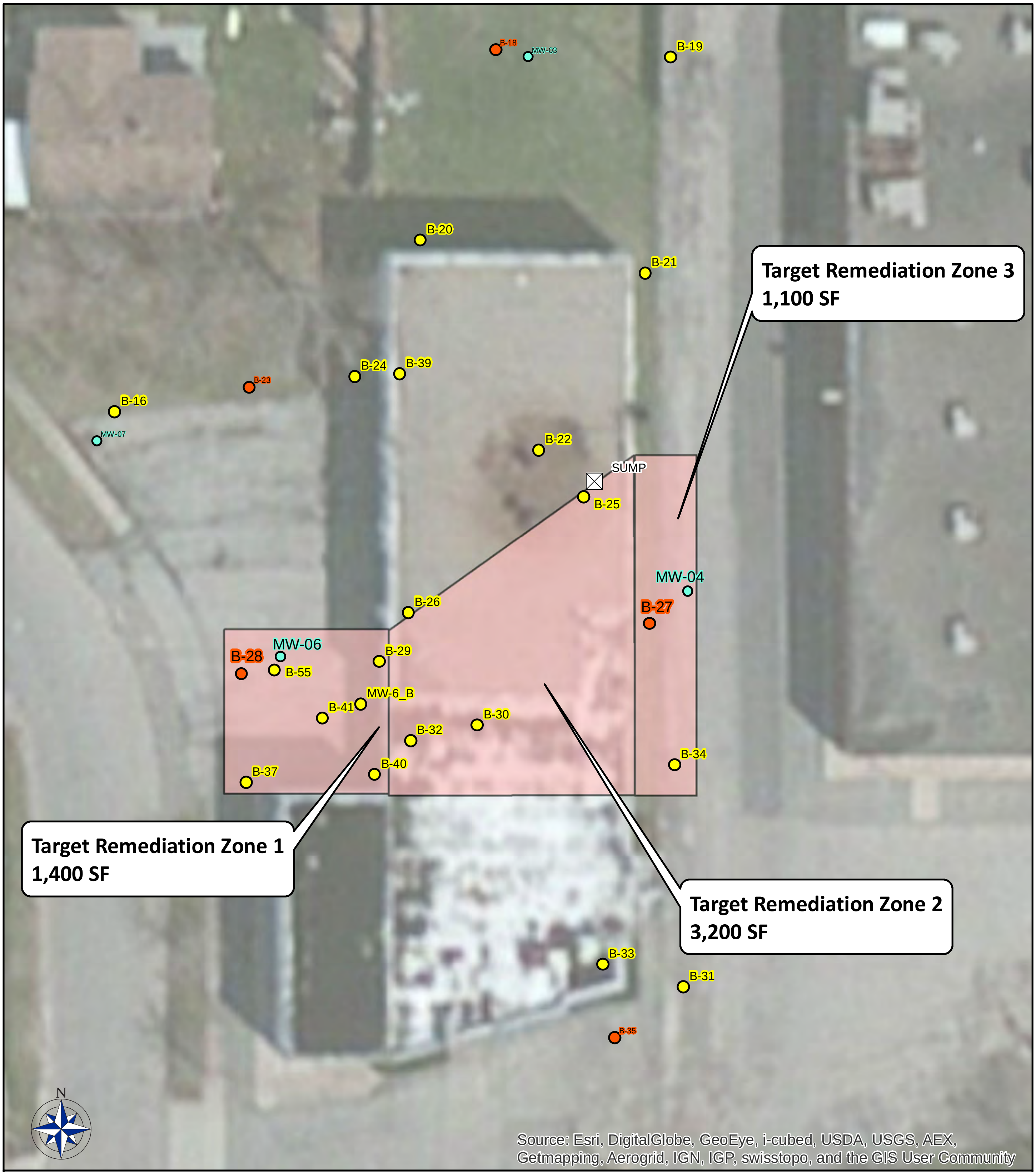
⬅ Groundwater Flow Pathway

⇐ Contaminant Migration Pathway

Note: Not to scale.

Conceptual Site Model

Figure 5-5
Former Doro Dry Cleaners
Cheektowaga, NY



Target Remediation Zone 3
1,100 SF

Target Remediation Zone 1
1,400 SF

Target Remediation Zone 2
3,200 SF

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure 8-1
Former Doro Dry Cleaners
Cheektowaga, NY

Target Remediation Zones

Legend

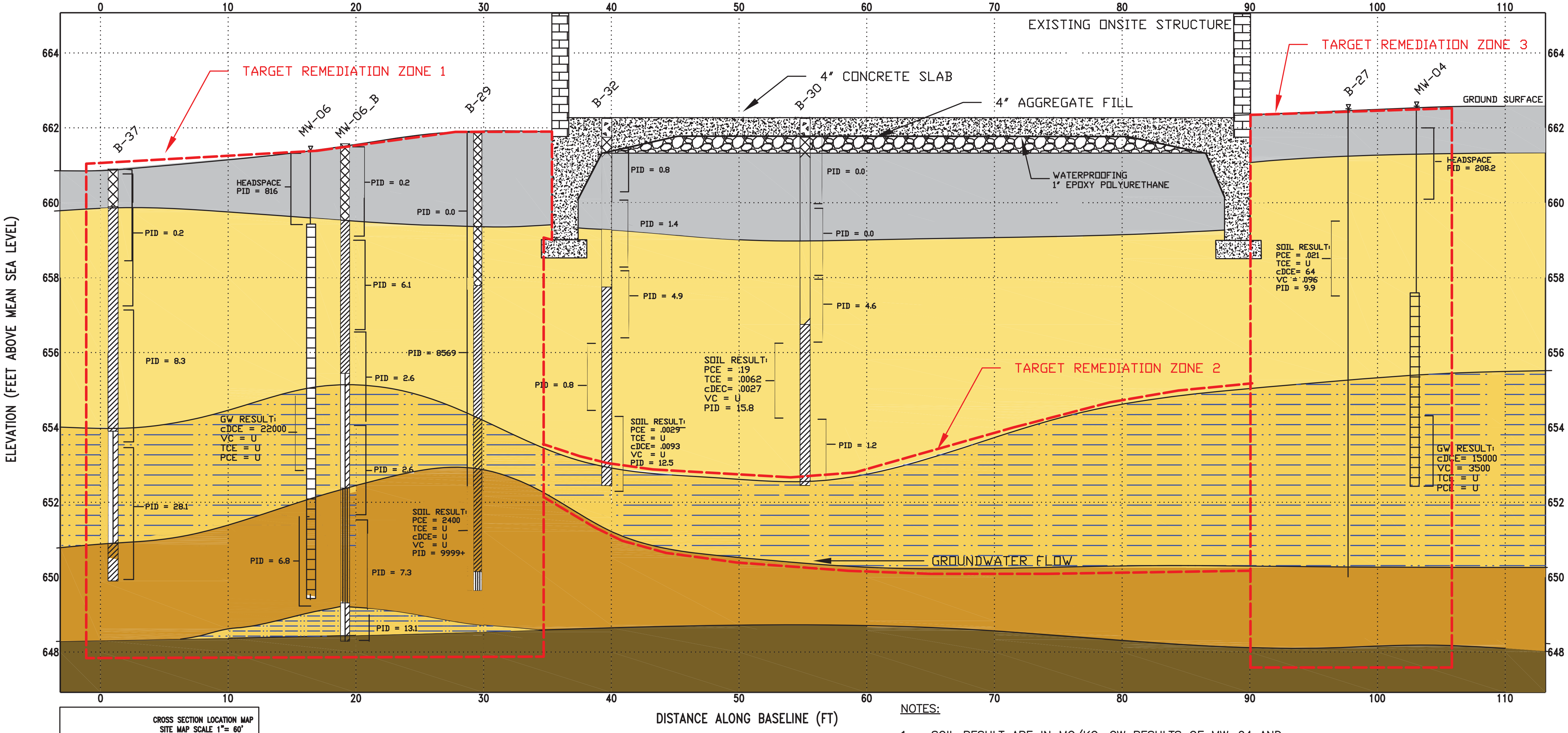
- ● Permanent Monitoring Well Locations
- ☒ Sump and Catch Basin Sample Locations
- ● Soil Boring and Temporary Monitoring Well Locations
- ● Soil Boring Locations
- ▨ Target Remediation Zone

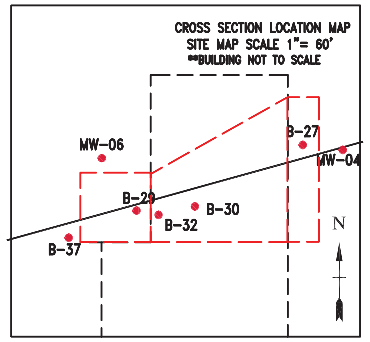
SF = Square Feet

30 15 0 30 Feet

CDM Smith

PassaroML C:\Users\passaroml\Documents\Doro Concentrations\Figure 8-1.mxd 10/9/2013





BOREHOLE LITHOGRAPHY LEGEND:

- ▥ USCS LOW PLASTICITY ORGANIC SILT OR CLAY
- ▥ USCS SILTY CLAY
- ▨ USCS POORLY-GRADED SAND WITH CLAY
- ▩ FILL MATERIAL
- ▨ USCS LOW PLASTICITY CLAY
- ▩ BEDROCK
- ▦ CONCRETE

INTERPRETED LITHOGRAPHY LEGEND:

- ■ FILL MATERIAL
- ■ NATURAL CLAY
- ■ SANDY-CLAY
- ☐ TARGET REMEDIATION ZONE
- ■ GLACIAL TILL
- ■ BEDROCK
- ▤ WATER BEARING ZONE

NOTES:

1. SOIL RESULT ARE IN MG/KG, GW RESULTS OF MW-04 AND MW-06 ARE IN UG/L, AND ALL PID RESULTS ARE IN PPM.

2. PLEASE NOTE THAT LITHOLOGOIC INTERPRETATIONS ARE BASED ON OBSERVATIONS IN THE FIELD.

3. ANALYTES WITH U QUALIFIER ARE NOT DETECTED.

4. TCE = TRICHLOROETHENE; PCE = TETRACHLOROETHENE; cDCE = cis-1,2-DICHLOROETHENE; VC = VINYL CHLORIDE; PID = PHOTO-IONIZATION DETECTOR

5. NO LITHOLOGIC DATA IS RECORDED FOR B-27. SAMPLE WAS LOST IN THE FIELD DUE TO COMPLICATIONS WITH PID. SAMPLE WAS COLLECTED ABOVE WATER TABLE

6. VERTICAL EXAGERATION 3X

CDM Smith

Camp Dresser McKee & Smith

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
REMEDIAL INVESTIGATION
FORMER DORO DRY CLEANERS
TOWN OF CHEEKTOWAGA, NY

PROFILE: TARGET REMEDIATION ZONES

DATE: FEB 2014

FIGURE NO.

8-2

STANDARD CROSS-SECTION: NYSDEC DORO_GINTDATA.GPJ STANDARD_ENVIRONMENTAL_PROJECT.GDT 9/6/13 REV.

Tables

Table 3-1
RI Sample Summary
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

Location	Sample ID	Date	Matrix	Drilling Method	Analytical Method (EPA)		PID (ppm)
Offsite Sampling Locations							
B-11	B-11 (6-8FT)	12/10/2012	SO	DPT	TCL Volatiles + 10	8260C	0.1
B-11	B-11	12/12/2012	GW	DPT	TCL Volatiles + 10	8260C	0.4
B-12	B-12 (8-12FT)	12/10/2012	SO	DPT	TCL Volatiles + 10	8260C	0
B-12	MS/MSD-1	12/10/2012	SO	DPT	TCL Volatiles + 10	8260C	0
B-13	B-13 (8-12FT)	12/10/2012	SO	DPT	TCL Volatiles + 10	8260C	0
B-14	B-14 (8-12FT)	12/10/2012	SO	DPT	TCL Volatiles + 10	8260C	1.3
B-14	B-14	12/13/2012	GW	DPT	TCL Volatiles + 10	8260C	3.4
B-15	B-15 (4-8FT)	12/20/2012	SO	DPT	TCL Volatiles + 10	8260C	0
					TCL SVOCs	8270D	
					TCL PCBs	8082A	
					TCL Pesticides	8081B	
					TAL Metals	6010C	
					Mercury	7471B	
					Cyanide	9014	
CB-2	CB-2	12/13/2012	GW	NA	TCL Volatiles + 10	8260C	NA
B-44	B-44_3_13_2013	3/13/2013	GW	DPT	VOCs	8260	0
B-45	B-45_3-13-2013	3/13/2013	GW	DPT	VOCs	8260	0
B-46	B-46_3-13-2013	3/13/2013	GW	DPT	VOCs	8260	0.4
B-47	B-47_3-13-2013	3/13/2013	GW	DPT	VOCs	8260	0
B-48	B-48_3_13_2013	3/13/2013	GW	DPT	VOCs	8260	0
B-50	B-50_3-13-2013	3/13/2013	GW	DPT	VOCs	8260	0
B-51	B-51_3-13-2013	3/13/2013	GW	DPT	VOCs	8260	0
B-52	B-52_3-13-2013	3/13/2013	GW	DPT	VOCs	8260	0
B-53	B-53_3-13-2013	3/13/2013	GW	DPT	VOCs	8260	0
B-54	B-54_3-13-2013	3/13/2013	GW	DPT	VOCs	8260	0
B-44	B-44_3_13_2013MS	3/13/2013	GW	DPT	VOCs	8260	0
B-44	B-44_3_13_2013MSD	3/13/2013	GW	DPT	VOCs	8260	0
FB-1	FB-1_3-13-2013	3/13/2013	FB	NA	VOCs	8260	0
FD-1	FD-01_3-13-2013	BLIND	FD	NA	VOCs	8260	0
SV-3	SV-3 SS	4/23/2013	AS	HAMMER DRILL	VOCs	TO-15	0
SV-3	SV-3 IA	4/23/2013	AI	NA	VOCs	TO-15	NA
SV-4	SV-4 OA	4/23/2013	AO	NA	VOCs	TO-15	NA
SV-4	SV-4 SS	4/23/2013	AS	HAMMER DRILL	VOCs	TO-15	0
SV-4	SV-4 IA	4/23/2013	AI	NA	VOCs	TO-15	NA

Table 3-1
RI Sample Summary
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

Location	Sample ID	Date	Matrix	Drilling Method	Analytical Method (EPA)		PID (ppm)
Offsite Sampling Locations							
SV-5	SV-5 OA	4/23/2013	AO	NA	VOCs	TO-15	NA
SV-5	SV-5 SS	4/23/2013	AS	HAMMER DRILL	VOCs	TO-15	0
SV-5	SV-5 IA	4/23/2013	AI	NA	VOCs	TO-15	NA
MW-01	MW-01_08-13-13	8/13/2013	GW	NA	VOCs, Alkalinity, Chloride, Ferrous Iron, Nitrate, Nitrite, Specific Conductance, Sulfate, Sulfide, Total Organic Carbon	8260, SM 4500-NO3 300.0, 375.2 300.0, SM 4500-C1, SM 4500-S, SM 3500-Fe D, 6020, SM2320B, 415.1	NA
MW-02	MW-02_08-13-13	8/13/2013	GW	NA	VOCs, Alkalinity, Chloride, Ferrous Iron, Nitrate, Nitrite, Specific Conductance, Sulfate, Sulfide, Total Organic Carbon	8260, SM 4500-NO3 300.0, 375.2 300.0, SM 4500-C1, SM 4500-S, SM 3500-Fe D, 6020, SM2320B, 415.1	NA
MW-08	MW-08_08-13-13	8/13/2013	GW	NA	VOCs, Alkalinity, Chloride, Ferrous Iron, Nitrate, Nitrite, Specific Conductance, Sulfate, Sulfide, Total Organic Carbon	8260, SM 4500-NO3 300.0, 375.2 300.0, SM 4500-C1, SM 4500-S, SM 3500-Fe D, 6020, SM2320B, 415.1	NA

Table 3-1
RI Sample Summary
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

Location	Sample ID	Date	Matrix	Drilling Method	Analytical Method (EPA)		PID (ppm)
Onsite Sampling Locations							
B-16	B-16 (12-14FT)	12/7/2012	SO	HSA	TCL Volatiles + 10	8260C	2.3
B-17	B-17 (8-10FT)	12/5/2012	SO	HSA	TCL Volatiles + 10	8260C	0
B-17	B-17	12/12/2012	GW	HSA	TCL Volatiles + 10	8260C	1.7
B-17	MS/MSD-3	12/13/2012	GW	HSA	TCL Volatiles + 10	8260C	1.7
B-18	B-18 (6-8FT)	12/6/2012	SO	HSA	TCL Volatiles + 10	8260C	0
B-18	B-18	12/12/2012	GW	HSA	TCL Volatiles + 10	8260C	2
B-19	B-19 (6-8FT)	12/12/2012	SO	DPT	TCL Volatiles + 10	8260C	0.6
B-20	B-20 (0-2FT)	12/7/2012	SO	HSA	TCL Volatiles + 10	8260C	0.5
B-20	B-20 (12-14FT)	12/7/2012	SO	HSA	TCL Volatiles + 10	8260C	0.4
B-21	B-21 (0-2FT)	12/12/2012	SO	DPT	TCL Volatiles + 10	8260C	13.1
B-21	MS/MSD-2	12/12/2012	SO	DPT	TCL Volatiles + 10	8260C	13.1
B-22	B-22 (0-4FT)	12/13/2012	SO	DPT	TCL Volatiles + 10	8260C	3.6
B-23	B-23 (0-2FT)	12/7/2012	SO	HSA	TCL Volatiles + 10	8260C	0.3
B-23	B-23	12/12/2012	GW	HSA	TCL Volatiles + 10	8260C	1.7
					TCL SVOCs	8270D	
					TCL PCBs	8082A	
					TCL Pesticides	8081B	
					TAL Metals	6010C/6020A	
					Mercury	7470B	
					Cyanide	9014	
B-24	B-24 (0-4FT)	12/5/2012	SO	HSA	TCL Volatiles + 10	8260C	0
B-25	B-25 (5-6FT)	12/13/2012	SO	DPT	TCL Volatiles + 10	8260C	1
B-26	B-26 (6-8FT)	12/13/2012	SO	DPT	TCL Volatiles + 10	8260C	1.4
B-27	B-27	12/12/2012	GW	DPT	TCL Volatiles + 10	8260C	1.8
B-27	B-27 (3-4FT)	12/13/2012	SO	DPT	TCL Volatiles + 10	8260C	NA
B-28	B-28 (4-6FT)	12/11/2012	SO	DPT	TCL Volatiles + 10	8260C	FLUX
B-28	B-28	12/12/2012	GW	DPT	TCL Volatiles + 10	8260C	2.4
B-28	DUP-3	12/12/2012	GW	DPT	TCL Volatiles + 10	8260C	2.4
B-29	B-29 (4-6FT)	12/11/2012	SO	DPT	TCL Volatiles + 10	8260C	8569

Table 3-1
RI Sample Summary
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

Location	Sample ID	Date	Matrix	Drilling Method	Analytical Method (EPA)		PID (ppm)
Onsite Sampling Locations							
B-29	B-29 (10-12FT)	12/11/2012	SO	DPT	TCL Volatiles + 10	8260C	9999+
					TCL SVOCs	8270D	
					TCL PCBs	8082A	
					TCL Pesticides	8081B	
					TAL Metals	6010C	
					Mercury	7471B	
					Cyanide	9014	
B-29 (10-12 FT)	DUP-1	12/11/2012	SO	DPT	TCL Volatiles + 10	8260C	9999+
B-30	B-30 (6-8FT)	12/10/2012	SO	Tripod	TCL Volatiles + 10	8260C	15.8
B-31	B-31 (6-8FT)	12/12/2012	SO	DPT	TCL Volatiles + 10	8260C	0
B-32	B-32 (8-10FT)	12/10/2012	SO	Tripod	TCL Volatiles + 10	8260C	12.5
B-33	B-33 (2-4FT)	12/10/2012	SO	Tripod	TCL Volatiles + 10	8260C	0.5
B-34	B-34 (4-6FT)	12/11/2012	SO	DPT	TCL Volatiles + 10	8260C	0
B-35	B-35 (6-8FT)	12/12/2012	SO	DPT	TCL Volatiles + 10	8260C	1.4
B-35	B-35	12/12/2012	GW	DPT	TCL Volatiles + 10	8260C	1.4
B-36	B-36	12/12/2012	GW	DPT	TCL Volatiles + 10	8260C	9.9
B-37	B-37 (10-12FT)	12/12/2012	SO	DPT	TCL Volatiles + 10	8260C	28.1
B-40	B-40 (10-12FT)	12/12/2012	SO	DPT	TCL Volatiles + 10	8260C	9999+
					TCL SVOCs	8270D	
					TCL PCBs	8082A	
					TCL Pesticides	8081B	
					TAL Metals	6010C	
					Mercury	7471B	
					Cyanide	9014	
B-40 (10-12 FT)	DUP-2	12/12/2012	SO	DPT	TCL Volatiles + 10	8260C	9999+
B-41	B-41 (10-12FT)	12/12/2012	SO	DPT	TCL Volatiles + 10	8260C	5.2
CB-1	CB-1	12/13/2012	GW	NA	TCL Volatiles + 10	8260C	NA
SUMP	Cistern	12/13/2012	GW	NA	TCL Volatiles + 10	8260C	10.9
SUMP	Cistern	12/13/2012	SO	NA	TCL Volatiles + 10	8260C	10.9
FB-1	FB-1	12/11/2012	FB	NA	TCL Volatiles + 10	8260C	NA
FB-2	FB-2	12/12/2012	FB	NA	TCL Volatiles + 10	8260C	NA
FB-3	FB-3	12/13/2012	FB	NA	TCL Volatiles + 10	8260C	NA
TB-1	TB-1	12/7/2012	TB	NA	TCL Volatiles + 10	8260C	NA
TB-2	TB-2	12/11/2012	TB	NA	TCL Volatiles + 10	8260C	NA

Table 3-1
RI Sample Summary
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

Location	Sample ID	Date	Matrix	Drilling Method	Analytical Method (EPA)		PID (ppm)
Onsite Sampling Locations							
TB-3	TB-3	12/12/2012	TB	NA	TCL Volatiles + 10	8260C	NA
TB-4	TB-4	12/13/2012	TB	NA	TCL Volatiles + 10	8260C	NA
SV-1	SV-1 IA2	4/23/2013	AI	NA	VOCs	TO-15	NA
SV-1	SV-1 SS2	4/23/2013 15:35:00	AS	HAMMER DRILL	VOCs	TO-15	1.2
SV-2	SV-2 OA	4/23/2013	AO	NA	VOCs	TO-15	NA
SV-2	SV-2 SS1	4/23/2013	AS	HAMMER DRILL	VOCs	TO-15	0.4
SV-1	DUP-1	4/22/2013	AI	NA	VOCs	TO-15	NA
SV-1	DUP-2	4/22/2013	AS	HAMMER DRILL	VOCs	TO-15	1.2
B-55	B-55_07-23-13	7/23/2013	SO	HSA	VOCs	8260	+15000
MW-06_B	MW-06_7-23-13	7/23/2013	SO	HSA	VOCs	8260	13.1
TB-01	TB-01_07-23-13	7/23/2013	WQ	NA	VOCs	8260	NA
B-55	FD-01_7-23-13	7/23/2013	SO	HSA	VOCs	8260	+15000
FB-01	FB-01_7-23-13	7/23/2013	WQ	NA	VOCs	8260	NA
FB-02	FB-02_7-23-13	7/23/2013	WQ	NA	VOCs	8260	NA
MW-03	MW-03_08-13-13	8/13/2013	GW	NA	VOCs, Alkalinity, Chloride, Ferrous Iron, Nitrate, Nitrite, Specific Conductance, Sulfate, Sulfide, Total Organic Carbon	8260, SM 4500-NO3 300.0, 375.2 300.0, SM 4500-C1, SM 4500-S, SM 3500-Fe D, 6020, SM2320B, 415.1	NA
MW-07	MW-07_08-13-13	8/13/2013	GW	NA	VOCs, DHC, BVC, TCE, VCR, Alkalinity, Chloride, Ferrous Iron, Nitrate, Nitrite, Specific Conductance, Sulfate, Sulfide, Total Organic Carbon	8260, SM 4500-NO3 300.0, 375.2 300.0, SM 4500-C1, SM 4500-S, SM 3500-Fe D, 6020, SM2320B, 415.1	NA

Table 3-1
RI Sample Summary
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

Location	Sample ID	Date	Matrix	Drilling Method	Analytical Method (EPA)		PID (ppm)
Onsite Sampling Locations							
MW-05	MW-05_08-13-13	8/13/2013	GW	NA	VOCs, DHC, BVC, TCE, VCR, Alkalinity, Chloride, Ferrous Iron, Nitrate, Nitrite, Specific Conductance, Sulfate, Sulfide, Total Organic Carbon	8260, SM 4500-NO3 300.0, 375.2 300.0, SM 4500-C1, SM 4500-S, SM 3500-Fe D, 6020, SM2320B, 415.1	NA
MW-04	MW-04_08-14-13	8/14/2013	GW	NA	VOCs, DHC, BVC, TCE, VCR, Alkalinity, Chloride, Ferrous Iron, Nitrate, Nitrite, Specific Conductance, Sulfate, Sulfide, Total Organic Carbon	8260, SM 4500-NO3 300.0, 375.2 300.0, SM 4500-C1, SM 4500-S, SM 3500-Fe D, 6020, SM2320B, 415.1	NA
MW-06	MW-06_08-14-13	8/14/2013	GW	NA	VOCs, DHC, BVC, TCE, VCR, Alkalinity, Chloride, Ferrous Iron, Nitrate, Nitrite, Specific Conductance, Sulfate, Sulfide, Total Organic Carbon	8260, SM 4500-NO3 300.0, 375.2 300.0, SM 4500-C1, SM 4500-S, SM 3500-Fe D, 6020, SM2320B, 415.1	NA

Notes:

PID - Phtotionization Detector
NA - Not Applicable
FD - Field Duplicate
AO - Outdoor Ambient Air
AS - SVI
AI - Indoor Air
GW - Groundwater

FB - Field Blank
SO - Soil
HSA - Hollow Stem Auger
DPT - Direct Push Technology
TCL - Target Compound List
WQ - Water Quality Sample

Table 3-2
Monitoring Well Installation Summary
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

Monitoring Well ID	Approx. Ground Elevation (feet)	Date Installed	Company	Material Type and Size	Depth of Well[1] (feet)	Bottom of Hole Elevation (feet)	Approx. Depth to Groundwater (feet)	Approx. Elev. Of Groundwater (feet)	PID Reading[2] (ppm) (headspace)	Sample Interval (feet)	Screen			
											Depth		Elevation	
											Top (feet)	Bottom (feet)	Top (feet)	Bottom (feet)
B-11	658.29	12/10/12	SJB	1 inch Dia. PVC	12.0	646.29	3.5	654.79	0.4	6-8	7.0	12.0	651.3	646.3
B-14	659.10	12/10/12	SJB	1 inch Dia. PVC	12.5	646.60	3.6	655.50	3.4	8-12	2.5	12.5	656.6	646.6
B-23	660.67	12/7/12	SJB	1 inch Dia. PVC	13.9	646.77	2.5	658.17	1.7	0-2	8.9	13.9	651.8	646.8
B-28	660.83	12/11/12	SJB	1 inch Dia. PVC	12.5	648.33	3.2	657.63	2.0	4-6	7.5	12.5	653.3	648.3
B-17	660.85	12/5/12	SJB	1 inch Dia. PVC	14.0	646.85	2.5	658.35	1.7	8-10	4.0	14.0	656.9	646.9
B-18	661.23	12/6/12	SJB	1 inch Dia. PVC	11.5	649.73	2.0	659.23	1.8	6-8	6.5	11.5	654.7	649.7
B-36	661.85	12/11/12	SJB	1 inch Dia. PVC	12.0	649.85	5.7	656.20	2.4	NA	7.0	12.0	654.9	649.9
B-35	662.22	12/11/2012	SJB	1 inch Dia. PVC	12.5	649.72	5	657.22	1.4	6-8	7.5	12.5	654.7	649.7
B-27	662.58	12/11/2012	SJB	1 inch Dia. PVC	12.50	650.08	4.1	658.48	9.9	3-4	7.5	12.5	655.1	650.1
B-44	NS	3/12/2013	SJB	1 inch Dia. PVC	13.40	NS	1.75	NS	0	NA	3.40	13.40	NS	NS
B-45	NS	3/12/2013	SJB	1 inch Dia. PVC	13.60	NS	1.35	NS	0	NA	8.60	13.60	NS	NS
B-46	NS	3/12/2013	SJB	1 inch Dia. PVC	13.50	NS	3.86	NS	0.4	NA	8.50	13.50	NS	NS
B-47	NS	3/12/2013	SJB	1 inch Dia. PVC	12.10	NS	1.67	NS	0	NA	7.10	12.10	NS	NS
B-48	NS	3/12/2013	SJB	1 inch Dia. PVC	12.40	NS	2.38	NS	0	NA	7.40	12.40	NS	NS
B-49	NS	3/12/2013	SJB	1 inch Dia. PVC	12.40	NS	NA	NS	0	NA	7.40	12.40	NS	NS
B-50	NS	3/12/2013	SJB	1 inch Dia. PVC	13.20	NS	5.44	NS	0	NA	8.20	13.20	NS	NS
B-51	NS	3/12/2013	SJB	1 inch Dia. PVC	13.80	NS	2.58	NS	0	NA	8.80	13.80	NS	NS
B-52	NS	3/12/2013	SJB	1 inch Dia. PVC	15.70	NS	2.75	NS	0	NA	10.70	15.70	NS	NS
B-53	NS	3/12/2013	SJB	1 inch Dia. PVC	13.40	NS	2.67	NS	0	NA	8.40	13.40	NS	NS
B-54	NS	3/12/2013	SJB	1 inch Dia. PVC	15.30	NS	4.16	NS	0	NA	10.30	15.30	NS	NS
MW-01	663.29	7/25/2013	SJB	2 inch Dia. PVC	12.00	651.29	3.3	659.99	392.4	NA	2.00	12.00	661.29	651.29
MW-02	661.67	7/25/2013	SJB	2 inch Dia. PVC	13.00	648.67	2.15	659.52	122.4	NA	3.00	13.00	658.67	648.67
MW-03	661.68	7/25/2013	SJB	2 inch Dia. PVC	11.00	650.68	6.15	655.53	28.6	NA	6.00	11.00	655.68	650.68
MW-04	662.65	7/25/2013	SJB	2 inch Dia. PVC	10.00	652.65	4.27	658.38	208.2	NA	5.00	10.00	657.65	652.65
MW-05	661.88	7/24/2013	SJB	2 inch Dia. PVC	10.00	651.88	5.6	656.28	260.8	NA	5.00	10.00	656.88	651.88
MW-06	661.40	7/23/2013	SJB	2 inch Dia. PVC	12.00	649.40	4.11	657.29	816	10-12	2.00	12.00	659.40	649.40
MW-07	659.90	7/24/2013	SJB	2 inch Dia. PVC	13.00	646.90	3.22	656.68	18.2	NA	3.00	13.00	656.90	646.90
MW-08	658.42	7/24/2013	SJB	2 inch Dia. PVC	10.00	648.42	3.92	654.50	54.8	NA	5.00	10.00	653.42	648.42

Notes

1. All monitoring wells were installed in the overburden layer.
2. PID Readings were taken from headspace of riser.
3. No water found at location B-49

NA - No soil sample collected

NS - Not surveyed

Table 3-3
Vapor Intrusion Sample Location Key
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

Location Code	Address of Structure Sampled	Associated Sample IDs
SV-1	3466 Genesee Street, Cheektowaga, New York	3466 Genesee IA2, 3466 Genesee SS2, DUP-1, DUP-2
SV-2	3466 Genesee Street, Cheektowaga, New York	3466 Genesee OA, 3466 Genesee SS1
SV-3	3470 Genesee Street, Cheektowaga, New York	3470 Genesee SS, 3470 Genesee IA
SV-4	136 Colden Court, Cheektowaga, New York	136 Colden OA, 136 Colden SS, 136 Colden IA
SV-5	132 Colden Court, Cheektowaga, New York	132 Colden OA, 132 Colden SS, 132 Colden IA

Table 4-1
Summary of Subsurface Soil Analytical Results
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

			Offsite Sample Locations										Onsite Sample Locations																					
Sample ID			B-11 (6-8')		B-12 (8-12')		B-13 (8-12')		B-14 (8-12')		B-15 (4-8')		B-16 (12-14')		B-17 (8-10')		B-18 (6-8')		B-19 (6-8')		B-20 (0-2')		B-20 (12-14')		B-21 (0-2')		B-22 (0-4')		B-23 (0-2')		B-24 (0-4')		B-25 (5-6')	
Sample Location			B-11		B-12		B-13		B-14		B-15		B-16		B-17		B-18		B-19		B-20		B-20		B-21		B-22		B-23		B-24		B-25	
Sampling Date			12/10/2012		12/10/2012		12/10/2012		12/10/2012		12/10/2012		12/7/2012		12/5/2012		12/6/2012		12/12/2012		12/7/2012		12/7/2012		12/12/2012		12/13/2012		12/7/2012		12/5/2012		12/13/2012	
Sample Depth			6-8 ft bgs		8-12 ft bgs		8-12 ft bgs		8-12 ft bgs		4-8 ft bgs		12-14 ft bgs		8-10 ft bgs		6-8 ft bgs		6-8 ft bgs		0-2 ft bgs		12-14 ft bgs		0-2 ft bgs		0-4 ft bgs		0-2 ft bgs		0-4 ft bgs		5-6 ft bgs	
NYSDEC Subpart 375-6: Remedial Program Soil Cleanup Objectives																																		
Chemical unrestricted	Unrestricted Use	Restricted Use - Commercial																																
Inorganic Analytes (mg/kg)																																		
Aluminum	NL										11000																							
Arsenic	13										5.2																							
Barium	350										66																							
Beryllium	7.2										0.37																							
Cadmium	2.5										0.42																							
Calcium	NL										63000																							
Chromium	30										20																							
Cobalt	NL										7.3																							
Copper	50										17																							
Iron	NL										19000																							
Lead	63										11																							
Magnesium	NL										19000																							
Manganese	1,600										550																							
Nickel	30										16																							
Potassium	NL										2100																							
Selenium	3.9																																	
Sodium	NL										730																							
Vanadium	NL										27																							
Cyanide	27											U																						
Zinc	109										62																							
Volatile Organic Compounds (mg/kg)																																		
Acetone	0.05	500.00		UJ		UJ		UJ		UJ		UJ		UJ		UJ		UJ		U		UJ		UJ		UJ		U		UJ		UJ		UJ
cis -1,2-Dichloroethene	0.25	500.00		U		U		U	0.012		0.004		0.035			U		U		U		U		U		U	0.0095			U		U	0.028	
trans-1,2-Dichloroethene	0.19	500.00		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
n-Butylbenzene	12.00	500.00		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
n-Propylbenzene	3.90	500.00		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
sec-Butylbenzene	11.00	500.00		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
Toluene	0.70	500.00		U		U		U		U		U		U		U	0.0022			U		U		U		U		U		U		U		U
Trichloroethene	0.47	200.00		U		U		U		U		U	0.003			U		U		U		U	0.0071			U	0.0043			U		U	0.0035	
1,2,4-Trimethylbenzene	3.60	190.00		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
1,3,5-Trimethylbenzene	8.40	190.00		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
Vinyl Chloride	0.02	13.00		U		U		U		U		U		U		U		U		U		U		U		U	0.016			U		U		U
Xylene (mixed)	0.26	500.00		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
1,1,1,2-Tetrachloroethane	NL	NL		U		U		U	0.0045			U		U		U		U		U		U		U		U		U		U		U		U
Isopropylbenzene (Cumene)	NL	NL		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
p-Isopropyltoluene (p-Cymene)	NL	NL		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
Tetrachloroethene	1.30	150.00		U		U		U				U	0.087			U		U		U	0.021		0.059		0.038	J	0.0099			U	0.0028		0.0085	
Pesticides (mg/kg)																																		
4,4'-DDD[2]	0.0033											U																						
4,4'-DDT [2]	0.0033											U																						
Tentatively Identified Compounds - Volatile Compounds (mg/kg)																																		
Napthalene, 1,2,3,4-tetra....(01)	NL			U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U
Napthalene, 1,2,3,4-tetra....(02)	NL			U		U		U		U		U		U		U		U		U		U		U		U		U		U		U		U

Notes:

1) Lab Qualifiers are defined as the following: J – estimated value, R – rejected value, U – non-detect value, D –dilution, N – presumptive evidence of the compound, B- Compound was found in the Blank and the Sample

2) Results in bold indicate detections.

3) Results are compared to NYSDEC Subpart 375-6 Table 375-6.8(b): Unrestricted Use Soil Cleanup Objectives (http://www.dec.ny.gov/regs/15507.html)

4) Table 4-1 presents only the compounds detected at concentrations exceeding their respective Unrestricted Use Soil Cleanup Objective. Compounds detected at concentrations below the Unrestricted Use Soil Cleanup Objective are not presented in this table.

Acronyms: bgs – below ground surface

Table 4-1
Summary of Subsurface Soil Analytical Results
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

			Onsite Sample Locations															
Sample ID			B-26 (6-8')	B-27 (3-4')	B-28 (4-6')	B-29 (4-6')	B-29 (10-12')	DUP-1	B-30 (6-8')	B-31 (6-8')	B-32 (8-10')	B-33 (2-4')	B-34 (4-6')	B-35 (6-8')	B-37 (10-12')	B-40 (10-12')	DUP-2	B-41 (10-12')
Sample Location			B-26	B-27	B-28	B-29	B-29	B-29	B-30	B-31	B-32	B-33	B-34	B-35	B-37	B-40	B-40	B-41
Sampling Date			12/13/2012	12/13/2012	12/11/2012	12/11/2012	12/11/2012	12/11/2012	12/10/2012	12/12/2012	12/10/2012	12/10/2012	12/11/2012	12/12/2012	12/12/2012	12/12/2012	12/12/2012	12/12/2012
Sample Depth			6-8 ft bgs	3-4 ft bgs	4-6 ft bgs	4-6 ft bgs	10-12 ft bgs	10-12 ft bgs	6-8 ft bgs	6-8 ft bgs	8-10 ft bgs	2-4 ft bgs	4-6 ft bgs	6-8 ft bgs	10-12 ft bgs	10-12 ft bgs	10-12 ft bgs	10-12'
NYSDEC Subpart 375-6: Remedial Program Soil Cleanup Objectives																		
Chemical unrestricted	Unrestricted Use	Restricted Use - Commercial																
Inorganic Analytes (mg/kg)																		
Aluminum	NL						5300									5200		
Arsenic	13						4.2									5.3		
Barium	350						38									46		
Beryllium	7.2						U									U		
Cadmium	2.5						0.3									0.35		
Calcium	NL						70000									87000		
Chromium	30						8.3									8.5		
Cobalt	NL						4.3									3.4		
Copper	50						7.8									7.6		
Iron	NL						11000									10000		
Lead	63						7.3									6.5		
Magnesium	NL						29000									35000		
Manganese	1,600						330									330		
Nickel	30						7									6.4		
Potassium	NL						1500									1400		
Selenium	3.9						U											
Sodium	NL						250									190		
Vanadium	NL						17									15		
Cyanide	27						0.82									U		
Zinc	109						47									48		
Volatile Organic Compounds (mg/kg)																		
Acetone	0.05	500.00	UJ	0.27 J	UJ	U	UJ	U	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	U	U
cis -1,2-Dichloroethene	0.25	500.00	U	64	U	U	U	U	0.0027	U	0.0093	U	0.0039	U	6.5	U	0.011	U
trans-1,2-Dichloroethene	0.19	500.00	U	0.058	U	U	U	U	U	U	U	U	U	U	U	U	U	U
n-Butylbenzene	12.00	500.00	U	0.036	U	U	U	U	U	U	U	U	U	U	U	U	U	U
n-Propylbenzene	3.90	500.00	U	0.0081	U	U	U	U	U	U	U	U	U	U	U	U	U	U
sec-Butylbenzene	11.00	500.00	U	0.031	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Toluene	0.70	500.00	U	U	U	U	U	U	U	0.0024	U	U	U	U	U	U	U	U
Trichloroethene	0.47	200.00	U	U	U	U	U	U	0.0062	U	U	U	U	U	0.13	U	0.01	U
1,2,4-Trimethylbenzene	3.60	190.00	U	0.14	U	U	U	U	U	0.0022	U	U	U	U	U	U	U	U
1,3,5-Trimethylbenzene	8.40	190.00	U	0.057	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Vinyl Chloride	0.02	13.00	U	0.096	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Xylene (mixed)	0.26	500.00	U	0.0051	U	U	U	U	U	U	U	U	U	U	U	U	U	U
1,1,1,2-Tetrachloroethane	NL	NL	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Isopropylbenzene (Cumene)	NL	NL	U	0.0054	U	U	U	U	U	U	U	U	U	U	U	U	U	U
p-Isopropyltoluene (p-Cymene)	NL	NL	U	0.035	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Tetrachloroethene	1.30	150.00	U	0.021	0.0033	1100	2400	1900	0.19	U	0.0029	U	U	U	42	67 J	28 J	0.014
Pesticides (mg/kg)																		
4,4'-DDD[2]	0.0033						0.022									U		
4,4'-DDT [2]	0.0033						0.012									0.0066		
Tentatively Identified Compounds - Volatile Compounds (mg/kg)																		
Napthalene, 1,2,3,4-tetra....(01)	NL		U	U	U	49 U	U	190	U	U	U	U	U	U	U	U	U	U
Napthalene, 1,2,3,4-tetra....(02)	NL		U	U	U		U	200	U	U	U	U	U	U	U	U	U	U

Notes:

1) Lab Qualifiers are defined as the following: J – estimated value, R – rejected value, U – non-detect value, D –dilution, N – presumptive evidence of the compound, B- Compound was found in the Blank and the Sample

2) Results in bold indicate detections.

3) Results are compared to NYSDEC Subpart 375-6 Table 375-6.8(b): Unrestricted Use Soil Cleanup Objectives (http://www.dec.ny.gov/regs/15507.html)

4) Table 4-1 presents only the compounds detected at concentrations exceeding their respective Unrestricted Use Soil Cleanup Objective. Compounds detected at concentrations below the Unrestricted Use Soil Cleanup Objective are not presented in this table.

Acronyms: bgs – below ground surface

Table 4-1
Summary of Subsurface Soil Analytical Results
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

			Onsite Sample Locations					
Sample ID			B-55_07-23-13		CISTERN		MW-06_7-23-13	
Sample Location			B-55		SUMP		MW-06	
Sampling Date			7/23/2013		12/13/2012		7/23/2013	
Sample Depth			10-12 ft bgs		NA		10-12 ft bgs	
NYSDEC Subpart 375-6: Remedial Program Soil Cleanup Objectives								
Chemical unrestricted	Unrestricted Use	Restricted Use - Commercial						
Inorganic Analytes (mg/kg)								
Aluminum	NL							
Arsenic	13							
Barium	350							
Beryllium	7.2							
Cadmium	2.5							
Calcium	NL							
Chromium	30							
Cobalt	NL							
Copper	50							
Iron	NL							
Lead	63							
Magnesium	NL							
Manganese	1,600							
Nickel	30							
Potassium	NL							
Selenium	3.9							
Sodium	NL							
Vanadium	NL							
Cyanide	27							
Zinc	109							
Volatile Organic Compounds (mg/kg)								
Acetone	0.05	500.00		U		U		U
cis -1,2-Dichloroethene	0.25	500.00	4.1		170		0.27	
trans-1,2-Dichloroethene	0.19	500.00		U		U		U
n-Butylbenzene	12.00	500.00		U		U		U
n-Propylbenzene	3.90	500.00		U		U		U
sec-Butylbenzene	11.00	500.00		U		U		U
Toluene	0.70	500.00		U		U		U
Trichloroethene	0.47	200.00	12	J		U	0.49	
1,2,4-Trimethylbenzene	3.60	190.00		U		U		U
1,3,5-Trimethylbenzene	8.40	190.00		U		U		U
Vinyl Chloride	0.02	13.00		U		U		U
Xylene (mixed)	0.26	500.00		U		U		U
1,1,1,2-Tetrachloroethane	NL	NL		U		U		U
Isopropylbenzene (Cumene)	NL	NL		U		U		U
p-Isopropyltoluene (p-Cymene)	NL	NL			210			
Tetrachloroethene	1.30	150.00	2600	J		U	5.9	
Pesticides (mg/kg)								
4,4'-DDD[2]	0.0033							
4,4'-DDT [2]	0.0033							
Tentatively Identified Compounds - Volatile Compounds (mg/kg)								
Napthalene, 1,2,3,4-tetra....(01)	NL			U		U		U
Napthalene, 1,2,3,4-tetra....(02)	NL			U		U		U

Notes:

1) Lab Qualifiers are defined as the following: J – estimated value, R – rejected value, U – non-detect value, D –dilution, N – presumptive evidence of the compound, B- Compound was found in the Blank and the Sample

2) Results in bold indicate detections.

3) Results are compared to NYSDEC Subpart 375-6 Table 375-6.8(b): Unrestricted Use Soil Cleanup Objectives (http://www.dec.ny.gov/regs/15507.html)

4) Table 4-1 presents only the compounds detected at concentrations exceeding their respective Unrestricted Use Soil Cleanup Objective. Compounds detected at concentrations below the Unrestricted Use Soil Cleanup Objective are not presented in this table.

Acronyms: bgs – below ground surface

Table 4-2
Summary of Groundwater Analytical Results
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

		Offsite Sample Locations																					
Sample ID		B-11		CB-2		B-14		B-44_3-13-13		B-45_3-13-13		B-46_3-13-13		B-47_3-13-13		B-48_3-13-13		B-50_3-13-13		B-51_3-13-13		B-52_3-13-13	
Sample Location		B-11		CB-2		B-14		B-44		B-45		B-46		B-47		B-48		B-50		B-51		B-52	
Sampling Date		12/12/2012		12/13/2012		12/13/2012		3/13/2013		3/13/2013		3/13/2013		3/13/2013		3/13/2013		3/13/2013		3/13/2013		3/13/2013	
Sample Depth (ft)		7-12 ft bgs.		NA		NA		3.40-13.40 ft bgs		8.60-13.60 ft bgs		8.50-13.50 ft bgs		7.10-12.10 ft bgs		7.40-12.40 ft bgs		8.20-13.20 ft bgs		8.80-13.80 ft bgs		10.70-15.70 ft bgs	
Chemical unrestricted	Ambient Water Quality Standards and Guidance Values and Groundwater Effluent																						
Inorganic Analytes (ug/L)																							
Aluminum	100																						
Arsenic	25																						
Barium	1000																						
Calcium	NL																						
Chromium	50																						
Iron	300																						
Magnesium	35000																						
Manganese	300																						
Potassium	NL																						
Sodium	20000																						
Volatile Organic Compounds (ug/L)																							
1,1,1 - Trichloroethane	5		U		U		U		U		U		U		U		U		U		U		U
1,1-Dichloroethane	5		U		U		U		U		U		U		U		U		U		U		U
cis -1,2-Dichloroethene	5	1.1	U		U	360			U		U		U		U		U	53			U		U
trans-1,2-Dichloroethene	5		U		U	2.1			U		U		U		U		U		U		U		U
Trichloroethene	5		U		U	2.2			U		U		U		U		U		U		U		U
Vinyl Chloride	2		U		U	170			U		U		U		U		U	8.5			U		U
Benzene	1		U		U		U		U		U		U		U		U		U		U		U
Chloroethane	5		U		U		U		U		U		U		U		U		U		U		U
Tetrachloroethene	5		U		U		U		U		U		U		U		U		U		U		U
Toluene	5								U		U		U		U		U		U	1.2			U
Acetone	50								UJ	72	J		UJ		UJ		UJ		UJ		UJ	68	J

Notes:

1) Lab Qualifiers are defined as the following: J – estimated value, R – rejected value, U – non-detect value, D –dilution, N – presumptive evidence of the compound, B- Compound was found in the Blank and the Sample

2) Results in bold indicate detections.

3) Results are compared to NYSDEC Subpart 375-6 Table 375-6.8(b): Unrestricted Use Soil Cleanup Objectives (http://www.dec.ny.gov/regs/15507.html)

Acronyms:

bgs – below ground surface

Table 4-2
Summary of Groundwater Analytical Results
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

		Offsite Sample Locations												Onsite Sample Locations							
Sample ID		B-53_3-13-13		FD-01_3-13-13		B-54_3-13-13		MW-01_08-13-13		MW-02_08-13-13		MW-08_08-13-13		B-17		B-18		B-23		B-27	
Sample Location		B-53		B-53		B-54		MW-01		MW-02		MW-08		B-17		B-18		B-23		B-27	
Sampling Date		3/13/2013		3/13/2013		3/13/2013		8/13/2013		8/13/2013		8/13/2013		12/12/2012		12/12/2012		12/12/2012		12/12/2012	
Sample Depth (ft)		8.40-13.40 ft bgs		8.40-13.40 ft bgs		10.30-15.30 ft bgs		11		11		9		4-14 ft bgs.		6.5-11.5 ft bgs		8.9-13.9 ft bgs		7.5-12.5 ft bgs	
Chemical unrestricted	Ambient Water Quality Standards and Guidance Values and Groundwater Effluent																				
Inorganic Analytes (ug/L)																					
Aluminum	100																	0.0039			
Arsenic	25																	2.7			
Barium	1000																	52			
Calcium	NL																	0.11			
Chromium	50																	12			
Iron	300							510		1100		1800						0.0043			
Magnesium	35000																	0.045			
Manganese	300																	370			
Potassium	NL																	0.0035			
Sodium	20000																	0.038	J		
Volatile Organic Compounds (ug/L)																					
1,1,1 - Trichloroethane	5		U		U		U		U		U		U		U		U		U		U
1,1-Dichloroethane	5		U		U		U		U		U		U		U		U		U		U
cis -1,2-Dichloroethene	5		U		U		U		U		U		U		U		U	1.7		920	
trans-1,2-Dichloroethene	5		U		U		U		U		U		U		U		U		U		U
Trichloroethene	5		U		U		U		U		U		U		U		U		U	14	
Vinyl Chloride	2		U		U		U		U		U		U		U		U		U	170	
Benzene	1		U		U		U		U		U		U		U		U		U		U
Chloroethane	5		U		U		U		U		U		U		U		U		U		U
Tetrachloroethene	5		U		U		U		U		U		U		U		U	2.8		11	
Toluene	5		U	1.3			U		U		U		U								
Acetone	50		UJ		UJ		UJ		U		U		U								

Notes:

1) Lab Qualifiers are defined as the following: J – estimated value, R – rejected value, U – non-detect value, D –dilution, N – presumptive evidence of the compound, B- Compound was found in the Blank and the Sample

2) Results in bold indicate detections.

3) Results are compared to NYSDEC Subpart 375-6 Table 375-6.8(b): Unrestricted Use Soil Cleanup Objectives (http://www.dec.ny.gov/regs/15507.html)

Acronyms:

bgs – below ground surface

Table 4-2
Summary of Groundwater Analytical Results
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

		Onsite Sample Locations																									
Sample ID		B-28		DUP-3		B-35		B-36		CISTERN		CB-1		TB-4		FB-3		TB-1		TB-2		FB-1		TB-3		FB-2	
Sample Location		B-28		B-28		B-35		B-36		SUMP		CB-1		NA		NA		NA		NA		NA		NA		NA	
Sampling Date		12/12/2012		12/12/2012		12/12/2012		12/12/2012		12/13/2012		12/13/2012		12/13/2012		12/13/2012		12/7/2012		12/11/2012		12/11/2012		12/12/2012		12/12/2012	
Sample Depth (ft)		7.5-12.5 ft bgs		7.5-12.5 ft bgs.		7.5-12.5 ft bgs.		7-12 ft bgs.		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Chemical unrestricted	Ambient Water Quality Standards and Guidance Values and Groundwater Effluent																										
Inorganic Analytes (ug/L)																											
Aluminum	100																										
Arsenic	25																										
Barium	1000																										
Calcium	NL																										
Chromium	50																										
Iron	300																										
Magnesium	35000																										
Manganese	300																										
Potassium	NL																										
Sodium	20000																										
Volatile Organic Compounds (ug/L)																											
1,1,1 - Trichloroethane	5		U		U		U		U	4.7			U		U		U		U		U		U		U		U
1,1-Dichloroethane	5		U		U		U		U	2.9			U		U		U		U		U		U		U		U
cis -1,2-Dichloroethene	5	21	J	130	J	59		38		620		11			U		U		U		U		U		U		U
trans-1,2-Dichloroethene	5		U		U		U		U	2.9			U		U		U		U		U		U		U		U
Trichloroethene	5	10	J	44	J	4.6		7		2.4			U		U		U		U		U		U		U		U
Vinyl Chloride	2		U	15	J	11		6.2			U		U		U		U		U		U		U		U		U
Benzene	1		U	3.6	J		U		U		U		U		U		U		U		U		U		U		U
Chloroethane	5		U		U		U		U	2.9			U		U		U		U		U		U		U		U
Tetrachloroethene	5	10	J	33	J	12		22		13		1.4			U		U		U		U		U		U		U
Toluene	5																										
Acetone	50																										

Notes:

1) Lab Qualifiers are defined as the following: J – estimated value, R – rejected value, U – non-detect value, D –dilution, N – presumptive evidence of the compound, B- Compound was found in the Blank and the Sample

2) Results in bold indicate detections.

3) Results are compared to NYSDEC Subpart 375-6 Table 375-6.8(b): Unrestricted Use Soil Cleanup Objectives (http://www.dec.ny.gov/regs/15507.html)

Acronyms:

bgs – below ground surface

Table 4-2
Summary of Groundwater Analytical Results
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

		Onsite Sample Locations																	
Sample ID		FB-1_3-13-13		TB-01_7-23-13		FB-01_7-23-13		FB-02_7-23-13		MW-03_08-13-13		MW-04_08-14-13		MW-05_08-13-13		MW-06_08-14-13		MW-07_08-13-13	
Sample Location		NA		NA		NA		NA		MW-03		MW-04		MW-05		MW-06		MW-07	
Sampling Date		3/13/2013		7/23/2013		7/23/2013		7/23/2013		8/13/2013		8/14/2013		8/13/2013		8/14/2013		8/13/2013	
Sample Depth (ft)		NA		NA		NA		NA		10		9		9		11		12	
Chemical unrestricted	Ambient Water Quality Standards and Guidance Values and Groundwater Effluent																		
Inorganic Analytes (ug/L)																			
Aluminum	100																		
Arsenic	25																		
Barium	1000																		
Calcium	NL																		
Chromium	50																		
Iron	300									2200		3400		50		270		87	U
Magnesium	35000																		
Manganese	300																		
Potassium	NL																		
Sodium	20000																		
Volatile Organic Compounds (ug/L)																			
1,1,1 - Trichloroethane	5		U		U		U		U		U		U		U		U		U
1,1-Dichloroethane	5		U		U		U		U		U		U		U		U		U
cis -1,2-Dichloroethene	5		U		U		U		U		U	15000		4.9		22000		130	
trans-1,2-Dichloroethene	5		U		U		U		U		U		U		U		U		U
Trichloroethene	5		U		U		U		U		U		U	8.9			U	6.4	
Vinyl Chloride	2		U		U		U		U		U	3500			U		U	44	
Benzene	1		U		U		U		U		U		U		U		U		U
Chloroethane	5		U		U		U		U		U		U		U		U		U
Tetrachloroethene	5		U		U		U	4			U		U	27			U	9.6	
Toluene	5		U		U		U		U		U		U		U		U		U
Acetone	50		UJ		U		U		U		U		U		U		U		U

Notes:

1) Lab Qualifiers are defined as the following: J – estimated value, R – rejected value, U – non-detect value, D –dilution, N – presumptive evidence of the compound, B- Compound was found in the Blank and the Sample

2) Results in bold indicate detections.

3) Results are compared to NYSDEC Subpart 375-6 Table 375-6.8(b): Unrestricted Use Soil Cleanup Objectives (http://www.dec.ny.gov/regs/15507.html)

Acronyms:

bgs – below ground surface

Table 4-3
Summary of Vapor Intrusion Analytical Results
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

				Sample Identification	13D1071-01		13D1071-02		13D1071-03		13D1071-04		13D1071-05		13D1071-06	
				Sample Location	SV-4 OA		SV-4 SS		SV-4 IA		SV-5 SS		SV-5 IA		SV-5 OA	
				Sample Date	23-Apr-13		23-Apr-13		23-Apr-13		23-Apr-13		23-Apr-13		23-Apr-13	
Chemical Name[1]	Indoor Air Statistical Value[2]	Outdoor Air Statistical Value[3]	Air Guideline Value[4]	Unit												
1,1,1-Trichloroethane	20.60	2.60	NL	ug/m^3	ND	U	ND	U	ND	U	5.40		7.10		ND	U
1,1,2,2-Tetrachloroethane	NL	NL	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,1,2-Trichloro-1,2,2-trifluoroeth	NL	NL	NL	ug/m^3	0.05	J	0.65	J	0.46	J	0.65	J	0.52	J	0.45	J
1,1,2-Trichloroethane	1.5	1.6	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,1-Dichloroethane	0.7	0.6	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,1-Dichloroethene	1.4	1.4	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,4-Trichlorobenzene	6.8	6.4	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,4-Trimethylbenzene	9.5	5.8	NL	ug/m^3	ND	U	3.70		0.40		2.80		0.46		0.22	
1,2-Dibromoethane (EDB)	1.5	1.6	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2-Dichloro-1,1,2,2-tetrafluoroe	NL	NL	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2-Dichlorobenzene	1.2	1.2	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2-Dichloroethane	0.9	0.8	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2-Dichloropropane	1.6	1.6	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,3,5-Trimethylbenzene	3.7	2.7	NL	ug/m^3	ND	U	0.99		ND	U	0.75		ND	U	ND	U
1,3-Butadiene	3	3.4	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,3-Dichlorobenzene	2.4	2.2	NL	ug/m^3	ND	U	0.36		ND	U	0.31		ND	U	ND	U
1,4-Dichlorobenzene	5.5	1.2	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,4-Dioxane	NL	NL	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
2-Butanone (MEK)	12	11.3	NL	ug/m^3	ND	U	ND		ND	U	ND	U	6.10		ND	U
2-Hexanone (MBK)	NL	NL	NL	ug/m^3	ND	U	0.62		0.45		0.28		0.78		0.26	
4-Ethyltoluene	3.6	3	NL	ug/m^3	ND	U	0.78		ND	U	0.58		ND	U	ND	U
4-Methyl-2-pentanone (MIBK)	6	1.9	NL	ug/m^3	ND	U	0.66	J	0.48	J	0.40	J	0.44	J	ND	U
Acetone	98.9	43.7	NL	ug/m^3	7.40	J	36.00	J	23.00	J	29.00	J	37.00	J	9.50	J
Benzene	9.4	6.6	NL	ug/m^3	0.42		0.64		0.38		0.58		0.44		0.36	
Benzyl chloride	<6.8	<6.4	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Bromodichloromethane	NL	NL	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Bromoform	NL	NL	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Bromomethane	1.7	1.6	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Carbon Disulfide	4.2	3.7	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Carbon tetrachloride	1.3	0.7	NL	ug/m^3	0.47		0.51		0.46		0.45		0.46		0.41	
Chlorobenzene	0.9	0.8	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Chloroethane	1.1	1.2	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Chloroform	1.1	0.6	NL	ug/m^3	ND	U	0.29		0.28		0.41		0.38		ND	U
Chloromethane	3.7	3.7	NL	ug/m^3	1.30		1.50		1.50		1.30		1.30		1.40	
cis-1,2-Dichloroethene	1.9	1.8	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
cis-1,3-Dichloropropene	2.3	2.2	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Cyclohexane	NL	NL	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Dibromochloromethane	NL	NL	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Dichlorodifluoromethane (Freon	16.5	8.1	NL	ug/m^3	1.40		5.10		6.10		1.40		1.20		1.40	
Ethanol	210.0	57.0	NL	ug/m^3	4.50		210.00		220.00		360.00		500.00		8.40	
Ethyl Acetate	5.4	1.5	NL	ug/m^3	8.70		14.00		44.00		1.70		2.70		1.70	
Ethylbenzene	5.7	3.5	NL	ug/m^3	ND	U	1.40		0.31		0.96		0.30		ND	U
Heptane	NL	NL	NL	ug/m^3	ND	U	0.63		ND	U	0.64		0.51		ND	U

Table 4-3
Summary of Vapor Intrusion Analytical Results
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

				Sample Identification	13D1071-01		13D1071-02		13D1071-03		13D1071-04		13D1071-05		13D1071-06	
				Sample Location	SV-4 OA		SV-4 SS		SV-4 IA		SV-5 SS		SV-5 IA		SV-5 OA	
				Sample Date	23-Apr-13		23-Apr-13		23-Apr-13		23-Apr-13		23-Apr-13		23-Apr-13	
Chemical Name[1]	**Indoor Air Statistical Value[2]**	**Outdoor Air Statistical Value[3]**	**Air Guideline Value[4]**	**Unit**												
Hexachlorobutadiene	6.8	6.4	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Hexane*	10.2	6.4	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Isopropanol	NL	NL	NL	ug/m^3	ND	U	14.00	J	27.00	J	25.00	J	76.00	J	ND	U
m,p-Xylene	22.2	12.8	NL	ug/m^3	0.07		4.40		0.76		3.00		0.73		ND	U
Methyl tert-Butyl Ether (MTBE)	11.5	6.2	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Methylene chloride	10	6.1	60.00	ug/m^3	0.48		4.50		2.50		4.90		3.60		ND	U
Naphthalene	5.1	4.9	NL	ug/m^3	ND	U	0.58		0.23		0.49		ND	U	ND	U
o-Xylene	7.9	4.6	NL	ug/m^3	ND	U	1.90		0.28		1.40		0.26		ND	U
Propene	NL	NL	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Styrene	1.9	1.3	NL	ug/m^3	ND	U	0.25		0.18		0.38		0.42		ND	U
Tetrachloroethene	15.9	6.5	100.00	ug/m^3	ND	U	0.74		0.38		ND	U	ND	U	ND	U
Tetrahydrofuran	NL	NL	NL	ug/m^3	ND	U	0.12		ND	U	ND	U	ND	U	ND	U
Toluene	43	33.7	NL	ug/m^3	0.46		5.80		1.80		7.10		4.80		0.58	
trans-1,2-Dichloroethene	NL	NL	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
trans-1,3-Dichloropropene	1.3	1.4	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Trichloroethene	4.2	1.3	5.00	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Trichlorofluoromethane (Freon 1	18.1	4.3	NL	ug/m^3	0.16		3.40		3.10		1.40		1.20		0.95	
Vinyl Acetate	NL	NL	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Vinyl Chloride	1.9	1.8	NL	ug/m^3	ND	U	0.11		ND	U	0.20		ND	U	ND	U

Notes:

1 - EPA Method TO-15

2 - Final New York State Department of Health Soil Vapor Intrusion Guidance, October 2006. Appendix C Table C2 - EPA 2001: Building assessment and survey evaluation (BASE) database, SUMMA® cainster method, 90th percentile for indoor air.

3 - Final New York State Department of Health Soil Vapor Intrusion Guidance, October 2006. Appendix C Table C2 - EPA 2001: Building assessment and survey evaluation (BASE) database, SUMMA® cainster method, 90th percentile for outdoor air.

4 - Final NYSDOH Soil Vapor Intrusion Guidance, October 2006. Table 3.1 Air Guideline Values Derived by the NYSDOH.

* - Value for n-Hexane

Acronyms:

bgs - below ground surface NL - not listed ug/m^3- microgram per meters cubed

Lab Qualifiers: **Color Legend:**

U - non-detect J- Estimated Yellow - Exceedance

Table 4-3
Summary of Vapor Intrusion Analytical Results
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

				Sample Identification	13D1071-07		13D1071-08		13D1071-09		13D1071-10		13D1071-11		13D1071-13	
				Sample Location	SV-3 SS		SV-3 IA		SV-2 SS1		SV-1 IA2		SV-1 SS2		SV-2 OA	
				Sample Date	23-Apr-13		23-Apr-13		23-Apr-13		23-Apr-13		23-Apr-13		23-Apr-13	
Chemical Name[1]	Indoor Air Statistical Value[2]	Outdoor Air Statistical Value[3]	Air Guideline Value[4]	Unit												
1,1,1-Trichloroethane	20.60	2.60	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,1,2,2-Tetrachloroethane	NL	NL	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,1,2-Trichloro-1,2,2-trifluoroeth	NL	NL	NL	ug/m^3	0.60	J	0.47	J	0.53	J	0.51	J	0.55	J	0.51	J
1,1,2-Trichloroethane	1.5	1.6	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,1-Dichloroethane	0.7	0.6	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,1-Dichloroethene	1.4	1.4	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	0.16		ND	U
1,2,4-Trichlorobenzene	6.8	6.4	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,4-Trimethylbenzene	9.5	5.8	NL	ug/m^3	3.80		0.36		10.00		11.00		6.20		ND	U
1,2-Dibromoethane (EDB)	1.5	1.6	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2-Dichloro-1,1,2,2-tetrafluoroe	NL	NL	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2-Dichlorobenzene	1.2	1.2	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2-Dichloroethane	0.9	0.8	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2-Dichloropropane	1.6	1.6	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,3,5-Trimethylbenzene	3.7	2.7	NL	ug/m^3	0.98		ND	U	2.60		2.60		1.60		ND	U
1,3-Butadiene	3	3.4	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,3-Dichlorobenzene	2.4	2.2	NL	ug/m^3	0.45		ND	U	0.28		ND	U	0.22		ND	U
1,4-Dichlorobenzene	5.5	1.2	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,4-Dioxane	NL	NL	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
2-Butanone (MEK)	12	11.3	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
2-Hexanone (MBK)	NL	NL	NL	ug/m^3	0.52		0.71		1.30		1.20		ND	U	ND	U
4-Ethyltoluene	3.6	3	NL	ug/m^3	0.76		ND	U	2.90		2.80		1.70		ND	U
4-Methyl-2-pentanone (MIBK)	6	1.9	NL	ug/m^3	0.58	J	ND	U	0.76		1.10	J	ND	U	ND	U
Acetone	98.9	43.7	NL	ug/m^3	70.00	J	36.00	J	34.00	J	23.00	J	ND	U	ND	J
Benzene	9.4	6.6	NL	ug/m^3	0.70		0.57		8.60		7.90		5.90		0.39	
Benzyl chloride	<6.8	<6.4	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Bromodichloromethane	NL	NL	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Bromoform	NL	NL	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Bromomethane	1.7	1.6	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Carbon Disulfide	4.2	3.7	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Carbon tetrachloride	1.3	0.7	NL	ug/m^3	0.29		0.45		0.30		0.43		0.41		0.45	
Chlorobenzene	0.9	0.8	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Chloroethane	1.1	1.2	NL	ug/m^3	ND	U	ND	U	0.26		ND	U	ND	U	ND	U
Chloroform	1.1	0.6	NL	ug/m^3	ND	U	ND	U	0.18		ND	U	ND	U	ND	U
Chloromethane	3.7	3.7	NL	ug/m^3	1.40		1.30		1.60		1.40		1.20		1.30	
cis-1,2-Dichloroethene	1.9	1.8	NL	ug/m^3	ND	U	ND	U	6.80		4.50		4.20		ND	U
cis-1,3-Dichloropropene	2.3	2.2	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Cyclohexane	NL	NL	NL	ug/m^3	ND	U	ND	U	3.30		3.10		2.10		ND	U
Dibromochloromethane	NL	NL	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Dichlorodifluoromethane (Freon	16.5	8.1	NL	ug/m^3	1.30		1.30		1.40		1.30		1.40		1.50	
Ethanol	210.0	57.0	NL	ug/m^3	170.00		34.00		160.00		79.00		170.00		5.10	
Ethyl Acetate	5.4	1.5	NL	ug/m^3	8.50		6.80		2.60		2.50		4.00		2.10	
Ethylbenzene	5.7	3.5	NL	ug/m^3	1.20		0.28		7.90		7.70		5.10		ND	U
Heptane	NL	NL	NL	ug/m^3	0.65		0.40		9.50		9.60		6.50		ND	U

Table 4-3
Summary of Vapor Intrusion Analytical Results
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

Sample Identification					13D1071-07		13D1071-08		13D1071-09		13D1071-10		13D1071-11		13D1071-13	
Sample Location					SV-3 SS		SV-3 IA		SV-2 SS1		SV-1 IA2		SV-1 SS2		SV-2 OA	
Sample Date					23-Apr-13		23-Apr-13		23-Apr-13		23-Apr-13		23-Apr-13		23-Apr-13	
Chemical Name[1]	**Indoor Air Statistical Value[2]**	**Outdoor Air Statistical Value[3]**	**Air Guideline Value[4]**	**Unit**												
Hexachlorobutadiene	6.8	6.4	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Hexane*	10.2	6.4	NL	ug/m^3	ND	U	ND	U	28.00		26.00		20.00		ND	U
Isopropanol	NL	NL	NL	ug/m^3	9.90	J	3.50	J	8.00	J	4.30	J	7.20	J	ND	U
m,p-Xylene	22.2	12.8	NL	ug/m^3	4.00		0.85		29.00		28.00		19.00		0.38	
Methyl tert-Butyl Ether (MTBE)	11.5	6.2	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Methylene chloride	10	6.1	60.00	ug/m^3	3.60		1.40		2.40		2.20		3.10		2.20	
Naphthalene	5.1	4.9	NL	ug/m^3	1.20		5.30		0.55		1.40		0.60		ND	U
o-Xylene	7.9	4.6	NL	ug/m^3	1.80		0.34		10.00		10.00		6.50		0.16	
Propene	NL	NL	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Styrene	1.9	1.3	NL	ug/m^3	0.19		0.15		0.16		ND	U	ND	U	ND	U
Tetrachloroethene	15.9	6.5	100.00	ug/m^3	0.31		ND	U	190.00		200.00		150.00		0.73	
Tetrahydrofuran	NL	NL	NL	ug/m^3	0.17		ND	U	0.97		0.31		0.13		ND	U
Toluene	43	33.7	NL	ug/m^3	6.30		3.00		51.00		46.00		34.00		0.80	
trans-1,2-Dichloroethene	NL	NL	NL	ug/m^3	ND	U	ND	U	0.26		0.17		0.19		ND	U
trans-1,3-Dichloropropene	1.3	1.4	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Trichloroethene	4.2	1.3	5.00	ug/m^3	ND	U	ND	U	5.90		5.40		4.50		ND	U
Trichlorofluoromethane (Freon 1	18.1	4.3	NL	ug/m^3	1.20		1.00		10.00		12.00		8.70		1.10	
Vinyl Acetate	NL	NL	NL	ug/m^3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Vinyl Chloride	1.9	1.8	NL	ug/m^3	0.27		ND	U	0.33		0.13		0.17		ND	U

Notes:

1 - EPA Method TO-15

2 - Final New York State Department of Health Soil Vapor Intrusion Guidance, October 2006. Appendix C Table C2 - EPA 2001: Building assessment and survey evaluation (BASE) database, SUMMA® cainster method, 90th percentile for indoor air.

3 - Final New York State Department of Health Soil Vapor Intrusion Guidance, October 2006. Appendix C Table C2 - EPA 2001: Building assessment and survey evaluation (BASE) database, SUMMA® cainster method, 90th percentile for outdoor air.

4 - Final NYSDOH Soil Vapor Intrusion Guidance, October 2006. Table 3.1 Air Guideline Values Derived by the NYSDOH.

* - Value for n-Hexane

Acronyms:

bgs - below ground surface	NL - not listed	ug/m^3- microgram per meters cubed
Lab Qualifiers:		**Color Legend:**
U - non-detect	J- Estimated	Yellow - Exceedance

Table 4-4
NYSDEC Work Assignment # D007621-6
Former Doro Dry Cleaners Site No. 9-15-238
Vapor Intrusion Recommendations Based on NYSDOH Decision Matrices[1]

Location	Compound	Sub-Slab Air Concentrations	Indoor Air Concentrations	Outdoor Air Concentrations[2]	Action Recommended[3]	Final Action Recommended[3]
SV-1	PCE	150	200	0.73	Mitigation	Based on PCE results, mitigation is needed to minimize current or potential exposures associated with soil vapor intrusion.
	TCE	4.5	5.4	ND	Reasonable Action	
	Carbon Tetrachloride	0.41	0.43	0.45	Reasonable Action	
	1,1,1-TCA	ND	ND	ND	No Further Action	
SV-2	PCE	190	200	0.73	Mitigation	Based on PCE and TCE mitigation is needed to minimize current or potential exposures associated with soil vapor intrusion.
	TCE	5.9	5.4	ND	Mitigation	
	Carbon Tetrachloride	0.3	0.43	0.45	Reasonable Action	
	1,1,1-TCA	ND	ND	ND	No Further Action	
SV-3	PCE	0.31	ND	0.73	No Further Action	Based on carbon tetrachloride results reasonable and practical action should be taken to identify source(s) and reduce exposure, as concentrations are likely due to sources other than soil vapor intrusion.
	TCE	ND	ND	ND	No Further Action	
	Carbon Tetrachloride	0.29	0.45	0.45	Reasonable Action	
	1,1,1-TCA	ND	ND	ND	No Further Action	
SV-4	PCE	0.74	0.38	ND	No Further Action	Based on carbon tetrachloride results reasonable and practical action should be taken to identify source(s) and reduce exposure, as concentrations are likely due to sources other than soil vapor intrusion.
	TCE	ND	ND	ND	No Further Action	
	Carbon Tetrachloride	0.51	0.46	0.47	Reasonable Action	
	1,1,1-TCA	ND	ND	ND	No Further Action	
SV-5	PCE	ND	ND	ND	No Further Action	Based on carbon tetrachloride and 1,1,1-TCA results reasonable and practical action should be taken to identify source(s) and reduce exposure, as concentrations are likely due to sources other than soil vapor intrusion.
	TCE	ND	ND	ND	No Further Action	
	Carbon Tetrachloride	0.45	0.46	0.41	Reasonable Action	
	1,1,1-TCA	5.4	7.1	ND	Reasonable Action	

Notes:

1. "Guidance for Evaluating Soil Vapor Intrusion in the State of New York", NYSDOH, October 2006
2. Outdoor ambient air sample SV-2 OA was used for comparison with SV-1, SV-2, and SV-3 sub-slab and indoor air samples
3. Action levels based on NYSDOH Matrix 1 for TCE and carbon tetrachloride and Matrix 2 for PCE and 1,1,1-TCA,

All Concentrations in $\mu g/m^3$
PCE = Tetrachloroethene
TCE = Trichloroethene
1,1,1-TCA = 1,1,1-Trichloroethane
ND = indicates the compound was not detected at or above the quanititation limit

Table 4-5
Summary of Groundwater DHC and Reductase Analytical Results
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

	Onsite Wells							
Sample ID	MW-07_08-13-13		MW-05_08-13-13		MW-04_08-14-13		MW-06_08-14-13	
Sample Location	MW-07		MW-05		MW-04		MW-06	
Sampling Date	8/13/2013		8/13/2013		8/14/2013		8/14/2013	
Sample Depth (screened interval)								
Dechlorinating Bacteria (cells/mL)								
DHC	9.5		<0.5		11.5		0.55	J
BVC	<0.5		<0.5		61.1		0.337	J
TCE	<0.5		<0.5		3.9		8.5	
VCR	<0.5		<0.5		0.2	J	<0.5	

Notes:
DHC - Dehalococcoides bacteria
TCE – The tceA gene encodes the enzyme responsible for reductive dechlorination of TCE to cis-¬-DCE in some strains of Dehalococcoides. Absence of tceA does not preclude the potential for reductive dechlorination of TCE in the field since the tceA gene is not universally distributed among all DHC and is not present in other microorganisms capable of reductive dechlorination of TCE (e.g. Dehalobacter). Detection of the tceA gene provides an additional line of evidence indicating the potential for dechlorination of TCE.
BVC - The bvcA gene encodes the vinyl chloride reductase enzyme responsible for reductive dechlorination of vinyl chloride to ethane by Dehalococcoides str. BAV1. Presence of bvcA gene indicates the potential for reductive dechlorination of VC to ethene. Absence of both bvcA and vcrA genes suggests VC may accumulate.
VCR - The vcrA gene encodes the vinyl chloride reductase enzyme responsible for reductive dechlorination of cis---DCE and vinyl chloride by Dehalococcoides strain VS. Presence of vcrA gene indicates the potential for reductive dechlorination of DCE and/or VC to ethene. Absence of both bvcA and vcrA genes suggest VC may accumulate.
< The target gene was not detected at the Limit of Quantitation reported for that sample.
J - Estimated gene copies below the practical quantitation limit, but above the limit of quantitation

Table 5-1
Physical/Chemical Properties of Contaminants of Potential Concern
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

Compounds	CAS No	Molecular Weight g/mole		Water Solubility mg/L		Henry's Law Constant unitless		Vapor Pressure atm		Soil organic carbon-water partition coefficient K_{oc} (mL water/g soil)		Octanol/water partitioning coefficient K_{ow} unitless		Soil-water partition coefficient Kd_s (cm3 water/g soil)		Fish Bioconcentration Factor BCF_{fish} L/kg		Degradation Rate Constant Ksg year $^{-1}$	
Chlorinated Volatile Organic Compounds																			
cis- 1,2-Dichloroethene (cis-1,2-DEC)	156-59-2	96.94	a	6.41E+03	b	1.67E-01	b	2.30E-01	a	4.98E+02	a	9.60E+01	a	4.98	a	11.1	b	1.41	a
Tetrachloroethene (PCE)	127-18-4	165.85	a	2.06E+02	b	7.24E-01	b	2.42E-02	a	2.65E+02	a	3.51E+02	a	2.65	a	52	b	7.03E-01	a
1,1,1-Trichloroethane (1,1,1-TCA)	71-55-6	133.42	a	1.29E+03	b	7.03E-01	b	1.63E-01	a	1.35E+05	a	2.64E+02	a	1350	a	5	b	9.26E-01	a
Trichloroethene (TCE)	79-01-6	131.4	a	1.28E+03	b	4.03E-01	b	9.48E-02	a	9.40E+01	a	2.71E+02	a	0.94	a	16	b	0.703	a
Carbon Tetrachloride	56-23-5	153.84	a	7.93E+02	b	1.13	b	1.48E-01	a	1.52E+02	a	5.21E+02	a	1.52	a	7.4	b	0.703	a
Methylene Chloride	75-09-2	84.94	a	1.30E+04	b	1.33E-01	b	4.87E-01	a	1.00E+01	a	1.80E+01	a	0.10	a	23.1	b	9.03	a
Vinyl Chloride (VC)	75-01-4	62.5	a	8.80E+03	b	1.14	b	3.68E+00	a	1.11E+01	a	1.40E+01	a	0.11	a	5.47	b	1.41	a

Notes

NA = not available; * at 1,000ºC

Source

a. EPA 1999. Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustible Facilities, vol 2, Appendix A, EPA530-D-99-001B, August 1999

b. The Risk Assessment Information System. http://rais.ornl.gov/ (RAIS source is EPA EPI: http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

Table 5-2
Summary of Groundwater Analytical Results
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

	Offsite Wells						Onsite Wells									
Sample ID	MW-01_08-13-13		MW-02_08-13-13		MW-08_08-13-13		MW-03_08-13-13		MW-07_08-13-13		MW-05_08-13-13		MW-04_08-14-13		MW-06_08-14-13	
Sample Location	MW-01		MW-02		MW-08		MW-03		MW-07		MW-05		MW-04		MW-06	
Sampling Date	8/13/2013		8/13/2013		8/13/2013		8/13/2013		8/13/2013		8/13/2013		8/14/2013		8/14/2013	
Monitored Natural Attenuation Parameters (Lab Samples)																
Alkalinity (mg/L)	400		290		430		620		560		340		540		380	
Chloride (mg/L)	150		350		180		95		190		39		150		150	
Ferrous Iron (mg/L)		U	0.3		0.21		1.9			U		U	1.4			U
Nitrate as N (mg/L)		U		U		U		U		U	1.5			U		U
Nitrite as N (mg/L)	0.37			U		U	0.02			U		U		U		U
Specific Conductance (µmhos/cm)	1200		1500		1300		1400		1500		790		1300		1200	
Sulfate (mg/L)	130		23		100		120		31		77		78		82	
Sulfide (mg/L)		UJ		UJ		UJ		UJ		UJ		UJ		UJ		UJ
Total Organic Carbon (mg/L)	12		2.2		5.3		7.3		4.7		3		18		14	
Field Parameters																
pH	7.02		6.97		7.16		6.7		6.95		7.12		6.91		7.32	
Dissolved Oxygen (mg/L)	2.88		2.8		3.52		3.32		3.04		2.96		2.97		2.86	
Oxidation Reduction Potential (ORP) (mV)	-37.2		14.6		85.1		-16.8		63.9		86		-57.1		49.4	
Temperature (°C)	20.3		19.53		19.66		17.28		18.51		21.7		18.37		20.45	
Turbidity (NTUs)	15.1		35.7		20.2		12.5		6.11		1.66		21.8		7.65	

ND = Analyte not detected above reporting limit
NTU = Nephelometric Turbidity Units
µmhos/cm = micromhos/centimeter = microSiemens/centimeter
mV = millivolt

Table 6-1
Summary of Chemicals of Concern in Soil and Sludge
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

CAS No	Chemical	Min Concentration (µg/L)	Maximum Concentration (mg/kg)	Unit	Location of Maximum Concentration	Start Depth	End Depth	Depth Unit	Number of Detections	375-6.8(b): Restricted Use Soil Cleanup Objectives - Unrestricted[1] (mg/kg)	COC? Yes/No
Volatile Organic Compounds											
71-55-6	1,1,1-Trichloroethane		ND						0 / 33	0.68	No
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.0045	mg/kg	B-14	8	12	ft	1 / 33	NL	No
99-87-6	p-Isopropyltoluene	ND	0.035	mg/kg	B-27	3	4	ft	1 / 33	NL	No
79-34-5	1,1,2,2-Tetrachloroethane		ND						0 / 33	NL	No
79-00-5	1,1,2-Trichloroethane		ND						0 / 33	NL	No
75-34-3	1,1-Dichloroethane		ND						0 / 33	0.27	No
75-35-4	1,1-Dichloroethene		ND						0 / 33	0.33	No
87-61-6	1,2,3-Trichlorobenzene		ND						0 / 33	NL	No
120-82-1	1,2,4-Trichlorobenzene		ND						0 / 33	NL	No
95-63-6	1,2,4-Trimethylbenzene	0.0022	0.14	mg/kg	B-31	6	8	ft	2 / 33	3.6	No
96-12-8	1,2-Dibromo-3-Chloropropane		ND						0 / 33	NL	No
106-93-4	1,2-Dibromoethane (edb)		ND						0 / 33	NL	No
95-50-1	1,2-Dichlorobenzene		ND						0 / 33	1.1	No
107-06-2	1,2-Dichloroethane		ND						0 / 33	0.02	No
78-87-5	1,2-Dichloropropane		ND						0 / 33	NL	No
108-67-8	1,3,5-Trimethylbenzene	ND	0.057	mg/kg	B-27	3	4	ft	1 / 33	8.4	No
541-73-1	1,3-Dichlorobenzene		ND						0 / 33	2.4	No
106-46-7	1,4-Dichlorobenzene		ND						0 / 33	1.8	No
78-93-3	2-Butanone		ND						0 / 33	NL	No
591-78-6	2-Hexanone		ND						0 / 33	NL	No
460-00-4	4-Bromofluorobenzene		ND						0 / 0	NL	No
108-10-1	4-Methyl-2-Pentanone (MIBK)		ND						0 / 33	NL	No
67-64-1	Acetone	ND	0.27	mg/kg	B-27	3	4	ft	1 / 33	0.05	No
71-43-2	Benzene		ND						0 / 33	0.06	No
75-27-4	Bromodichloromethane		ND						0 / 33	NL	No
75-25-2	Bromoform		ND						0 / 33	NL	No
74-83-9	Bromomethane		ND						0 / 33	NL	No
75-15-0	Carbon Disulfide		ND						0 / 33	NL	No
56-23-5	Carbon Tetrachloride		ND						0 / 33	0.76	No
108-90-7	Chlorobenzene		ND						0 / 33	1.1	No
75-00-3	Chloroethane		ND						0 / 33	NL	No
67-66-3	Chloroform		ND						0 / 33	0.37	No
74-87-3	Chloromethane		ND						0 / 33	NL	No
156-59-2	cis-1,2-Dichloroethene	0.0027	170	mg/kg	SUMP	3	4	ft	12 / 33	0.25	Yes
10061-01-5	cis-1,3-Dichloropropene		ND						0 / 33	NL	No
124-48-1	Dibromochloromethane		ND						0 / 33	NL	No
1868-53-7	Dibromoflueormethane		ND						0 / 0	NL	No
75-71-8	Dichlorodifluoromethane		ND						0 / 33	NL	No
100-41-4	Ethylbenzene		ND						0 / 33	1	No
98-82-8	Isopropylbenzene	ND	0.0054	mg/kg	B-27	3	4	ft	1 / 33	NL	No
1634-04-4	Methyl Tert-Butyl Ether (MTBE)		ND						0 / 33	0.93	No
75-09-2	Methylene Chloride		ND						0 / 33	0.05	No
91-20-3	Naphthalene		ND						0 / 33	12	No
104-51-8	n-Butylbenzene	ND	0.036	mg/kg	B-27	3	4	ft	1 / 33	12	No
103-65-1	n-Propylbenzene	ND	0.0081	mg/kg	B-27	3	4	ft	1 / 33	3.9	No
95-47-6	O-Xylene*	ND	0.0051	mg/kg	B-27	3	4	ft	1 / 33	0.26	No
135-98-8	sec-Butylbenzene	ND	0.031	mg/kg	B-27	3	4	ft	1 / 33	11	No
100-42-5	Styrene		ND						0 / 33	NL	No
98-06-6	tert-Butylbenzene		ND						0 / 33	5.9	No
127-18-4	Tetrachloroethene	0.0028	2400	mg/kg	B-29	10	12	ft	18 / 33	1.3	Yes
108-88-3	Toluene	0.0022	0.0024	mg/kg	B-31	6	8	ft	2 / 33	0.7	No
156-60-5	trans-1,2-Dichloroethene	ND	0.058	mg/kg	B-27	3	4	ft	1 / 33	0.19	No
10061-02-6	trans-1,3-Dichloropropene		ND						0 / 33	NL	No
79-01-6	Trichloroethene	0.003	0.13	mg/kg	B-37	10	12	ft	7 / 33	0.47	No
75-69-4	Trichlorofluoromethane		ND						0 / 33	NL	No
75-01-4	Vinyl Chloride	0.016	0.096	mg/kg	B-27	3	4	ft	2 / 33	0.02	Yes
1330-20-7	Xylene (total)	ND	0.0051	mg/kg	B-27	3	4	ft	1 / 33	0.26	No

Table 6-1
Summary of Chemicals of Concern in Soil and Sludge
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

CAS No	Chemical	Min Concentration (µg/L)	Maximum Concentration (mg/kg)	Unit	Location of Maximum Concentration	Start Depth	End Depth	Depth Unit	Number of Detections	375-6.8(b): Restricted Use Soil Cleanup Objectives - Unrestricted^1 (mg/kg)	COC? Yes/No
Semi-volatile Organic Compounds											
95-95-4	2,4,5-Trichlorophenol		ND						0 / 3	NL	No
88-06-2	2,4,6-Trichlorophenol		ND						0 / 3	NL	No
120-83-2	2,4-Dichlorophenol		ND						0 / 3	NL	No
105-67-9	2,4-Dimethylphenol		ND						0 / 3	NL	No
51-28-5	2,4-Dinitrophenol		ND						0 / 3	NL	No
121-14-2	2,4-Dinitrotoluene		ND						0 / 3	NL	No
606-20-2	2,6-Dinitrotoluene		ND						0 / 3	NL	No
91-58-7	2-Chloronaphthalene		ND						0 / 3	NL	No
95-57-8	2-Chlorophenol		ND						0 / 3	NL	No
91-57-6	2-Methylnaphthalene		ND						0 / 3	NL	No
95-48-7	2-Methylphenol		ND						0 / 3	NL	No
88-74-4	2-Nitroaniline		ND						0 / 3	NL	No
88-75-5	2-Nitrophenol		ND						0 / 3	NL	No
91-94-1	3,3'-Dichlorobenzidine		ND						0 / 3	NL	No
99-09-2	3-Nitroaniline		ND						0 / 3	NL	No
534-52-1	4,6-Dinitro-2-Methylphenol		ND						0 / 3	NL	No
101-55-3	4-Bromophenyl-Phenylether		ND						0 / 3	NL	No
59-50-7	4-Chloro-3-Methylphenol		ND						0 / 3	NL	No
106-47-8	4-Chloroaniline		ND						0 / 3	NL	No
7005-72-3	4-Chlorophenyl-Phenylether		ND						0 / 3	NL	No
106-44-5	4-Methylphenol		ND						0 / 0	NL	No
100-01-6	4-Nitroaniline		ND						0 / 3	NL	No
100-02-7	4-Nitrophenol		ND						0 / 3	NL	No
83-32-9	Acenaphthene		ND						0 / 3	20	No
208-96-8	Acenaphthylene		ND						0 / 3	100	No
120-12-7	Anthracene		ND						0 / 3	100	No
56-55-3	Benzo(a)anthracene		ND						0 / 3	1	No
50-32-8	Benzo(a)pyrene		ND						0 / 3	1	No
205-99-2	Benzo(b)fluoranthene		ND						0 / 3	1	No
191-24-2	Benzo(g,h,i)perylene		ND						0 / 3	100	No
207-08-9	Benzo(k)fluoranthene		ND						0 / 3	0.8	No
111-91-1	bis(2-Chloroethoxy)Methane		ND						0 / 3	NL	No
111-44-4	bis(2-Chloroethyl) Ether		ND						0 / 3	NL	No
117-81-7	bis(2-Ethylhexyl)Phthalate		ND						0 / 3	NL	No
108-60-1	bis-Chloroisopropyl Ether		ND						0 / 0	NL	No
85-68-7	Butylbenzylphthalate		ND						0 / 3	NL	No
86-74-8	Carbazole		ND						0 / 3	NL	No
218-01-9	Chrysene		ND						0 / 3	1	No
53-70-3	Dibenzo(a,h)anthracene		ND						0 / 3	0.33	No
132-64-9	Dibenzofuran		ND						0 / 3	NL	No
84-66-2	Diethylphthalate		ND						0 / 3	NL	No
131-11-3	Dimethylphthalate		ND						0 / 3	NL	No
84-74-2	Di-n-butylphthalate		ND						0 / 3	NL	No
117-84-0	Di-n-octylphthalate		ND						0 / 3	NL	No
206-44-0	Fluoranthene		ND						0 / 3	100	No
86-73-7	Fluorene		ND						0 / 3	30	No
118-74-1	Hexachlorobenzene		ND						0 / 3	0.33	No
87-68-3	Hexachlorobutadiene		ND						0 / 3	NL	No
77-47-4	Hexachlorocyclopentadiene		ND						0 / 3	NL	No
67-72-1	Hexachloroethane		ND						0 / 3	NL	No
193-39-5	Indeno(1,2,3-cd)pyrene		ND						0 / 3	0.5	No
78-59-1	Isophorone		ND						0 / 3	NL	No
98-95-3	Nitrobenzene		ND						0 / 3	NL	No
621-64-7	n-Nitroso-di-n-propylamine		ND						0 / 3	NL	No
86-30-6	n-Nitrosodiphenylamine		ND						0 / 3	NL	No
87-86-5	Pentachlorophenol		ND						0 / 3	0.8	No
85-01-8	Phenanthrene		ND						0 / 3	100	No
108-95-2	Phenol		ND						0 / 3	0.33	No
129-00-0	Pyrene		ND						0 / 0	100	No

Duplicate and quality assurance samples not included in table

NL - not listed

mg/kg - milligrams per kilogram

COC - chemical of concern

J - Analyte detected below quantitation limits

D - Compound is identified at a secondary dilution factor

Notes:

1. NYSDEC Subpart 375-6: Table 375-6.8(a): Restricted Use Soil Cleanup Objectives, http://www.dec.ny.gov/regs/15507.html#15513 (375). December 14, 2006.

* Xylene (total) was used for o-xylene criteria when the criteria is not listed.

Table 6-2
Summary of Chemicals of Concern in Groundwater and Stormwater
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

CAS No	Chemical	Minimum Concentration (µg/L)	Maximum Concentration (µg/L)	Location of Maximum Concentration	Start Depth	End Depth	Depth Unit	Number of Detections	Minimum MDL	Maximum MDL	Lowest Reporting Limit	Maximum Reporting Limit	Lowest Reporting Limit	NYSDEC Standards and Guidance Values for Class GA Groundwater[1] (µg/L)	COC? Yes/No
Volatile Organic Compounds															
71-55-6	1,1,1-Trichloroethane		4.7	SUMP				1 / 30	0.05	0.05	0.1	0.5	0.1	5	No
79-34-5	1,1,2,2-Tetrachloroethane							0 / 30	0.18	0.18	0.18	1.8	0.18	5	No
76-13-1	1,1,2-trichloro-1,2,2-trifluoroethane							0 / 30	0.11	0.11	0.11	1.1	0.11	5	No
79-00-5	1,1,2-Trichloroethane							0 / 30	0.08	0.08	0.08	0.8	0.08	1	No
75-34-3	1,1-Dichloroethane		2.9	SUMP				1 / 30	0.09	0.09	0.09	0.9	0.09	5	No
75-35-4	1,1-Dichloroethene							0 / 30	0.1	0.1	0.1	1	0.1	5	No
87-61-6	1,2,3-Trichlorobenzene							0 / 30	0.22	0.22	0.22	2.2	0.22	5	No
120-82-1	1,2,4-Trichlorobenzene							0 / 30	0.11	4.81	0.11	4.8	0.11	5	No
96-12-8	1,2-Dibromo-3-Chloropropane							0 / 30	0.48	0.48	0.48	4.8	0.48	0.04	No
106-93-4	1,2-Dibromoethane (edb)							0 / 30	0.14	0.14	0.14	1.4	0.14	NL	No
95-50-1	1,2-Dichlorobenzene							0 / 30	0.06	3.46	0.06	3.5	0.06	3	No
107-06-2	1,2-Dichloroethane							0 / 30	0.09	0.09	0.09	1.8	0.09	0.6	No
78-87-5	1,2-Dichloropropane							0 / 30	0.2	0.2	0.2	2	0.2	1	No
541-73-1	1,3-Dichlorobenzene							0 / 30	0.06	3.88	0.06	3.9	0.06	3	No
106-46-7	1,4-Dichlorobenzene							0 / 30	0.11	3.74	0.11	3.7	0.11	3	No
78-93-3	2-Butanone (mek)							0 / 30	0.41	0.41	0.41	4.1	0.41	50	No
591-78-6	2-Hexanone							0 / 30	0.66	0.66	0.66	6.6	0.66	50	No
108-10-1	4-Methyl-2-Pentanone (MIBK)							0 / 30	0.22	0.22	0.22	2.2	0.22	NL	No
67-64-1	Acetone	68	72	B-45	8.6	13.6	ft	2 / 30	0.54	0.54	0.54	5.4	0.54	50	No
71-43-2	Benzene		3.6 D	B-28 (DUP)	7.5	12.5	ft	1 / 30	0.05	0.05	0.05	0.5	0.05	1	No
75-27-4	Bromodichloromethane							0 / 30	0.08	0.08	0.08	0.8	0.08	50	No
75-25-2	Bromoform							0 / 30	0.25	0.25	0.25	2.5	0.25	50	No
74-83-9	Bromomethane							0 / 30	0.38	0.38	0.38	3.8	0.38	5	No
75-15-0	Carbon Disulfide							0 / 30	0.05	0.05	0.05	0.5	0.05	60	No
56-23-5	Carbon Tetrachloride							0 / 30	0.09	0.09	0.09	0.9	0.09	5	No
108-90-7	Chlorobenzene							0 / 30	0.05	0.05	0.05	0.5	0.05	5	No
75-00-3	Chloroethane		2.9	SUMP				1 / 30	0.33	0.33	0.33	3.3	0.33	5	No
67-66-3	Chloroform							0 / 30	0.04	0.04	0.04	0.4	0.04	7	No
74-87-3	Chloromethane							0 / 30	0.13	0.13	0.13	1.3	0.13	5	No
156-59-2	cis-1,2-Dichloroethene	1.1	920 D	B-27	7.5	12.5	ft	15 / 30	0.05	0.05	0.05	0.5	0.05	5	**Yes**
10061-01-5	cis-1,3-Dichloropropene							0 / 30	0.07	0.07	0.07	0.7	0.07	0.4	No
110-82-7	Cyclohexane							0 / 0						NL	No
124-48-1	Dibromochloromethane							0 / 30	0.12	0.12	0.12	1.2	0.12	50	No
75-71-8	Dichlorodifluoromethane							0 / 30	0.04	0.04	0.04	0.4	0.04	5	No
100-41-4	Ethylbenzene							0 / 30	0.05	0.05	0.05	0.5	0.05	5	No
98-82-8	Isopropylbenzene							0 / 30	0.06	0.06	0.06	0.6	0.06	5	No
79-20-9	Methyl Acetate							0 / 0						NL	No
1634-04-4	Methyl Tert-Butyl Ether (MTBE)							0 / 30	0.05	0.05	0.05	0.5	0.05	10	No
108-87-2	Methylcyclohexane							0 / 0						NL	No
75-09-2	Methylene Chloride							0 / 30	2.26	2.26	2.3	43	2.3	5	No

Table 6-2
Summary of Chemicals of Concern in Groundwater and Stormwater
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

CAS No	Chemical	Minimum Concentration (µg/L)	Maximum Concentration (µg/L)	Location of Maximum Concentration	Start Depth	End Depth	Depth Unit	Number of Detections	Minimum MDL	Maximum MDL	Lowest Reporting Limit	Maximum Reporting Limit	Lowest Reporting Limit	NYSDEC Standards and Guidance Values for Class GA Groundwater [1] (µg/L)	COC? Yes/No
Volatile Organic Compounds															
136777-61-2	m-Xylene & p-Xylene*							0 / 0						5	No
104-51-8	n-Butylbenzene							0 / 30	0.05	0.05	0.05	0.5	0.05	5	No
103-65-1	n-Propylbenzene							0 / 30	0.04	0.04	0.04	0.4	0.04	5	No
95-47-6	o-Xylene**							0 / 30	0.05	0.05	0.05	0.5	0.05	5	No
100-42-5	Styrene							0 / 30	0.06	0.06	0.06	0.6	0.06	5	No
98-06-6	tert-Butylbenzene							0 / 30	0.05	0.05	0.05	0.5	0.05	5	No
127-18-4	Tetrachloroethene	1.4	33	B-28 (DUP)	7.5	12.5	ft	11 / 30	0.14	0.14	0.14	1.4	0.14	5	**Yes**
108-88-3	Toluene	1.2	1.3	B-53	8.4	13.4	ft	2 / 30	0.04	0.04	0.04	0.4	0.04	5	No
1330-20-7	Total Xylenes							0 / 0						5	No
156-60-5	trans-1,2-Dichloroethene	2.1	2.9	SUMP				2 / 30	0.065	0.68	0.065	1400	0.065	5	No
10061-02-6	trans-1,3-Dichloropropene							0 / 30	0.12	0.12	0.12	1.2	0.12	0.4	No
79-01-6	Trichloroethene	2.2	44 D	B-28 (DUP)	7.5	12.5	ft	9 / 30	0.12	0.12	0.12	1.2	0.12	5	**Yes**
75-69-4	Trichlorofluoromethane							0 / 30	0.07	0.07	0.07	0.7	0.07	5	No
75-01-4	Vinyl Chloride	6.2	170 D	B-14 & B-27				8 / 30	0.16	0.16	0.16	1.6	0.16	2	**Yes**
XYLENES	Xylene (total)							0 / 0						5	No
Semi-volatile Organic Compounds															
92-52-4	1,1'-Biphenyl							0 / 0						5	No
95-95-4	2,4,5-Trichlorophenol							0 / 1	2.73	2.73	2.7	2.7	2.7	NL	No
88-06-2	2,4,6-Trichlorophenol							0 / 1	3.59	3.59	3.6	3.6	3.6	NL	No
120-83-2	2,4-Dichlorophenol							0 / 1	3.42	3.42	3.4	3.4	3.4	5	No
105-67-9	2,4-Dimethylphenol							0 / 1	7.24	7.24	7.2	7.2	7.2	50	No
51-28-5	2,4-Dinitrophenol							0 / 1	3.21	3.21	3.2	3.2	3.2	10	No
121-14-2	2,4-Dinitrotoluene							0 / 1	3.02	3.02	3	3	3	5	No
606-20-2	2,6-Dinitrotoluene							0 / 1	2.67	2.67	2.7	2.7	2.7	5	No
91-58-7	2-Chloronaphthalene							0 / 1	4.02	4.02	4	4	4	NL	No
95-57-8	2-Chlorophenol							0 / 1	3.63	3.63	3.6	3.6	3.6	NL	No
91-57-6	2-Methylnaphthalene							0 / 1	3.54	3.54	3.5	3.5	3.5	NL	No
95-48-7	2-Methylphenol							0 / 1	3.09	3.09	3.1	3.1	3.1	NL	No
88-74-4	2-Nitroaniline							0 / 1	2.88	2.88	2.9	2.9	2.9	5	No
88-75-5	2-Nitrophenol							0 / 1	3.34	3.34	3.3	3.3	3.3	NL	No
91-94-1	3,3'-Dichlorobenzidine							0 / 1	5.51	5.51	5.5	5.5	5.5	5	No
99-09-2	3-Nitroaniline							0 / 1	3.5	3.5	3.5	3.5	3.5	5	No
534-52-1	4,6-Dinitro-2-Methylphenol							0 / 1	4.74	4.74	4.7	4.7	4.7	NL	No
101-55-3	4-Bromophenyl-Phenylether							0 / 1	3.8	3.8	3.8	3.8	3.8	NL	No
59-50-7	4-Chloro-3-Methylphenol							0 / 1	2.91	2.91	2.9	2.9	2.9	NL	No
106-47-8	4-Chloroaniline							0 / 1	2.87	2.87	2.9	2.9	2.9	5	No
7005-72-3	4-Chlorophenyl-Phenylether							0 / 1	2.9	2.9	2.9	2.9	2.9	NL	No
100-01-6	4-Nitroaniline							0 / 1	3.9	3.9	3.9	3.9	3.9	5	No
100-02-7	4-Nitrophenol							0 / 1	3.82	3.82	3.8	3.8	3.8	NL	No
83-32-9	Acenaphthene							0 / 1	2.71	2.71	2.7	2.7	2.7	NL	No

Table 6-2
Summary of Chemicals of Concern in Groundwater and Stormwater
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

CAS No	Chemical	Minimum Concentration (µg/L)	Maximum Concentration (µg/L)	Location of Maximum Concentration	Start Depth	End Depth	Depth Unit	Number of Detections	Minimum MDL	Maximum MDL	Lowest Reporting Limit	Maximum Reporting Limit	Lowest Reporting Limit	NYSDEC Standards and Guidance Values for Class GA Groundwater ^{1} (µg/L)	COC? Yes/No
Semi-volatile Organic Compounds															
208-96-8	Acenaphthylene							0 / 1	2.68	2.68	2.7	2.7	2.7	NL	No
98-86-2	Acetophenone							0 / 1	3.38	3.38	3.4	3.4	3.4	NL	No
120-12-7	Anthracene							0 / 1	2.41	2.41	2.4	2.4	2.4	50	No
1912-24-9	Atrazine							0 / 0						7.5	No
100-52-7	Benzaldehyde							0 / 0						NL	No
56-55-3	Benzo(a)anthracene							0 / 1	2.32	2.32	2.3	2.3	2.3	0.002	No
50-32-8	Benzo(a)pyrene							0 / 1	2.88	2.88	2.9	2.9	2.9	NL	No
205-99-2	Benzo(b)fluoranthene							0 / 1	2.09	2.09	2.1	2.1	2.1	0.002	No
191-24-2	Benzo(g,h,i)perylene							0 / 1	4.99	4.99	5	5	5	NL	No
207-08-9	Benzo(k)fluoranthene							0 / 1	3.09	3.09	3.1	3.1	3.1	0.002	No
111-91-1	bis(2-Chloroethoxy)Methane							0 / 1	3.1	3.1	3.1	3.1	3.1	5	No
111-44-4	bis(2-Chloroethyl) Ether							0 / 1	4.46	4.46	4.5	4.5	4.5	1	No
117-81-7	bis(2-Ethylhexyl)Phthalate							0 / 1	7.1	7.1	7.1	7.1	7.1	5	No
108-60-1	bis-Chloroisopropyl Ether							0 / 0						5	No
85-68-7	Butylbenzylphthalate							0 / 1	2.6	2.6	2.6	2.6	2.6	50	No
105-60-2	Caprolactam							0 / 0						NL	No
86-74-8	Carbazole							0 / 1	1.72	1.72	1.7	1.7	1.7	NL	No
218-01-9	Chrysene							0 / 1	2.68	2.68	2.7	2.7	2.7	0.002	No
53-70-3	Dibenzo(a,h)anthracene							0 / 1	5	5	5	5	5	NL	No
132-64-9	Dibenzofuran							0 / 1	2.85	2.85	2.8	2.8	2.8	NL	No
84-66-2	Diethylphthalate							0 / 1	2.82	2.82	2.8	2.8	2.8	50	No
131-11-3	Dimethylphthalate							0 / 1	2.6	2.6	2.6	2.6	2.6	50	No
84-74-2	Di-n-butylphthalate							0 / 1	2.2	2.2	2.2	2.2	2.2	50	No
117-84-0	Di-n-octylphthalate							0 / 1	6.8	6.8	6.8	6.8	6.8	50	No
206-44-0	Fluoranthene							0 / 1	2.03	2.03	2	2	2	50	No
86-73-7	Fluorene							0 / 1	2.36	2.36	2.4	2.4	2.4	50	No
118-74-1	Hexachlorobenzene							0 / 1	0.005	3.53	0.005	3.5	0.005	0.04	No
87-68-3	Hexachlorobutadiene							0 / 1	0.26	5.56	0.26	5.6	0.26	0.5	No
77-47-4	Hexachlorocyclopentadiene							0 / 1	7.91	7.91	7.9	7.9	7.9	5	No
67-72-1	Hexachloroethane							0 / 1	4.52	4.52	4.5	4.5	4.5	5	No
193-39-5	Indeno(1,2,3-cd)pyrene							0 / 1	4.55	4.55	4.6	4.6	4.6	0.002	No
78-59-1	Isophorone							0 / 1	3.15	3.15	3.2	3.2	3.2	50	No
91-20-3	Naphthalene							0 / 1	0.21	2.97	0.21	3	0.21	10	No
98-95-3	Nitrobenzene							0 / 1	3.54	3.54	3.5	3.5	3.5	0.4	No
621-64-7	n-Nitroso-di-n-propylamine							0 / 1	5.51	5.51	5.5	5.5	5.5	NL	No
86-30-6	n-Nitrosodiphenylamine							0 / 1	3.87	3.87	3.9	3.9	3.9	50	No
87-86-5	Pentachlorophenol							0 / 1	3.72	3.72	3.7	3.7	3.7	1	No
85-01-8	Phenanthrene							0 / 1	2.57	2.57	2.6	2.6	2.6	50	No
108-95-2	Phenol							0 / 1	1.46	1.46	1.5	1.5	1.5	1	No
129-00-0	Pyrene							0 / 1	2.55	2.55	2.6	2.6	2.6	50	No

Table 6-2
Summary of Chemicals of Concern in Groundwater and Stormwater
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

CAS No	Chemical	Minimum Concentration (µg/L)	Maximum Concentration (µg/L)	Location of Maximum Concentration	Start Depth	End Depth	Depth Unit	Number of Detections	Minimum MDL	Maximum MDL	Lowest Reporting Limit	Maximum Reporting Limit	Lowest Reporting Limit	NYSDEC Standards and Guidance Values for Class GA Groundwater [1] (µg/L)	COC? Yes/No
Inorganics															
7429-90-5	Aluminum		0.0039	B-23	2.5	2.5	ft	1 / 1	2.64E-05	2.64E-05	0.000026	0.000026	0.000026	100	No
7440-36-0	Antimony							0 / 1	0.1059	0.1059	0.53	0.53	0.53	3	No
7440-38-2	Arsenic		2.7	B-23	2.5	2.5	ft	1 / 1	0.249	0.249	1.2	1.2	1.2	25	No
7440-39-3	Barium		52	B-23	2.5	2.5	ft	1 / 1	0.3365	0.3365	1.7	1.7	1.7	1000	No
7440-41-7	Beryllium							0 / 1	0.0825	0.0825	0.41	0.41	0.41	3	No
7440-43-9	Cadmium							0 / 1	0.0288	0.0288	0.14	0.14	0.14	5	No
7440-70-2	Calcium		0.11	B-23	2.5	2.5	ft	1 / 1	8.76E-05	8.76E-05	0.000088	0.000088	0.000088	NL	No
7440-47-3	Chromium		12	B-23	2.5	2.5	ft	1 / 1	0.3443	0.3443	1.7	1.7	1.7	50	No
7440-48-4	Cobalt							0 / 1	0.0155	0.0155	0.078	0.078	0.078	NL	No
7440-50-8	Copper							0 / 1	0.1305	0.1305	0.65	0.65	0.65	200	No
7439-89-6	Iron		0.0043	B-23	2.5	2.5	ft	1 / 1	2.65E-05	2.65E-05	0.000026	0.000026	0.000026	300	No
7439-92-1	Lead							0 / 1	0.0474	0.0474	0.24	0.24	0.24	25	No
7439-95-4	Magnesium		0.045	B-23	2.5	2.5	ft	1 / 1	3.68E-05	3.68E-05	0.000037	0.000037	0.000037	35000	No
7439-96-5	Manganese		370	B-23	2.5	2.5	ft	1 / 1	0.5535	0.5535	2.8	2.8	2.8	300	**Yes**
7439-97-6	Mercury							0 / 1	4.66E-05	4.66E-05	4.70E-05	4.70E-05	4.70E-05	0.7	No
7440-02-0	Nickel							0 / 1	0.2204	0.2204	1.1	1.1	1.1	100	No
7440-09-7	Potassium		0.0035	B-23	2.5	2.5	ft	1 / 1	0.000459	0.000459	0.00046	0.00046	0.00046	NL	No
7782-49-2	Selenium							0 / 1	0.5376	0.5376	2.7	2.7	2.7	10	No
7440-22-4	Silver							0 / 1	0.1638	0.1638	0.82	0.82	0.82	50	No
7440-23-5	Sodium		0.038	B-23	2.5	2.5	ft	1 / 1	0.001912	0.001912	0.0019	0.0019	0.0019	20000	No
7440-28-0	Thallium							0 / 1	0.1489	0.1489	0.74	0.74	0.74	0.5	No
7440-62-2	Vanadium							0 / 1	0.5745	0.5745	2.9	2.9	2.9	NL	No
7440-66-6	Zinc							0 / 1	1.3268	1.3268	6.6	6.6	6.6	2000	No

Duplicate and quality assurance samples not included in table

NL - not listed

µg/L - micrograms per liter

COC - chemical of concern

J - Analyte detected below quantitation limits

B - Analyte is found in the associated blank and in the sample

E - Compound concentration exceeds the calibration range of the GC/MS instrument for that specific analysis.

Notes:

1. NYSDEC. June 1998. TOGS 1.1.1. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.
Includes April 2000 and June 2004 Addendum values. (http://www.dec.ny.gov/regulations/2652.html)
Includes revisions in Part 703 effective February 16, 2008.

* m-xylene and p-xylene reported as one compound under S0M01.2. Xylene (total) was used for m,p-xylene criteria.

** Xylene (total) was used for o-xylene criteria.

Table 6-3
On-Site Soil Vapor and Ambient Air Sampling Results
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

Sample ID	**SV-1 SS2**		**SV-2 SS1**		**SV-2 OA**		**SV-1 IA2**	
Lab ID	13D1071-11		13D1071-09		13D1071-13		13D1071-10	
Sampling Date	23-Apr-13		23-Apr-13		23-Apr-13		23-Apr-13	
Unit	µg/m^3		µg/m^3		µg/m^3		µg/m^3	
Volatile Organic Compounds								
1,1,1-Trichloroethane	ND	U	ND	U	ND	U	ND	U
1,1,2,2-Tetrachloroethane	ND	U	ND	U	ND	U	ND	U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	0.55	V-05	0.53	V-05	0.51	V-05	0.51	V-05
1,1,2-Trichloroethane	ND	U	ND	U	ND	U	ND	U
1,1-Dichloroethane	ND	U	ND	U	ND	U	ND	U
1,1-Dichloroethene	0.16		ND	U	ND	U	ND	U
1,2,4-Trichlorobenzene	ND	U	ND	U	ND	U	ND	U
1,2,4-Trimethylbenzene	6.20		10.00		ND	U	11.00	
1,2-Dibromoethane (EDB)	ND	U	ND	U	ND	U	ND	U
1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114)	ND	U	ND	U	ND	U	ND	U
1,2-Dichlorobenzene	ND	U	ND	U	ND	U	ND	U
1,2-Dichloroethane	ND	U	ND	U	ND	U	ND	U
1,2-Dichloropropane	ND	U	ND	U	ND	U	ND	U
1,3,5-Trimethylbenzene	1.60		2.60		ND	U	2.60	
1,3-Butadiene	ND	U	ND	U	ND	U	ND	U
1,3-Dichlorobenzene	0.22		0.28		ND	U	ND	U
1,4-Dichlorobenzene	ND	U	ND	U	ND	U	ND	U
1,4-Dioxane	ND	U	ND	U	ND	U	ND	U
2-Butanone (MEK)	ND	U	ND	U	ND	U	ND	U
2-Hexanone (MBK)	ND	U	1.30		ND	U	1.20	
4-Ethyltoluene	1.70		2.90		ND	U	2.80	
4-Methyl-2-pentanone (MIBK)	ND	U	0.76		ND	U	1.10	L-05
Acetone	28.00	L-05	34.00	L-05	8.60	L-05	23.00	L-05
Benzene	5.90		8.60		0.39		7.90	
Benzyl chloride	ND	U	ND	U	ND	U	ND	U
Bromodichloromethane	ND	U	ND	U	ND	U	ND	U
Bromoform	ND	U	ND	U	ND	U	ND	U
Bromomethane	ND	U	ND	U	ND	U	ND	U
Carbon Disulfide	ND	U	ND	U	ND	U	ND	U
Carbon tetrachloride	0.41		0.30		0.45		0.43	
Chlorobenzene	ND	U	ND	U	ND	U	ND	U
Chloroethane	ND	U	0.26		ND	U	ND	U
Chloroform	ND	U	0.18		ND	U	ND	U
Chloromethane	1.20		1.60		1.30		1.40	
cis-1,2-Dichloroethene	4.20		6.80		ND	U	4.50	
cis-1,3-Dichloropropene	ND	U	ND	U	ND	U	ND	U
Cyclohexane	2.10		3.30		ND	U	3.10	
Dibromochloromethane	ND	U	ND	U	ND	U	ND	U
Dichlorodifluoromethane (Freon 12)	1.40		1.40		1.50		1.30	
Ethanol	170.00		160.00		5.10		79.00	
Ethyl Acetate	4.00		2.60		2.10		2.50	
Ethylbenzene	5.10		7.90		ND	U	7.70	
Heptane	6.50		9.50		ND	U	9.60	
Hexachlorobutadiene	ND	U	ND	U	ND	U	ND	U
Hexane*	20.00		28.00		ND	U	26.00	
Isopropanol	7.20	L-05	8.00	L-05	ND	U	4.30	L-05
m,p-Xylene	19.00		29.00		0.38		28.00	
Methyl tert-Butyl Ether (MTBE)	ND	U	ND	U	ND	U	ND	U
Methylene chloride	3.10		2.40		2.20		2.20	
Naphthalene	0.60		0.55		ND	U	1.40	
o-Xylene	6.50		10.00		0.16		10.00	
Propene	ND	U	ND	U	ND	U	ND	U
Styrene	ND	U	0.16		ND	U	ND	U
Tetrachloroethene	150.00		190.00		0.73		200.00	
Tetrahydrofuran	0.13		0.97		ND	U	0.31	
Toluene	34.00		51.00		0.80		46.00	
trans-1,2-Dichloroethene	0.19		0.26		ND	U	0.17	
trans-1,3-Dichloropropene	ND	U	ND	U	ND	U	ND	U
Trichloroethene	4.50		5.90		ND	U	5.40	
Trichlorofluoromethane (Freon 11)	8.70		10.00		1.10		12.00	
Vinyl Acetate	ND	U	ND	U	ND	U	ND	U
Vinyl Chloride	0.17		0.33		ND	U	0.13	

Notes:

µg/m3 - micrograms per meter cubed

U - Non Detect

V-05 - Continuing calibration did not meet method specifications and was biased on the low side for this compound. Increased uncertainty is associated with the reported value which is likely to be biased on the low side.

L-01 - Laboratory fortified blank /laboratory control sample recovery outside of control limits. Data validation is not affected since all results are "not detected" for all samples in this batch for this compound and bias is on the high side.

L-05 - Laboratory fortified blank/laboratory control sample recovery is outside of control limits. Reported value for this compound is likely to be biased on the high side.

Table 6-4
Off-Site Soil Vapor and Ambient Air Sampling Results
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

Sample ID	**CAS Number**	**SV-4 OA**		**SV-4 SS**		**SV-4 IA**		**SV-5 SS**		**SV-5 IA**		**SV-5 OA**		**SV-3 SS**		**SV-3 IA**	
Lab ID		13D1071-01		13D1071-02		13D1071-03		13D1071-04		13D1071-05		13D1071-06		13D1071-07		13D1071-08	
Sampling Date		23-Apr-13		23-Apr-13		23-Apr-13		23-Apr-13		23-Apr-13		23-Apr-13		23-Apr-13		23-Apr-13	
Unit		$\mu g/m^3$		$\mu g/m^3$		$\mu g/m^3$		$\mu g/m^3$		$\mu g/m^3$		$\mu g/m^3$		$\mu g/m^3$		$\mu g/m^3$	
Volatile Organic Compounds (EPA TO-15)																	
1,1,1-Trichloroethane	71-55-6	ND	U	ND	U	ND	U	5.4		7.1		ND	U	ND	U	ND	U
1,1,2,2-Tetrachloroethane	79-34-5	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 11	76-13-1	0.054	V-05	0.65	V-05	0.46	V-05	0.65	V-05	0.52	V-05	0.45	V-05	0.6	V-05	0.47	V-05
1,1,2-Trichloroethane	79-00-5	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,1-Dichloroethane	75-34-3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,1-Dichloroethene	75-35-4	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,4-Trichlorobenzene	120-82-1	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,4-Trimethylbenzene	95-63-6	ND	U	3.7		0.4		2.8		0.46		0.22		3.8		0.36	
1,2-Dibromoethane (EDB)	106-93-4	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 1	76-14-2	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2-Dichlorobenzene	95-50-1	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2-Dichloroethane	107-06-2	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2-Dichloropropane	78-87-5	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,3,5-Trimethylbenzene	108-67-8	ND	U	0.99		ND	U	0.75		ND	U	ND	U	0.98		ND	U
1,3-Butadiene	106-99-0	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,3-Dichlorobenzene	541-73-1	ND	U	0.36		ND	U	0.31		ND	U	ND	U	0.45		ND	U
1,4-Dichlorobenzene	106-46-7	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,4-Dioxane	123-91-1	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
2-Butanone (MEK)	78-93-3	ND	U	ND		ND	U	ND	U	6.1		ND	U	ND	U	ND	U
2-Hexanone (MBK)	591-78-6	ND	U	0.62		0.45		0.28		0.78		0.26		0.52		0.71	
4-Ethyltoluene	622-96-8	ND	U	0.78		ND	U	0.58		ND	U	ND	U	0.76		ND	U
4-Methyl-2-pentanone (MIBK)	108-10-1	ND	U	0.66	L-05	0.48	L-05	0.4	L-05	0.44	L-05	ND	U	0.58	L-05	ND	U
Acetone	67-64-1	7.4	L-05	36	L-05	23	L-05	29	L-05	37	L-05	9.5	L-05	70	L-05	36	L-05
Benzene	71-43-2	0.42		0.64		0.38		0.58		0.44		0.36		0.7		0.57	
Benzyl chloride	100-44-7	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Bromodichloromethane	75-27-4	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Bromoform	75-25-2	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Bromomethane	74-83-9	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Carbon Disulfide	75-15-0	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Carbon tetrachloride	56-23-5	0.47		0.51		0.46		0.45		0.46		0.41		0.29		0.45	
Chlorobenzene	108-90-7	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Chloroethane	75-00-3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Chloroform	67-66-3	ND	U	0.29		0.28		0.41		0.38		ND	U	ND	U	ND	U
Chloromethane	74-87-3	1.3		1.5		1.5		1.3		1.3		1.4		1.4		1.3	
cis-1,2-Dichloroethene	156-59-2	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
cis-1,3-Dichloropropene	10061-01-5	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Cyclohexane	110-82-7	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Dibromochloromethane	124-48-1	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Dichlorodifluoromethane (Freon 12)	75-71-8	1.4		5.1		6.1		1.4		1.2		1.4		1.3		1.3	
Ethanol	64-17-5	4.5		210		220		360		500		8.4		170		34	
Ethyl Acetate	141-78-6	8.7		14		44		1.7		2.7		1.7		8.5		6.8	
Ethylbenzene	100-41-4	ND	U	1.4		0.31		0.96		0.3		ND	U	1.2		0.28	
Heptane	142-82-5	ND	U	0.63		ND	U	0.64		0.51		ND	U	0.65		0.4	
Hexachlorobutadiene	87-68-3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Hexane*	110-54-3	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Isopropanol	67-63-0	ND	U	14	L-05	27	L-05	25	L-05	76	L-05	ND	U	9.9	L-05	3.5	L-05
m,p-Xylene	1330-20-7	0.073		4.4		0.76		3		0.73		ND	U	4		0.85	
Methyl tert-Butyl Ether (MTBE)	1634-04-4	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Methylene chloride	75-09-2	0.48		4.5		2.5		4.9		3.6		ND	U	3.6		1.4	
Naphthalene	91-20-3	ND	U	0.58		0.23		0.49		ND	U	ND	U	1.2		5.3	
o-Xylene	95-47-6	ND	U	1.9		0.28		1.4		0.26		ND	U	1.8		0.34	
Propene	115-07-1	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Styrene	100-42-5	ND	U	0.25		0.18		0.38		0.42		ND	U	0.19		0.15	
Tetrachloroethene	127-18-4	ND	U	0.74		0.38		ND	U	ND	U	ND	U	0.31		ND	U
Tetrahydrofuran	109-99-9	ND	U	0.12		ND	U	ND	U	ND	U	ND	U	0.17		ND	U
Toluene	108-88-3	0.46		5.8		1.8		7.1		4.8		0.58		6.3		3	
trans-1,2-Dichloroethene	156-60-5	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
trans-1,3-Dichloropropene	10061-02-6	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Trichloroethene	79-01-6	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Trichlorofluoromethane (Freon 11)	75-69-4	0.16		3.4		3.1		1.4		1.2		0.95		1.2		1	
Vinyl Acetate	108-05-4	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Vinyl Chloride	75-01-4	ND	U	0.11		ND	U	0.2		ND	U	ND	U	0.27		ND	U

Notes:
U - non-detect
$\mu g/m^3$ - micrograms per cubic meter
specifications and was biased on the low side for this
compound. Increased uncertainty is associated with the
L-01 - Laboratory fortified blank /laboratory control sample
recovery outside of control limits. Data validation is not
affected since all results are "not detected" for all samples
recovery is outside of control limits. Reported value for this
compound is likely to be biased on the high side.

Table 6-5
Summary of Potential Exposure Pathways
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

Condition	Area of Concern	Receptors	Environmental Media & Exposure Route	Exposure Pathway	Rationale
Current	Onsite	Workers and visitors	Dermal contact with and incidental ingestion of soil and inhalation of fugitive dust	Incomplete	Contamination in onsite soil is at a depth of approximately 12 feet below ground surface and is covered with asphalt.
			Dermal contact with and incidental ingestion of groundwater	Incomplete	Groundwater is not used for drinking water.
			Inhalation of indoor air	Complete	Receptors may be exposed to contamination in air in onsite buildings while working or visiting at the site.
	Offsite	Workers, visitors, and residents	Dermal contact with and incidental ingestion of groundwater	Incomplete	Groundwater is not used for drinking water.
			Inhalation of indoor air	Incomplete	A sub-slab depressurization system is operating in structure where vapor intrusion was detected.
Future	Onsite	Workers and visitors	Dermal contact with and incidental ingestion of soil and inhalation of fugitive dust	Complete	Contamination in onsite soil is at a depth of approximately 12 feet below ground surface and is covered with asphalt, could be encountered during excavation.
			Dermal contact with and incidental ingestion of groundwater	Complete	Groundwater is shallow and could be encountered during excavation.
			Inhalation of indoor air	Complete	Receptors may be exposed to contamination in air in onsite buildings while working or visiting at the site.
	Offsite	Workers, visitors, and residents	Dermal contact with and incidental ingestion of groundwater	Complete	Groundwater is shallow and could be encountered during excavation.
			Inhalation of indoor air	Complete	Receptors may be exposed to contamination in indoor air while working or visiting surrounding businesses, or while living at or visiting residences surrounding the site.

Table 8-1
Contaminant Mass Estimates
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

		Total VOCs (kilograms)
TRZ 1	Dissolved in water bearing zone	2.9
	Soil	3.3
TRZ 2	Dissolved in water bearing zone	4.1
	Soil	assumed negligible
TRZ 3	Dissolved in water bearing zone	0.1
	Soil	1.0
Full Site	Dissolved in water bearing zone	7.3
	Soil	5.9

Note: total does not include sorbed mass in water bearing zone

TRZ = Target Remediation Zone

Mass estimated using statistical interpolation of sample results.

Table 10-1
Groundwater Remediation Technology Screening
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

General Response Action	Technology Type	Process Option	Description	Screening for Effectiveness, Implementability, and Relative Cost			Retained?
				Effectiveness	**Implementability**	**Relative Cost**	
Long-Term Monitoring	Long-Term Monitoring	Long-Term Monitoring	Periodic environmental monitoring to determine nature and extent of contaminant plume.	Not effective in reducing contamination levels by itself. Would not alter the risk to human health or the effect on the environment. Effective in providing information on Site conditions.	Easily implementable. Comprehensive monitoring well network needs to be installed for the long-term monitoring program.	Medium capital cost if monitoring well network needs to be established. Medium operation and maintenance (O&M) costs.	Retained
Institutional/Engineering Controls	Institutional Controls	Environmental Easements	Environmental easements are used to prevent certain types of uses for properties where exposure pathways to contaminants may be created as a result of those uses. They may be used to require the installation of a vapor mitigation system or prevent well drilling activities within the contamination plume. They are generally administrated by local government.	Effective in reducing risks to human health posed by groundwater contamination by restricting or eliminating use of contaminated groundwater. The effectiveness depends on proper enforcement. Would not reduce the migration and environmental impact of the contaminated groundwater.	May not be easy to implement. Depends on the local government and its enforcement system.	Implementation cost is low. Some administrative, long-term monitoring and periodic assessment cost would be required.	Retained
		Well Drilling Restrictions	This process involves regulatory actions that regulate the installation of wells. NYSDEC has the administrative authority to prevent installation of drinking water wells in contaminated areas.	Effective for protection of human health by preventing direct contact with contaminated groundwater at the site. Would not reduce migration or environmental impact of the contaminated groundwater.	Implementable via the existing permitting process. May be combined with other remediation activities as a protective measure to prevent exposure to contaminants during and post remediation.	Implementation cost is low.	Retained
	Engineering Controls	Fencing	Fences would limit access to contaminanted areas. Can also be used to limit health and safety risks during remedial action at the Site.	Effective for protection of human health if any above-ground treatment system poses hazards to untrained personnel during the remedial action. May also minimize property loss or damage during investigation or remediation. Would not reduce the migration and environmental impact of the contaminated groundwater in any of the contaminant areas.	Easily implementable.	Low capital and operational costs.	Retained
	Community Awareness	Information and Education Programs	Community information and education programs would be undertaken to enhance awareness of potential hazards, available technologies capable to address the contamination, and remediation progress to the local community.	Educational programs would protect human health by creating awareness and would enhance the implementation of environmental easements within the contaminated aquifer.	Implementable.	Low capital cost and operational costs.	Retained

Table 10-1
Groundwater Remediation Technology Screening
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

General Response Action	Technology Type	Process Option	Description	Screening for Effectiveness, Implementability, and Relative Cost			Retained?
Monitored Natural Attenuation (MNA)	MNA	MNA	Relies on natural destructive (biodegradation and abiotic degradation) and nondestructive mechanisms (dilution, dispersion, volatilization, and adsorption) to reduce contaminant levels within a reasonable time frame. Implemented with a long term monitoring program. Under favorable conditions, these physical, chemical, or biological processes act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in groundwater within a reasonable timeframe.	Effective for sites where multiple years of data have demonstrated that the contaminant plume is contained or shrinking; attenuation mechanisms are active and responsible for containing the plume; and sufficient evidence exists that these mechanisms would persist for the required time of plume management. Microbiological sampling indicated that insufficient cells of halorespiring bacteria were present to sustain biodegradation of PCE and TCE in groundwater. However, the aerobic conditions (~3ppm dissolved oxygen) are conducive to the direct oxidation of cis-1,2-DCE and VC, which are the predominant contaminants in groundwater.	Materials and services necessary to monitor attenuation are readily available and implementable at the site. Institutional/engineering controls would be required to minimize human exposure.	Low to medium capital costs because additional monitoring wells would be suggested. Medium to high O&M cost since monitoring would continue for many years.	Not retained.
Containment	Vertical Barrier	Slurry Walls	Slurry walls are constructed by making low-permeability slurry (typically either a soil-bentonite mixture or a cement-bentonite mixture) into an excavated trench. Excavation can be completed using a long-arm excavator and a clam shovel to achieve the required depth. Slurry would be pumped into the hole during the course of excavation to keep the sidewalls from collapsing.	Eliminates migration of contaminated groundwater horizontally. Mobility of the plume may be reduced. Slurry wall barriers are effective in preventing additional groundwater contamination from migrating offsite or for diverting uncontaminated groundwater around a contaminant source. Use of this technology does not guarantee that further remediation may not be necessary and there is potential for the slurry wall to degrade or deteriorate over time. A slurry wall keyed into the dry, mimimally-conductive glacial till would be effective at containing groundwater.	Slurry walls are constructible at this Site. Construction materials and services are readily available. The depth of installation (less than 15 feet) is well within the range of typical slurry wall applications. There is sufficient open space for the construction equipment to operate.	Moderate capital cost.	Retained
		Sheet Pile Barriers	Sheet pile barriers are constructed by driving or vibrating sections of steel sheet piling into the ground. Each sheet pile section is interlocked at its edges, and the seams are often grouted to prevent leakage. Upon completion of remedial activities, the sheet piles can be vibrated out of the ground, disassembled, and removed from the Site, provided that the sheeting and joints are still of good structural integrity at the time of removal. Otherwise, the sheets would be cut off below ground surface, and the walls would continue to influence groundwater flow patterns on a localized scale.	Eliminates migration of contaminated groundwater horizontally. Mobility of the plume may be reduced. If good joints are installed, the sheet piling may be effective in preventing additional groundwater contamination from migrating offsite or for diverting uncontaminated groundwater around a contaminant source. Effectiveness is limited if poor joints are installed. Use of this technology does not guarantee that further remediation in the future may not be necessary. Sheet pile keyed into the dry, mimimally-conductive glacial till would be effective at containing groundwater.	Sheet piles have been widely used in the heavy construction industry, particularly for groundwater control and slope stability. Construction materials and services are readily available. The depth of installation (less than 15 feet) is well within the range of typical sheet pile wall installations. There is sufficient open space for the construction equipment to operate. Completely watertight joints are nearly impossible to install.	Moderate capital cost.	Retained

Table 10-1
Groundwater Remediation Technology Screening
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

General Response Action	Technology Type	Process Option	Description	Screening for Effectiveness, Implementability, and Relative Cost			Retained?
Extraction	Groundwater Extraction	Extraction Wells	Installation of groundwater extraction wells to provide hydraulic control and capture of contaminant migration. Effective when combined with other treatment and discharge technologies. Potential scenarios for extraction wells include containment of source area groundwater, containment of the leading edge of the high concentration plume, or preventing contaminated groundwater from migrating offsite.	Effective in providing hydraulic control and removal at sites where the soil is conductive, hydrogeology is well understood and the pumping rate necessary to maintain hydraulic control is sustainable. Reduces migration of contaminated groundwater and reduces concentrations of contaminants in groundwater over time. The water bearing zone is expected to have limited hydraulic conductivity, which would require a slow pumping rate. Furthermore, sorbed mass in the clay will desorb slowly and limit the effectiveness of contaminant capture with pumps. However, groundwater pumping for hydraulic control (and not contaminant removal) could be effective at containing the plume.	Implementable. Necessary equipment and materials are readily available.	Medium to high capital cost due to depth of drilling. Medium O&M cost due to prolonged period of operation generally required.	Not retained
	Saturated Soil Extraction	Excavation and backfill	Contaminated saturated soil is excavated and either transported to a disposal site or treated. The excavated are would be backfilled with either clean fill or the treated soil.	Protects human receptors by eliminating surface exposure of contaminants and removing subsurface contaminants. May be combined with transport, disposal, and/or treatment technologies.	Partly implementable. For complete remediation with this process option, the buildings on site would need to be demolished. Excavation would be required to the depth of the aquitard (the glacial till layer), which is relatively shallow (<15 feet bgs). Would require dewatering and treatment and/or disposal of the excavated soil and groundwater.	High capital costs. Low O&M costs.	Retained

Table 10-1
Groundwater Remediation Technology Screening
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

General Response Action	Technology Type	Process Option	Description	Screening for Effectiveness, Implementability, and Relative Cost			Retained?
Treatment	In-situ Treatment	In-situ Thermal Remediation	The temperature of the contaminated area is increased by electrical resistivity heating, thermal conduction heating or steam injection, causing groundwater and VOCs to vaporize, increasing the diffusion rate and solubility of contaminants, and potentially enhancing degradation of contaminants. The resulting vapors are extracted by a vadose zone soil vapor extraction system or dual phase extraction wells and then treated in an above ground treatment system.	Successfully applied in removing contamination sources in silty or clayey soils as found at the site. Contaminant vapor would be captured using vertical or horizontal SVE wells or dual phase extraction. Residual heat would also be capable of stimulating accelerated biodegradation of remaining low-concentration contaminants. If too much unheated water enters the treatment zone from upgradient, it can create a significant heat sink and decrease efficiency. However, with the slow groundwater velocity in the target treatment zone, this is not expected to be a factor.	Implementable. Vendors and equipment are readily available. The heating points (electrodes or conductive heating wells) also serve as vapor extraction wells.	High capital and O&M costs over a short period, approximately one year.	Retained.
		Air Sparging	Air or oxygen is injected into the contaminated aquifer. Injected air strips VOCs into the unsaturated zones. SVE is usually implemented in conjunction with air sparging.	Air sparging is effective for removal of volatile, relatively insoluble organics from highly permeable, relatively uniform sandy aquifer. Oxygen added to the contaminated groundwater can enhance aerobic biodegradation of contaminants below and above the water table. The contaminated water bearing zone at the site is low permeability sandy clay, which decreases the effectiveness of air sparging.	Air sparging is not implementable in the groundwater at this site because the resulting contaminant vapor would be trapped by the overlying low-permeability clay in the vadose zone, and could not be effectively captured and treated with a soil vapor extraction system.	Moderate capital and O&M costs.	Not retained
		In-situ Chemical Reduction (ISCR)	In-situ chemical reduction involves the introductions of reductants such as zero valent iron (ZVI) particles, organo-iron salts, iron minerals, or a mixture to reduce the contaminants to non-hazardous compounds.	The effectiveness of in-situ chemical reduction, such as ZVI and EHC, in treating contaminated groundwater is proven for the site contaminants. Treatability and pilot-scale testing will be required to identify the most effective amendment.	Achieving uniform delivery of reductant and adequate contact of reductant with contaminants are critical for effective treatment. Injection alone would not be implementable in the low-permeability sandy clay water bearing zone; emplacement via fracturing would be needed, or distribution (of ionic ISCR amendments only) with electrokinetics. Fracturing vendors do not work in the top ten feet due to equipment concerns. The limited distribution techniques makes ISCR less implementable, but not infeasible. May result in secondary water quality changes like increase in concentrations of iron and manganese in the groundwater.	Medium to high capital cost. Low O&M costs.	Retained

Table 10-1
Groundwater Remediation Technology Screening
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

General Response Action	Technology Type	Process Option	Description	Screening for Effectiveness, Implementability, and Relative Cost			Retained?
Treatment	In-situ Treatment	In-situ Chemical Oxidation (ISCO)	ISCO involves the introduction of chemical oxidants (e.g., catalyzed hydrogen peroxide) into the subsurface to destroy organic contaminants in groundwater. Complete oxidation of contaminants results in their breakdown into non toxic compounds, such as carbon dioxide, water, and minerals. Repeat application of oxidant is generally required due to the natural soil oxidant demand.	The effectiveness of in-situ chemical oxidation in treating contaminated groundwater is proven for the site contaminants. Treatability and pilot-scale testing will be required to identify the most effective amendment.	Achieving uniform delivery of oxidant and adequate contact of oxidant with contaminants are critical for effective treatment. Injection alone would not be implementable in the low-permeability sandy clay water bearing zone; emplacement via fracturing would be needed, or distribution (of ionic ISCO amendments only) with electrokinetics. Fracturing vendors do not work in the top ten feet due to equipment concerns. The limited distribution techniques makes ISCO less implementable, but not infeasible.	Medium to high capital costs. Low O&M costs.	Retained
		In-situ Bioremediation	In-situ bioremediation is designed to facilitate the in-situ biological destruction of chlorinated VOCs over a wide range of concentrations in groundwater. It involves the introduction of organics, nutrients, and potentially microorganisms into the subsurface to stimulate the growth of natural microorganisms to detoxify chlorinated solvent contamination in the subsurface.	Enhanced aerobic and anaerobic bioremediation and bioaugmentation has been successfully applied at many Sites. Geochemistry at the site is not naturally favorable for reductive dechlorination, and dehalogenating bacteria are not present in significant nubmers. However, this concern is mainly for PCE and TCE, which have not been found in significant (i.e. ppm-level) concentrations in groundwater. The principle contaminants, cis-1,2-DCE and VC, are known to be directly oxidizable in aerobic conditions, such as those present at the site. The most effective bioremediation would concentrate on enhancing the ability of aerobic microbes to degrade the cis-1,2-DCE and VC.	Effectively delivering the amendments and bacteria into the contaminated matrix is critical for the success of in situ treatment. Given the low hydraulic conductivity of the target remediation zone, injection would not be implementable. Emplacement via fracturing would be difficult since the thickness of the remediation zone is only approximately 2 feet (the propagation of fractures cannot be effectively controlled). Distribution via electrokinetics is an innovative technique that could be potentially implementable (Mao et al, 2012).	Medium to high capital costs. Low O&M costs.	Retained

Table 10-1
Groundwater Remediation Technology Screening
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

General Response Action	Technology Type	Process Option	Description	Screening for Effectiveness, Implementability, and Relative Cost			Retained?
Discharge	On-Site Discharge	On-Site Injection	Treated groundwater is injected into the aquifer on Site through a series of wells. Injection requires that the groundwater be treated to meet applicable groundwater standards prior to disposal to the subsurface.	The aquifer that is injected into must be transmissive enough to receive the volume of water injected. The sandy clay aquifer at the site is not very transmissive.	Implementable, given that standard construction methods and materials would be utilized. Some implementability problems can arise during long-term operation of injection wells, such as clogging of screen packs with precipitates or microbial fouling, particularly in high iron conditions. These can be overcome by proper removal of suspended solids and excess iron from the treated water, periodic chlorination of the injected water, and redevelopment and cycling on/off of wells.	Medium capital costs. Medium to high O&M costs if well rehabilitation needs to be performed periodically.	Not retained
		On-Site Surface Recharge	Treated groundwater can be disposed on-Site using a surface recharge system such as a drain field or a recharge basin. Recharge basins are shallow ponds that allow water to infiltrate into the ground gradually, and depending on the permeability of the soil, generally require large surface areas.	Not effective for this Site because the shallow zone of the aquifer is characterized by low hydraulic conductivity.	Easily implementable using available construction resources. Would be required to meet substantive requirements of NYSDEC permit for discharge.	Low capital and O&M costs.	Not retained
	Off-Site Discharge	Discharge to Storm Sewer	Treated groundwater is discharged directly to a storm sewer if available.	Effective if there are storm sewers in the vicinity of the Site and treated water meets NYSDEC discharge permit requirements.	Implementable; requires NYSDEC discharge permit and coordination with local authority. Additional investigation of the implementability of discharging to storm sewer should be evaluated prior to the remedial action.	Low capital costs. Medium O&M costs.	Retained

Note:

ft = feet

bgs = below ground surface

Highlighted rows indicate technology eliminated from further evaluation

Table 10-2
Soil Remediation Technology Screening
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

General Response Action	Technology Type	Process Option	Description	Screening for Effectiveness, Implementability, and Relative Cost			Retained?
				Effectiveness	Implementability	Relative Cost	
No Action	No Action	No Action	No action is performed at the site.	Not effective, but required for consideration by the NCP as a baseline for comparison. Unlikely to be acceptable due to the level of contaminants on site. Not protective of the environment.	Easily implemented	None	Retained (required by NCP as stand-alone alternative)
Institutional Controls	Land Use Controls	Governmental and Proprietary Controls	Contact with contaminated medium would be controlled through zoning and restrictions governing land use of the site.	Restricts future uses of the site that are not protective of human health and the environment but does not physically address contamination.	Implemented using legal instruments and labor resources; potential public resistance; zoning requires the cooperation of the municipality.	Low	Retained
		Informational Devices	Contact with contaminated medium would be controlled through legal instruments such as Notices of Environmental Contamination or deed notices	Restricts future uses of the site that are not protective of human health and the environment but does not physically address contamination.	Somewhat easily implemented using legal instruments and labor resources; potential public resistance.	Low	Retained
	Community Awareness	Information and Education Programs	Community information and education programs would be undertaken to enhance awareness of potential hazards and remedies.	Protects human receptors by enhancing awareness of potential site hazards and remedies. Does not directly affect ecological receptors and does not physically address contaminants.	Easily implemented using available technical and community involvement labor resources.	Low	Retained
	Monitoring	Sampling of environmental media.	Periodic monitoring of environmental media would be conducted. Can be both short-term and long-term.	Protects human receptors by monitoring contaminant concentrations and migration. Does not directly affect receptors and does not physically address contaminants.	Easily implemented using available technical labor and equipment resources.	Low to Moderate	Retained

Table 10-2
Soil Remediation Technology Screening
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

General Response Action	Technology Type	Process Option	Description	Screening for Effectiveness, Implementability, and Relative Cost			Retained?
				Effectiveness	Implementability	Relative Cost	
Monitored Natural Attenuation	Monitored Natural Attenuation	Monitored Natural Attenuation	Reliance on natural destructive and nondestructive mechanisms to reduce contaminant levels in the context of a long term monitoring program.	Effective where natural mechanisms have been shown to be able to meet the RAOs within a reasonable timeframe.	Easily implemented using available technical labor and equipment resources.	Low to Moderate	Eliminated from consideration due to effectiveness issues (not anticipated to meet RAOs within a reasonable timeframe).
Containment	Capping	Asphalt, concrete, or Clay Cap	Cover surface with low-permeability material such as asphalt, concrete or clay to prevent exposure to contaminated materials and limit water infiltration.	Protects human receptors by eliminating surface exposure of contaminants and minimizes water infiltration into subsurface, with the use of a relatively thin cap construction. Does not physically address existing contamination. Does not lessen toxicity or volume of contamination in subsurface soil. Limitations include the potential for saturated contaminated subsurface soil under cap to release contamination to groundwater. Effectiveness of clay caps may decrease over time due to development of desiccation cracking.	Implemented using available construction resources and materials. Requires increased maintenance for long-term protectiveness.	Moderate	Retained
Removal	Excavation	Mechanical Excavation & Backfill	Excavation of contaminated soil to the extent possible using typical construction equipment.	Protects human receptors by eliminating surface exposure of contaminants and reducing subsurface contaminants. Effective technique for removing contaminated soil from the site. Must be combined with transport, disposal, and/or treatment technologies. Engineering controls may be necessary to capture emissions of contaminants volatized during removal of contaminated soils.	Implementable. Shoring of the building would be required due to the proximity of the target remediation zone to the onsite building to prevent structural disturbance of the building. Must be combined with engineering controls during implementation to provide protection to workers and the environment.	Moderate	Retained.

Table 10-2
Soil Remediation Technology Screening
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

General Response Action	Technology Type	Process Option	Description	Screening for Effectiveness, Implementability, and Relative Cost			Retained?
				Effectiveness	Implementability	Relative Cost	
Treatment	Thermal	In-situ Thermal Remediation	The temperature of the contaminated area is increased by electrical resistivity heating (ERH), thermal conduction heating or steam injection. As the soil is heated, VOCs vaporize, increasing diffusion rate and solubility of contaminants, and potentially enhancing abiotic degradation or even biological degradation of contaminants. The resulting vapors are extracted by a vadose zone soil vapor extraction system or dual phase extraction wells and then treated in an above ground treatment system.	Successfully applied in removing contamination sources in silty or clayey soils such as the soils found at the site. Contaminant vapor would be captured using vertical or horizontal SVE wells. Residual heat would also be capable of stimulating accelerated biodegradation of remaining low-concentration contaminants.	Implementable by specialty vendors. The technology requires a significant, reliable source of electrical power or natural gas to run the system. The business on site would need to be shut down during installation and operations, including the cool-down phase.	High capital and O&M costs over a short period, approximately one year.	Retained.
		Ex situ Incineration	High temperature (2000 °F) burning of soil that destroys organic materials. Can be conducted either on site in a mobile unit or off site.	Protects receptors by eliminating exposure to contaminants and reducing concentrations of contaminants. Treated soil would be backfilled or disposed following incineration.	Difficult to implement due to limited availability of equipment and operators. Anticipate difficulty obtaining local acceptance to site an incinerator for onsite treatment.	Very High	Eliminated from consideration due to implementability issues.
		Ex Situ Low Temperature Thermal Desorption	Low temperature (300-600 °F) process that volatilizes organic materials, which are captured and processed in an off-gas treatment system or recycled.	Protects receptors by eliminating exposure to contaminants and reducing concentrations of contaminants. Clay and silty soils and high humic content soils increase reaction times as a result of binding of contaminants. Particle size can reduce performance of technology so soil may need to be pre-screened and re-worked.	Equipment and labor resources somewhat readily available. Requires specialized technical personnel for installation of equipment. Off-gas treatment may be required for dust and vapor emissions. May encounter difficulties meeting air discharge requirements. High energy requirements due to high contaminant concentrations. Process has intensive startup and monitoring requirements.	High	Eliminated from consideration due to implementability issues.

Table 10-2
Soil Remediation Technology Screening
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

General Response Action	Technology Type	Process Option	Description	Screening for Effectiveness, Implementability, and Relative Cost			Retained?
				Effectiveness	Implementability	Relative Cost	
Treatment (continued)	Biological	Enhanced In situ Bioremediation	Uses introduction of amendments to stimulate biotic degradation of contaminants	Most effective on dissolved-phase organics. Recent studies show that it can be effective in source areas with residual DNAPL as well. Effectiveness is decreased in the vadose zone since sufficient moisture is neceesary to sustain a biological community and appropriate geochemical conditions must be mantained.	There is a large suite of suitable bioremediation amendments that can be selected during design. Amendment delivery can be challenging in clayey formations. Limitations to implementability include the following: delivery method for nutrients, presence of nutrients in subsurface, moisture, and type of microorganisms present in subsurface. Requires relatively long timeframe for remediation (years to decades) if high concentrations of VOCs or DNAPL are present. Would require in situ soil mixing to introduce the amendments and requisite moisture into the low-permeabiliy soils in the vadose zone	Moderate	Eliminated from consideration due to effectiveness and implementability issues.
	Physical	Soil Vapor Extraction	Establishes a vacuum in either the vadose zone (ex situ) or a mound of excavated soil (ex situ) to volatilize and extract organic contaminants from soil.	Protects receptors by reducing concentration of contaminants in soil. Effective for removing organic contaminants from soil. Limited effectiveness in site geology consisting of low permeability silt and clay which would limit the radius of influence of the extraction wells and may cause short circuiting.	Relatively easy to implement using readily available equipment. System may require off-gas treatment to address air emissions. Residual liquids and spent treatment materials may require further treatment. Presence of low permeability silt and clay layer above the aquifer may necessitate enhancements, such as creation of a permeable gravel-filled trench or pneumatic fracturing to increase secondary porosity.	Low	Retained

Table 10-2
Soil Remediation Technology Screening
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

General Response Action	Technology Type	Process Option	Description	Screening for Effectiveness, Implementability, and Relative Cost			Retained?
				Effectiveness	Implementability	Relative Cost	
Treatment (continued)	Chemical	In-situ Chemical Oxidation	An oxidizing agent (e.g., hydrogen peroxide, Fenton's Reagent, potassium permanganate, persulfate, or ozone) is mixed into the subsurface. Dissolved organic compounds are destroyed upon reaction with the oxidant.	Protects receptors by reducing concentration of contaminants in subsurface. Effective organic destruction if adequate contact between reagents and dissolved contaminants occurs in a saturated soil.	Achieving good distribution of the oxidant throughout the unsaturated, low-permeability clay of the treatment zone would be difficult. Injection would have a very limited range of influence in this geology and not be cost effective. Even with the use of environmental fracturing technologies, the oxidants would be in primary or secondary fractures that would still require the oxidant to diffuse up and out of the clay matrix. In situ soil mixing is a technique that could mechanically mix the amendment and water into the clay and create the contact and saturation needed for successful remediation. Space limitations at the Site for soil mixing equipment may affect implementability. Buildings on treatment zone footprint may need to be demolished or modified.	Moderate to High	Retained.
		In situ Chemical Reduction	The technology involves the introduction of reductants such as nano-or micro-scale zero valent iron (ZVI) particles to reduce the contaminants to non-hazardous compounds.	Protects receptors by reducing concentration of contaminants in subsurface. Effective VOCs destruction if adequate contact between reagents and dissolved contaminants occurs. Achieving uniform delivery of the reductant and adequate contact of reductant with contaminants would be critical for effective treatment.	Since ZVI is a particle and is larger than the pore space in clayey soils, fracturing or in situ soil mixing would be required in the clayey soils of the vadose zone.	High capital cost, depending on the delivery technology and the depth required to be achieved.	Retained.

Table 10-2
Soil Remediation Technology Screening
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

General Response Action	Technology Type	Process Option	Description	Screening for Effectiveness, Implementability, and Relative Cost			Retained?
				Effectiveness	Implementability	Relative Cost	
Disposal	Off-site Disposal	Non-Hazardous Waste Landfill	Disposing excavated soil in an off-site non-hazardous waste landfill.	Disposal in non-hazardous waste landfill is effective in preventing direct contact and in reducing mobility of contaminants; however the volume and toxicity of the waste is not reduced.	This technology is technically implementable. However, offsite disposal at a non-hazardous waste landfill would need to be implemented with a removal action. Since excavation is retained, offsite disposal at a non-hazardous landfill would be implemented.	Moderate	Retained.
		Hazardous Waste Landfill	Disposing excavated soil in an off-site, permitted, RCRA hazardous waste landfill.	Effective for disposal of materials that do not meet required treatment under the RCRA LDRs. Effective in preventing direct contact and in reducing mobility of contaminants; however the volume and toxicity of the waste are not reduced.	RCRA Subtitle C landfills that accept contaminated soils are available. However, this process option needs to be implemented with the removal action for contaminated soil. .	High	Retained.

Table 10-3
Screening of Technologies and Process Options for Vapor
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

General Response Action	Technology Type	Process Option	Description	Screening for Effectiveness, Implementability, and Relative Cost			Retained?
				Effectiveness	Implementability	Relative Cost	
No Action	No Action	No Action	No action is performed at the site.	Not effective, but required for consideration by the NCP as a baseline for comparison. Unlikely to be acceptable due to the level of contaminants on site. Not protective of the environment.	Easily implemented	None	Retained (required by NCP as stand-alone alternative)
Containment	Passive Barriers	Geomembrane	Impermeable geomembrane place beneath building.	Protects human receptors by preventing vapors from traveling into the on site buildings thereby eliminating exposure to contaminants.	Cannot be implemented because the technology only works for new construction. It is not feasible as a retrofit.	Low	Not retained due to lack of implementability
		Spray-on vapor membrane	Placement of a spray-applied vapor membrane. The membrane may be a rubberized asphalt emulsion or an epoxy (method of sealing all cracks and potential vapor instrusion points.	Protects human receptors by preventing vapors from traveling into the on site buildings thereby eliminating exposure to contaminants. Is primarily used in cases where affected buildings do not have a concrete foundation.	Easily implementable	Low	Not retained due to lack of necessity.
		Sealing	Seal cracks and other openings such as openings in slab, major cracks in walls, utility penetrations, sump lids that do not fit tightly, and floor drains	Difficult to find and seal all openings which reduces the effectiveness of the technology.	Difficult to implement because it is diffcult to find and seal all openings.	Moderate	Not retained due to lack of implementability and effectiveness

Table 10-3
Screening of Technologies and Process Options for Vapor
Former Doro Dry Cleaners - Site No. 9-15-238
NYSDEC Work Assignment No. D007621-6

General Response Action	Technology Type	Process Option	Description	Screening for Effectiveness, Implementability, and Relative Cost			Retained?
				Effectiveness	Implementability	Relative Cost	
Removal	Active Ventilation	Sub-slab suction	Placement of additional venting system consisting of a vent pipe (or a series of vent pipes) installed through the slab and connected to a vacuum pump to extract the vapors from beneath the slab. May be installed in conjunction with a vapor barrier.	Protects human receptors by preventing vapors from traveling into the on site buildings thereby eliminating exposure to contaminants. Up to 99.5% reduction in vapor intrusion is possible.	Easily implementable. It is the most widely used and accepted approach.	Moderate	Retained
	Passive Ventilation	Sub-slab depressurization	System consists of a vent pipe (or a series of vent pipes) installed through the slab - relies on convective flow of warmed air upward in the vent pipe to draw air from beneath the slab	The buildings have concrete slabs so they would be effective at protecting human health as long as the slab is inspected for any cracks/openings. Sealing cracks would be required to prevent vapors that are not transported through the vent pipe from traveling into the onsite buildings.	Easily implementable	Low	Retained

Appendices (on disk)