FINAL
REMEDIAL SYSTEM OPTIMIZATION EVALUATION REPORT
CARRIAGE CLEANERS SITE
SITE # 828120

WORK ASSIGNMENT NO. D009809-15

Prepared for:

New York State Department of Environmental Conservation
Albany, New York

Prepared by:

MACTEC Engineering and Geology, P.C.
Portland, Maine

MACTEC Project No. 3612206118

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TABLE OF CONTENTS

LIST OF TABLES III

LIST OF FIGURES IV

GLOSSARY OF ACRONYMS AND ABBREVIATIONS V

1.0 INTRODUCTION 1-1
1.1 PROJECT OBJECTIVES AND SCOPE OF WORK 1-1
1.2 REPORT OVERVIEW 1-3

2.0 REMEDIAL ACTION DESCRIPTION 2-1
2.1 SITE LOCATION AND HISTORY 2-1
2.2 REGULATORY HISTORY AND REQUIREMENTS 2-2
2.3 CLEAN-UP GOALS AND SITE CLOSURE CRITERIA 2-3
2.4 REMEDIAL ACTIONS AND POST-REMEDIAL INVESTIGATIONS PERFORMED TO DATE 2-4
2.4.1 Vapor Intrusion Mitigation 2-4
2.4.2 Soil Remediation 2-5
2.4.3 Groundwater Water Mitigation 2-6
2.4.4 Site Management Plan 2-8
2.5 DESCRIPTION OF EXISTING GWETS AND SVE SYSTEM 2-8
2.5.1 System Goals and Objectives 2-8
2.5.2 System Description 2-9
2.5.3 Current Operation and Maintenance Program 2-9
2.6 CONCEPTUAL SITE MODEL OVERVIEW 2-11

3.0 SYSTEM PERFORMANCE TO THROUGH JUNE 2019 3-1
3.1 SOIL VAPOR EXTRACTION SYSTEM 3-1
3.2 GROUNDWATER EXTRACTION AND TREATMENT SYSTEM 3-4
3.3 COMBINED SYSTEM MASS REMOVAL 3-7
3.4 SYSTEM DOWNTIME AND OPERATIONAL ISSUES 3-8
3.5 MAJOR COST COMPONENTS OF PROCESSES 3-9
3.6 SUSTAINABILITY EVALUATION 3-9
3.7 REGULATORY COMPLIANCE 3-10

4.0 EVALUATION OF POTENTIAL SYSTEM MODIFICATIONS 4-1
4.1 EVALUATION OF OPTIONS TO ACHIEVE REMEDIATION GOALS 4-1
4.1.1 Options for SVE System 4-1
4.1.2 Options for GWETS 4-2
4.2 EVALUATION OF OPTIONS TO IMPROVE SYSTEM PERFORMANCE 4-3
4.2.1 Options for SVE System Performance 4-3
4.2.2 Options for GWET System Performance 4-4
4.3 EVALUATION OF OPTIONS TO IMPROVE SUSTAINABILITY 4-5
4.4 RECOMMENDATIONS TO REDUCE COSTS 4-5

5.0 CONCLUSIONS AND RECOMMENDATIONS 5-1

6.0 REFERENCES 6-1

TABLES

FIGURES

APPENDICES

APPENDIX A: Monroe County Sewer Use Permit

APPENDIX B: Record of Decision

LIST OF TABLES

Tables

2.1 Routine Sampling, Maintenance, and Reporting Summary

3.1 PCE Concentrations in Subsurface Soil
3.2 Soil Vapor Extraction Rebound Study TO-15 Results
3.3 Groundwater PCE Concentrations
3.4 GW Wells – Multiple Parameters

LIST OF FIGURES

Figures

1.1 Site Location

2.1 Site Layout
2.2 Sub- Slab Depressurization System Locations
2.3 Vapor and Soil Sampling Locations
2.4 Remedial System Optimization Existing Process Flow Diagram

3.1 Soil Vapor Extraction System Operational Parameters
3.2 Soil Vapor Extraction Well Flow Rates
3.3 Groundwater Extraction and Treatment System Flow Rates
3.4 Soil Vapor Extraction System Influent and Effluent Concentrations

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

AST	above-ground storage tank
bgs	below ground surface
CSM	Conceptual Site Model
FS	Feasibility Study
ft	foot or feet
gpm	gallons per minute
GWETS	groundwater extraction and treatment system
lbs	pounds
MACTEC	MACTEC Engineering and Geology, P.C.
MERC	methanol extraction of rock chips
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MNA	monitored natural attenuation
µg/L	micrograms per liter
NYCRR	New York Codes, Rules, and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
OM&M	operation, maintenance, and monitoring
OBG	O'Brien & Gere
OP-TECH	OP-TECH Environmental Services
PCE	tetrachloroethylene

GLOSSARY OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

PID	photoionization detector
ppm	parts per million
PRR	Periodic Review Reports
RA	remedial action
RI	Remedial Investigation
ROD	Record of Decision
ROI	Radius of Influence
RSO	Remedial System Optimization
scfm	standard cubic feet per minute
SCO	soil cleanup objectives
Site	Carriage Cleaners
SMP	Site Management Plan
SSDS	sub-slab depressurization system
SVE	soil vapor extraction
TI	technical impracticability
USEPA	United States Environmental Protection Agency
VC	vinyl chloride
VE	vapor extraction
VGAC	vapor-phased granular activated carbon
VI	vapor intrusion
VLS	vapor liquid separator
VMP	vapor monitoring point
VOC	volatile organic compound

1.0 INTRODUCTION

MACTEC Engineering and Geology, P.C. (MACTEC) prepared this Remedial System Optimization (RSO) Evaluation for the Carriage Cleaners site (Site) in Brighton, Monroe County, New York (see Figure 1.1). This work was completed for the New York State (NYS) Department of Environmental Conservation (NYSDEC) under Work Assignment No. D009809-15. The Site was assigned Site No. 828120 by the NYSDEC. The Record of Decision (ROD) identified the Site as a Class 2 site that poses a significant threat to the public health and environment. In October 2013, the Site was downgraded to a Class 4 site because remedial construction actions had been completed for all operable units, but the Site had not been brought into compliance with standards, criteria, or guidance. Active groundwater extraction with on-site treatment and discharge to a sanitary sewer was operational October 2011 to September 2020, and active soil vapor extraction (SVE) and discharge to ambient air activities are currently in operation at the Site. An RSO report was prepared in 2016 (MACTEC, 2016), which provided recommendations for field activities to further evaluate potential system optimization.

1.1 PROJECT OBJECTIVES AND SCOPE OF WORK

The overall objectives of the RSO evaluation are the following:

- Review remedial program objectives
- Evaluate overall system operation, effectiveness, and progress towards achieving remedial objectives
- Assess the selected remedy's applicability to meeting remedial action (RA) objectives and goals, as well as the appropriateness of the remedial program for the Site
- Assess studies and pilot tests conducted as part of the 2016 RSO recommendations
- Identify potential modifications to the remedial program and treatment systems

This scope of work consisted of a review of historical and recent investigations at the Site, review of recommendations and associated results from the 2016 RSO, review of operational data, developing and evaluation of potential system modifications, and preparation of this report. Previous investigations and historical data from the Site that were reviewed for this report include:

- The Pre-Design Investigation and basis of design documents for the SVE system and the groundwater extraction and treatment system (GWETS)
- Weekly, biweekly, monthly, and semi-annual operational monitoring and sampling from December 2011 through September 2019

- Semi-annual groundwater sampling events from 2009 to March 2020
- A subsurface soil investigation conducted in September 2013 and results of subsequent samples collected in March 2017. The March 2017 sampling was conducted in response to the recommendation in the 2016 RSO Report.
- A radius of influence analysis for the groundwater extraction well conducted in August 2015 and groundwater extraction pilot testing conducted from December 2018 to July 2019.
- SVE system modification transitioning a vapor monitoring point to an additional extraction well. Also modified the new well's depth per recommendations in the 2016 RSO Report.
- SVE rebound study conducted from December 2017 through November 2018 per recommendations in the 2016 RSO Report.
- Groundwater extraction pilot testing conducted at MW-6B and MW-8B from December 2018 to July 1019.

Review of existing site permit documentation and discharge requirements was also conducted for this report. The following permit and discharge criteria are currently used for the Site:

- The County of Monroe Sewer Use Permit Number 951 for the GWETS system (included as Appendix A)
- The DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants and Title 6 of the New York Codes, Rules, and Regulations Part 212 is applicable for the SVE system.

This evaluation presents findings from previous site investigations listed above, provides a brief summary of current site remedial systems, operations data and associated permits, and options for optimization of the remedial system. This evaluation is intended to present a high-level conceptual design discussion and contains recommended actions for the Site to: (1) convert the existing SVE system to a sub-slab depressurization system (SSDS) and (2) conditionally proceed with a pilot study to evaluate monitored natural attenuation (MNA) as a viable method to reduce the contaminant mass and extent of the Site groundwater plume.

Following the submittal of the draft evaluation (January 2020), the GWETS was shut-down (September 2020) at the request of the NYSDEC. When directed, a RSO work plan and design will be prepared and submitted to detail a groundwater rebound study (which will address groundwater and vapor intrusion monitoring), and to implement the recommended action to convert the existing SVE system to a SSDS.

1.2 REPORT OVERVIEW

This evaluation is organized as follows:

- Section 2.0 provides a summary of site history, regulatory history, investigations, and remedial activities conducted to date, and a conceptual site model (CSM)
- Section 3.0 provides GWETS and SVE system performance data through June 2019
- Section 4.0 presents an evaluation of potential system modifications
- Section 5.0 presents conclusions and recommendations
- Section 6.0 presents report references

2.0 REMEDIAL ACTION DESCRIPTION

This section presents a summary of the site history, regulatory history and requirements, and previous and ongoing RAs at the Site.

2.1 SITE LOCATION AND HISTORY

The Site is located at 2101 Monroe Avenue, Town of Brighton, Monroe County, New York (Figure 1.1). The Site is a commercially zoned parcel approximately 0.35 acres in size located at the intersection of Brooklawn Drive and Monroe Avenue. The area is a densely populated, mixed commercial and residential area. The Site is currently occupied by a one-story cement block dry cleaning facility, a two-story wood-framed house (currently unoccupied), and a paved parking lot.

Dry cleaning operations have occurred at the Site for at least 30 years; a Town of Brighton Sewer inspection suggests that dry cleaning operations may have occurred at the Site as early as 1959. Up until October 10, 2018 Carriage Cleaners utilized tetrachloroethene (PCE) during dry-cleaning operations. Since then, naphthalene, a petroleum-based solvent, has been used. Data collected as part of the various investigations suggest that PCE disposal may have occurred at multiple locations at the Site. Evaluation of a storm sewer adjacent to the west side of the building documented a failed section of the sewer and the presence of PCE contamination in soil near the sewer at a concentration of 48 parts per million (ppm) in 2007 (NYSDEC, 2008) and 3,900 ppm in 2008 (MACTEC, 2009). Additional PCE disposal appears to have occurred below the building.

It is also possible that spills occurred in a narrow alleyway between the site commercial building and onsite residential property (2111 Monroe Avenue). Although a source area was not identified within this alleyway during previous investigations, spills could have occurred at a former 275 gallon above-ground storage tank (AST) that was historically used to store PCE, or in the vicinity of the rear entrance/exit to the site building, where PCE was stored in 55-gallon and 30-gallon drums. Soil samples collected from two separate areas within the alleyway contained PCE at concentrations of 1.3 and 1.5 ppm, but these samples were from below the water table and may represent a source of groundwater contamination and not a soil source of soil contamination.

Data collected during previous investigations did not provide information on when and for what duration PCE disposal occurred at the Site. The data does generally show that PCE handling practices over a period of more than 25 years has contributed to the on-site PCE contamination.

2.2 REGULATORY HISTORY AND REQUIREMENTS

In 2004, the NYSDEC listed the Site as a Class 2 site after a series of investigations related to a petroleum spill at the former Newcomb Oil/Citgo Gasoline Station at 2087 Monroe Avenue identified chlorinated solvents in groundwater samples collected downgradient of the Site.

The owner of Carriage Cleaners at the time subsequently completed a limited Phase II Environmental Site Assessment in 2004. The results of the site assessment reportedly did not identify a source for the PCE but did indicate that soil and groundwater at the Carriage Cleaners property were contaminated with PCE. The site assessment report concluded that possible breaks in the storm and sanitary sewer lines may represent a potential source for the PCE contamination. During the site assessment, the highest concentration (34.5 ppm) of PCE in soil was detected in a soil boring advanced adjacent to the underground sewer lines servicing the west side of the Carriage Cleaners building. In groundwater, PCE was detected at a maximum concentration (4,380 parts per billion) in an overburden monitoring well located near the PCE AST in the alleyway that separates the Carriage Cleaners building from the adjacent residential building located at 2111 Monroe Avenue (NYSDEC, 2008).

In addition to on-site investigation activities, the NYSDEC completed an off-site vapor intrusion (VI) program in January of 2004. A total of six VI sample sets (sub-slab, indoor air, and ambient air samples) were collected at four residential properties. Three VI sample sets were collected at one large apartment complex on Monroe Avenue. Based on this off-site VI sampling one basement/crawlspace ventilation system and four SSDS were installed as part of an interim remedial measure in February 2004 (three of the SSDSs were installed at the apartment complex) (NYSDEC, 2008).

The data collected as part of these investigation activities led to the listing of the Site as a Class 2 Inactive Hazardous Waste Disposal site in June 2004. A Class 2 site is a site where hazardous waste presents a significant threat to the public health or the environment and action is required.

Based on this listing, a Remedial Investigation (RI) / Feasibility Study (FS) of the property was completed for the NYSDEC by O'Brien & Gere (OBG). The RI was conducted between March 2005 and November 2007. The RI included the collection of soil vapor, subsurface soil, indoor air, and groundwater samples; the installation of 10 groundwater monitoring wells; the evaluation and subsequent repair of an underground storm sewer pipe; and the permeability testing of newly installed monitoring wells (OBG, 2007). Based on the results of the RI, subsurface soil, groundwater, and soil vapor/indoor air were determined to be the media in need of remedy; the primary contaminant of concern was PCE (NYSDEC, 2008).

The FS Report (OBG, 2007) identified the preferred remedy with the following components:

- Presumptive remedy of SVE of site soils
- Groundwater extraction for control of site groundwater
- Monitored natural attenuation of off-site groundwater
- VI mitigation and monitoring of off-site properties
- Excavation of site soils
- Groundwater monitoring
- Deed restrictions.

The ROD prepared by NYSDEC identified the aforementioned remedy as the selected remedy for the Site.

2.3 CLEAN-UP GOALS AND SITE CLOSURE CRITERIA

NYSDEC prepared a ROD (Appendix B) for the Site in March 2008 (NYSDEC, 2008) identifying the following remediation goals for the Site:

- Eliminate or reduce to the extent practicable:
    - Exposures of persons at or around the Site to PCE, and PCE breakdown products in soil and groundwater
    - The release of contaminants from soil into groundwater that may create exceedances of groundwater quality standards
    - The release of contaminants from subsurface soil beneath basements into indoor air through soil vapor.
- Attaining to the extent practicable:

- Ambient Water Quality Standards and Guidance Values for groundwater (NYSDEC, 1998)
- The soil cleanup objectives (SCOs) included in the Technical and Administrative Guidance Memorandum 4046 and Title 6 pf the New York Codes, Rules, and Regulations (NYCRR) Subpart 375-6 – Remedial Program SCO.
- The air guidelines provided in the Guidance for Evaluating Soil Vapor Intrusion in the state of New York, dated October 2006.

Through remedial actions performed to date, the remedial goals listed above have been addressed with the exception of attaining ambient water quality standards and guidance for groundwater. The following sections will further describe what actions were taken to address the goals and will recommend changes to optimize ongoing operations that will continue to be protective of public health and the environment.

2.4 REMEDIAL ACTIONS AND POST-REMEDIAL INVESTIGATIONS PERFORMED TO DATE

The following paragraphs provide brief summaries of the RAs and post-RA investigations performed at the Site. Additional information for each can be found in the 2016 RSO report (MACTEC, 2016), and Quarterly Operation, Maintenance and Monitoring (OM&M) Reports (3rd quarter 2019 [MACTEC, 2019a]), annual Periodic Review Reports (PRR) (2019 PRR [MACTEC, 2019b]). Since the submission of the draft RSO evaluation (January 2020), the OM&M Reports for 4th quarter 2019, 1st quarter 2020, and 2nd quarter 2020, and the 2020 PRR have been submitted to NYSDEC for review (MACTEC, 2020a, 2020b, 2020c, 2020d). Locations of RAs and post-RA investigation locations related to on-site soil, soil gas, and groundwater, and general site layout are included in Figure 2.1.

2.4.1 Vapor Intrusion Mitigation

One basement ventilation system and sixteen SSDS systems are active in the vicinity of the Site. Three of the SSDSs are located in a large apartment building (Hampshire Apartments), and the basement ventilation system and thirteen SSDSs are located in off-site residential properties. These vapor mitigation systems are monitored and maintained by NYSDEC. The locations of these

systems are shown in Figure 2.2. The on-site residential building, unoccupied since a fire occurred there in 2014, houses an inactive SSDS.

Continued operation of these systems is recommended to ensure public safety due to the potential for vapor intrusion.

2.4.2 Soil Remediation

Soil Excavation and Aboveground Tank Removal

In 2011, the 250-gallon PCE AST was removed from the site alleyway. Additionally, 127 cubic yards of contaminated soil were removed from an approximate 260 square foot (ft) excavation that extended approximately 12 feet (ft) below ground surface (bgs) and three feet below groundwater elevation at the storm sewer break on the building's west side. Confirmatory sidewall samples were not collected during the advancement of the excavation due to the presence of the sheeting/shoring system. Following completion of excavation advancement, approximately 1,540 pounds (lbs) of potassium permanganate were placed at a rate of 5.5 lbs per square foot onto the base of the excavated area via excavator bucket on August 11, 2011. Prior to backfilling, reagent piping was placed at the bottom of the excavation to support future injections of permanganate. The excavation was then backfilled with stone to a depth of 6.5 ft bgs and common borrow to pre-existing grade.

In addition to the removal of the AST and excavation of impacted soils, and in an effort to minimize recontamination of site soils during continued operation of the site as a dry cleaner, floor drains inside the facility were abandoned and washing machine effluents previously tied into the floor drain/storm sewer lines were rerouted to the sanitary sewer by OP-TECH September 29, 2011 to October 7, 2011; storm sewers were replaced by OP-TECH July to August 2011. The facility floor drains will be visually inspected by the OM&M contractor during the RSO activities to verify that they were sealed during the abandonment to eliminate the preferential pathway.

Soil Vapor Extraction System

To further reduce soil impacts under the building where excavation was not feasible, an SVE system was installed and has been operating since October 2011. The general configuration of the

SVE system's extraction wells and vapor monitoring points is presented in Figure 2.3. The SVE system is described in further detail in Subsection 2.5 of this report.

Soil Sampling and Associated SVE Reconfiguration

In 2013, subslab borings (DP-14A and DP-17A) were completed within the building to evaluate the effectiveness of the SVE by sampling for the presence of residual contamination in an area that historically had the highest PCE concentration in soil beneath building. Sampling showed that the SVE system operation had reduced PCE contamination in the soil beneath the building by several orders of magnitude at DP-17A such that SCOs had been achieved. The PCE concentration at the DP-14A location had decreased by approximately 50% but still exceeded the SCOs.

As a result of the soil sampling, the SVE system was reconfigured to target the extraction wells closest to DP-14A and one of the vapor monitoring points (VMP), VP-08, was converted into a vapor extraction (VE) well, VE-8. This well was screened deeper than the other SVE wells, and during high groundwater conditions moisture was pulled into the SVE system's vapor liquid separator (VLS) causing the liquid level in the VLS to trip the automatic system shutoff level on a few occasions. VE-8 has since been modified to reduce its depth to minimize system downtime.

In 2017, another round of sub-slab soil sampling was conducted near DP-14 revealing a maximum PCE concentration of 0.019 milligrams per kilogram (mg/kg), below the SCO, indicating that the SVE system has achieved its remedial goal. As a result, the SVE system was turned off for approximately one year during which time a rebound study was conducted. Results of the rebound study are discussed in subsequent sections of this report. Currently, the SVE system continues to operate, capturing vapors from impacted groundwater and impacted bedrock below the targeted soil.

2.4.3 Groundwater Water Mitigation

Groundwater Extraction and Treatment System

To reduce the migration of contaminants from the Site within groundwater, a GWETS was installed and operated October 2011 through September 2020; the GWETS was shut-down in September 2020. The GWETS includes a single recovery well, EW-1, which pumps on average

about 0.5 gallons per minute (gpm). The influent concentration of total volatile organic compounds (VOCs) captured by EW-1 ranged between 200 – 750 micrograms per liter (µg/L) and was treated by an on-site air stripper prior to sewer discharge under permit by Monroe County.

Installation of Permanganate Cylinders

Due to high PCE concentration (as high as 24 milligrams per liter (mg/L)) observed in groundwater at monitoring well MW-6 and in MW-6B (470 µg/l) and high PCE concentration in bedrock at MW-6B (as high as 48 mg/kg), potassium permanganate (RemOx® SR) cylinders were installed in 2014 to passively treat groundwater and bedrock in the vicinity of these wells. Quarterly visual inspections of both wells following the installation of the RemOx® SR revealed that the water in the wells was purple, indicating that potassium permanganate was still present through December 2018 at which time the permanganate cylinders were removed from the wells.

Extraction Well Radius of Influence Testing

In August 2015 a Radius of Influence (ROI) evaluation was conducted on the GWETS extraction well EW-1. Prior to shutting down the system, groundwater elevation measurements were made in several on-site and off-site wells. Approximately 24 hours after the GWETS was shut down, each monitoring well was gauged again. Measurements from the test indicate that EW-1 experienced 6.32 ft of drawdown while pumping; however, none of the surrounding wells showed a hydraulic response to pumping at EW-1. Notably, most of the wells showed an increase in depth to water following the GWETS shutdown. This is most likely due to either a barometric change or to aquifer drainage that was on-going prior to shutting down EW-1. Bedrock wells MW-8B and OW-1 are located within ten ft of EW-1; neither of the two wells showed an effect after pumping was stopped. Groundwater in the bedrock aquifer moves via fractured flow, and the lack of influence by EW-1 at these wells is likely due to the anisotropy of the aquifer; bedrock fractures at the nearby monitoring well locations are not connected to the bedrock fracture where EW-1 is located. Based on the results, flow through the fractured bedrock associated with EW-1 does not behave like an equivalent porous media; therefore, a ROI could not be calculated using the existing monitoring well network response.

Extraction Well Replacement Pilot Testing

Following removal of the permanganate cylinders at MW-6/6B, water was periodically pumped to remove residual permanganate from the wells, and groundwater was sampled. During pumping, drawdown in the well was recorded to evaluate the potential of using MW-6B as a replacement extraction well that may yield more water than EW-1 and potentially improve hydraulic containment. MW-6B was able to yield higher flow than EW-1, however, over the course of pumping and sampling, PCE concentrations in groundwater at MW-6B decreased to concentrations lower than what is typically observed in EW-1 (5.8 µg/l at MW-6B compared to 200 µg/l in May 2019). Therefore, MW-6B is not recommended to replace EW-1 as an extraction well.

Following the evaluation of MW-6B as a replacement extraction well, evaluation of MW-8B began. Historically, MW-8B exhibited similar VOC concentrations as those reported at EW-1, however its specific capacity was higher indicating a potential for enhanced connection to the aquifer. Pumping and sampling of MW-8B began; however, during the early stages of the well evaluation on July 11, 2019 during attempts to sample MW-8B, the sampling technician found the well pump to be irretrievable due to a rock cave in at approximately 18 ft bgs.

2.4.4 Site Management Plan

A Site Management Plan (SMP) (MACTEC, 2013) has been developed for long term management of remaining contamination as required by the Environmental Easement. The SMP includes plans for: (1) institutional/engineering controls, (2) monitoring, (3) operation and maintenance, and (4) reporting.

2.5 DESCRIPTION OF EXISTING GWETS AND SVE SYSTEM

2.5.1 System Goals and Objectives

SVE and GWET system operations were initiated at the Site in October 2011. Residual contaminated soil (i.e., soil remaining beneath the building) is treated by operation of the on-site SVE system, and contaminated shallow bedrock groundwater was extracted, treated, and discharged to minimize off-site contaminant mobilization during the GWET operation (October

2011 – September 2020). The primary goal for the SVE system is to achieve the SCO for PCE in soil (1.3 mg/kg). The primary goal of the groundwater extraction system was to minimize off-site mobilization of impacted groundwater.

2.5.2 System Description

The GWETS and SVE system operated concurrently through September 2020. The GWETS was designed by MACTEC, constructed by OP-TECH Environmental Services (OP-TECH), and operated October 2011 through September 2020. The GWETS was designed to extract and treat 0.6 gpm and to achieve hydraulic control of the contaminant plume to minimize off-site migration of contaminants. Bedrock groundwater was extracted via a single extraction well EW-1 and was pumped to an air stripper located in a site trailer adjacent to the active dry cleaner building. Once volatile organics were removed from the groundwater by the air stripper, the groundwater was discharged to the public sanitary sewer under a site-specific permit issued by the Monroe County Department of Environmental Services (MCDES).

The SVE system, also designed by MACTEC and constructed by OP-TECH, began operating in October 2011 with five VE wells; a sixth VE well was added in October 2014. The SVE system is designed to extract and treat up to 300 cubic ft per minute of vapor from impacted soil beneath the Carriage Cleaners building. Extracted vapor was treated via vapor-phase granular activated carbon (VGAC) until June 2012 but has since been discharged directly to the atmosphere at a rate below the acceptable discharge rate of 0.1 lbs per hour of high toxicity contaminants as defined in the DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants and Title 6 of the NYCRR Part 212. Figure 2.4 includes a process flow diagram for the systems.

2.5.3 Current Operation and Maintenance Program

The routine OM&M and reporting of the SVE and GWETS system including weekly, biweekly, monthly and quarterly monitoring, inspections, and reporting activities are summarized in Table 2.1 below. The routine OM&M activities do not include various studies/pilot tests such as the SVE rebound study.

Table 2.1: Routine Sampling, Maintenance, and Reporting Summary

Location Description	Location/ Sample ID	Quarterly	Monthly	Bi-Weekly	Weekly	Parameter/Analysis/Purpose
Groundwater Extraction Well	EW		X			Pressure
			X			Groundwater Elevation
Influent Groundwater	GWS-IN				X	Pressure
					X	Flow Rate
			X			Volatile organic compound (VOC) Sample (United States Environmental Protection Agency [USEPA] 624)
Effluent Groundwater	GWS-TE				X	Flow Total
			X			VOC Sample (USEPA 624)
Vapor Extraction Wells	VE-#		X			Pressure
					X	Flow Rate
			X			VOC Screening (via photoionization detector [PID])
Vapor Monitoring Points	VP-#		X			Pressure
			X			VOC Screening (via PID)
Combined Soil Vapor Influent	SVE				X	Pressure
					X	Flow Rate
					X	VOC Screening (via PID)
			X			VOC Sampling (via USEPA TO-15)
Air Stripper Vent Discharge	ASE				X	Pressure
					X	Flow Rate
					X	VOC Concentration (via PID)
			X			VOC Concentration (via USEPA TO-15)
Combined Stack Vent Discharge	CSV				X	Pressure
					X	Flow Rate
					X	VOC Concentration (via PID)
			X			VOC Concentration (via USEPA TO-15)
Air stripper cleaning	NA				X	Remove scale within stripper
OM&M Reporting	NA	X				Provide site data and activities to NYSDEC

Note: The sampling events highlighted in gray in Table 2.1 are not currently performed; the sampling was discontinued following the shut-down of the GWETS in September 2020.

2.6 CONCEPTUAL SITE MODEL OVERVIEW

This CSM has been derived based on site history, RIs, RAs, operational data, and post RA investigations, all of which have been previously described or will be described in further detail in subsequent sections of this report.

The Site contains a commercial building that has reportedly operated as a dry cleaner for over 30 years. Data collected during the RI performed by OBG suggest that PCE disposal may have occurred at multiple locations at the Site. Specifically, a failed sewer system adjacent to the northwest-side of the building resulted in a release, and 48 ppm PCE in soil were subsequently detected during the RI. An additional PCE release appears to have occurred in a narrow alleyway between the site building and an adjacent residential property located along Monroe Avenue, an area used to store drums in addition to the former AST, based on a reported groundwater concentration of 7,100 µg/L in monitoring well MW-1, an overburden well located on the west end of the alleyway behind the building (OBG, 2007). Soil contamination was also detected beneath the building during pre-design investigations, which is likely indicative of spills and poor housekeeping practices in the building during operations.

As directed by the ROD (NYSDEC, 2008), removal of contaminated soil associated with the faulty sewer line was conducted, and an SVE system was installed to reduce the concentration of PCE beneath the Carriage Cleaners building. In addition, a GWETS was installed to provide hydraulic control of contaminated groundwater and mitigate the threat of downgradient VI to nearby homes. The selected remedies prescribed by the ROD were operational by 2011.

Overburden geology at the Site consists of loose silt and fine sand overlying a denser till comprised of fine and medium sand with some silt and gravel. The total thickness of these unconsolidated deposits ranges from approximately 5 ft to 12 ft. Bedrock encountered immediately below the unconsolidated materials consists of dolomite with a weathered zone immediately below the till deposit, a shallow fractured bedrock zone with horizontal and vertical fractures, as well as pits and vugs and an intermediate more competent bedrock where the number of fractures decreases considerably.

Groundwater is sporadically present in the overburden. Where encountered, the saturated thickness of overburden groundwater is generally between one and five ft. The rate of groundwater movement in the overburden aquifer is estimated to be in the range of less than 0.045 to 0.09 (ft)/day. The overall flow of shallow groundwater has components flowing both northeast and southeast (OBG, 2007). The bedrock has limited primary porosity; the occurrence of groundwater in the bedrock occurs primarily in fractures. The overburden and shallow bedrock interface zones are considered to act as a single hydrogeologic unit. The estimated horizontal groundwater seepage velocity through the shallow bedrock interface zone is estimated to be approximately 1.4 ft/day or approximately 511 ft/year (OBG, 2007). The flow of groundwater in the bedrock primarily flows in a northeasterly direction.

A deeper intermediate zone appears to have limited hydraulic connection with the overburden and shallow bedrock interface zones. This was proven by an ROI study conducted in August 2015, where pumping water from EW-1 showed no indication of influence on nearby wells, as previously discussed, with a possible exception at off-Site monitoring well MW-210. PCE concentrations at MW-210 have decreased from 230 µg/L in 2009 to consistently below the NYS Class GA Groundwater Standard of 5 µg/l (NYS, 1999) during recent sampling events, with the exception of a slightly higher PCE concentration of 8 µg/L during the October 2019 semi-annual sampling event. Alternately, the observed reduction in PCE concentration at MW-210 may be a result of natural attenuation which will be further evaluated during the RSO activities including the groundwater rebound study.

The soil excavation and operation of the active SVE system have acted to minimize impacts to groundwater from impacted soil. The subslab soil sampling conducted in 2013 indicated a significant decrease in VOC concentrations in one location, and a lesser decrease in a second location. The highest observed VOC concentration in soil is located at a depth between 4 to 6 ft below the building slab and above the groundwater table. An additional VE well (VE-8 converted from VP-8) was installed in October 2014 to help target extraction in the area of highest reported soil contamination. Results of additional soil samples collected in 2017 indicate that SCOs have been achieved.

Lingering contamination is evident in MW-6, an overburden well located near the northeast corner of the building in the narrow alleyway where PCE was temporarily stored and presumably spilled.

Additional investigation, including the installation of bedrock well MW-6B, indicated the presence of PCE diffused into the bedrock matrix and was detected at a high concentration. The operation of the SVE system will likely continue to reduce residual concentrations of PCE in soil beneath the building but appears to have had no effect on contaminants located at the MW-6/6B location. Therefore in 2014 potassium permanganate (RemOx® SR) cylinders were installed to passively treat groundwater and bedrock in the vicinity of MW-6/6B. Since the removal of the cylinders in late 2018, groundwater contaminant concentrations reported in the bedrock at the MW-6/6B location have overall decreased. PCE was detected in groundwater samples collected in MW-6B on May 1, 2019, October 16, 2019, and March 30, 2020 at concentrations of 5.8 µg/L, 1000 µg/L, and 5.3 µg/L, respectively.

The RSO work plan and design shall include an updated CSM including current site groundwater data collected in October 2019 and March 2020, the evaluation of the necessity to further define/delineate the groundwater plume off-Site, and the evaluation of potential off-Site soil vapor intrusion exposures. Updated groundwater plume maps and groundwater flow direction figures will also be provided as part of the RSO work plan and design.

3.0 SYSTEM PERFORMANCE TO THROUGH JUNE 2019

The SVE system and GWETS have been operating since 2011. The following subsections summarize conditions and trends identified from the beginning of operations through June 2019 (MACTEC, 2019a) in terms of overall performance both in the subsurface and in the systems themselves. Additional detail was provided in quarterly OM&M reports and Annual Periodic Review Reports.

3.1 SOIL VAPOR EXTRACTION SYSTEM

The purpose of the SVE system is to treat residual contamination in overburden, vadose zone soil. The SVE system was designed to extract and treat soil vapor at a rate of up to 300 standard cubic ft per minute (scfm), while operating three extraction wells at a time at a rate of up to 100 scfm each. Several combinations of extractions wells have been active throughout operations to maximize the radius of influence of the SVE system and concentrate on areas with the highest concentrations in soil or soil vapor.

In March 2017, as recommended by the 2016 RSO, soil samples were collected in the vicinity of former sample location DP-14, and the PCE concentrations were below the SCO of 1.3 ppm, vastly reduced compared to the 2013 results as shown in Table 3.1 below.

Table 3.1 PCE Concentration is Subsurface Soil

Boring Location	December 2008		September 2013		March 2017	
	Depth Interval (ft bgs)	PCE Concentration (ppm)	Depth Interval (ft bgs)	PCE Concentration (ppm)	Depth Interval (ft bgs)	PCE Concentration (ppm)
DP-14	6	**290**	4 – 6	**140.01**	4 – 6	0.0061
			6 – 8	**39.01**	6 – 8	0.019
			10 – 11.5	0.85	10 – 11.5	Not Sampled

[1]Bolded values exceed the SCO for PCE of 1.3 ppm.
ft bgs = feet below ground surface
ppm = parts per million

As a result of the soil sampling investigation, a rebound study involving shutdown of the SVE system was conducted from December 2017 to December 2018. The objective of the study was to

assess the need for continued SVE system operation given that the SCOs had been achieved. During the system shutdown, periodic vapor samples were collected from:

- VE-4 – A vapor extraction well to compare against previous SVE influent concentrations. The well is screened from 3.5 to 6.5 feet bgs.
- VE-9 – A vapor monitoring point located directly beneath the building slab, to evaluate change in concentrations in the subslab as result of shutting down the system.
- Indoor Air – to evaluate changes in indoor air concentrations.

In general, as shown on Table 3.2, soil vapor concentrations at VE-4 increased over time during the rebound study and are likely attributable to contaminants off-gassing from groundwater and/or the bedrock matrix.

Table 3.2
Soil Vapor Extraction Rebound Study TO-15 Results

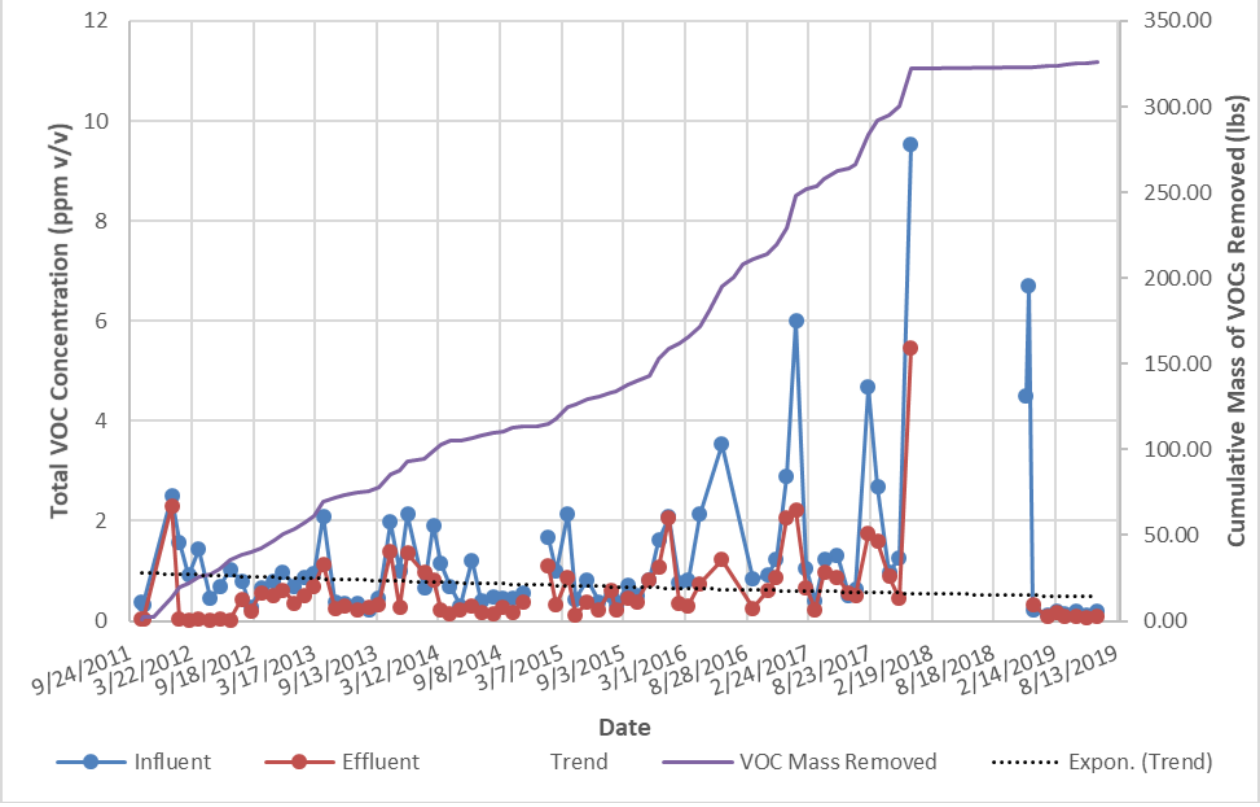
	VP-9		**VE-4 (March 2017 was Combined Influent Sample)**		**Indoor**		**Outdoor[1]**	
Date	PCE ($\mu g/m^3$)	TCE ($\mu g/m^3$)	PCE ($\mu g/m^3$)	TCE ($\mu g/m^3$)	PCE ($\mu g/m^3$)	TCE ($\mu g/m^3$)	PCE ($\mu g/m^3$)	TCE ($\mu g/m^3$)
3/19/2017 (Baseline)	8,100	650	2,600	130	7,200	360	4.2	1.3
12/20/2017	47,000	3,500	1,900	54	NA	NA	NA	NA
1/10/2018	27,000	1,400	24,000	720	27,000	1,100	4.4	< 0.21
2/14/2018	17,000	870	2,900	150	NT	NT	NT	NT
3/4/2018	27,000	1,200	410	23	NT	NT	NT	NT
4/11/2018	16,000	680	1,700	61	33,000	8,800	300 / 200	7.5 / 6
5/9/2018	26,000	1,100	2,700	81	NA	NA	NA	NA
6/13/2018	33,000	1,100	13,000	370	NA	NA	NA	NA
7/18/2018	28,000	720	31,000	500	1,700	760	230 / 670	0.83 / 9
8/15/2018	26,000	640	28,000	450	3,100	4,000	130 / 290	22 / 18
9/12/2018	46,000	930	54,000	740	720	770	29 / 1,300	1.4 / 13
10/10/2018	35,000	690	4,900	580	760	250	9.4/700	1.1/6.8
11/14/2018	30,000	670	28,000	510	880	5,500	0/0	0.77/0
11/20/2019	760	290	500	140	NA	NA	NA	NA

Notes:
1. Single outdoor samples were collected for comparison to ambient conditions during the baseline and first quarter 2018. During second, third, and fourth quarters 2018, two outdoor samples were collected, one upgradient and one downgradient from the dry cleaner. Results are shown as upwind / downwind.
2. NT = not tested
3. $\mu g/m^3$ = micrograms per cubic meter.
4. Sample on November 20, 2019 was nearly one year after turning SVE system back on, no indoor air samples were collected at this time.

Soil vapor concentrations at VE-9 did not appear to be affected by the SVE shutdown but remained elevated (generally higher than VE-4) throughout the rebound study. This may be attributable to saturation of the concrete slab with PCE over time during dry cleaning operations. Dry cleaner indoor air concentrations did not appear to be impacted by the SVE shutdown. Reported concentrations in indoor air were reduced during the warmer months, likely due to opening doors and windows for ventilation, and remained reduced toward the end of the shutdown, likely due to the dry cleaner switching from PCE-based products to naphthalene-based products. Regardless of the results, there was a concern that the elevated rebound soil vapor concentrations at VE-4 could continue to increase and contribute to the dry cleaner subslab and/or indoor areas, therefore the SVE system was reactivated on November 21, 2018.

Throughout routine operation of the SVE system, influent vapor samples have been collected on a monthly basis. Results of laboratory samples show a slight overall decreasing trend in VOC concentrations, as shown in Figure 3.1. In addition, the rate of mass removal has decreased as shown by the more gradual slope of the VOC mass removal line.

Figure 3.1: Soil Vapor Extraction System Influent and Effluent Concentrations

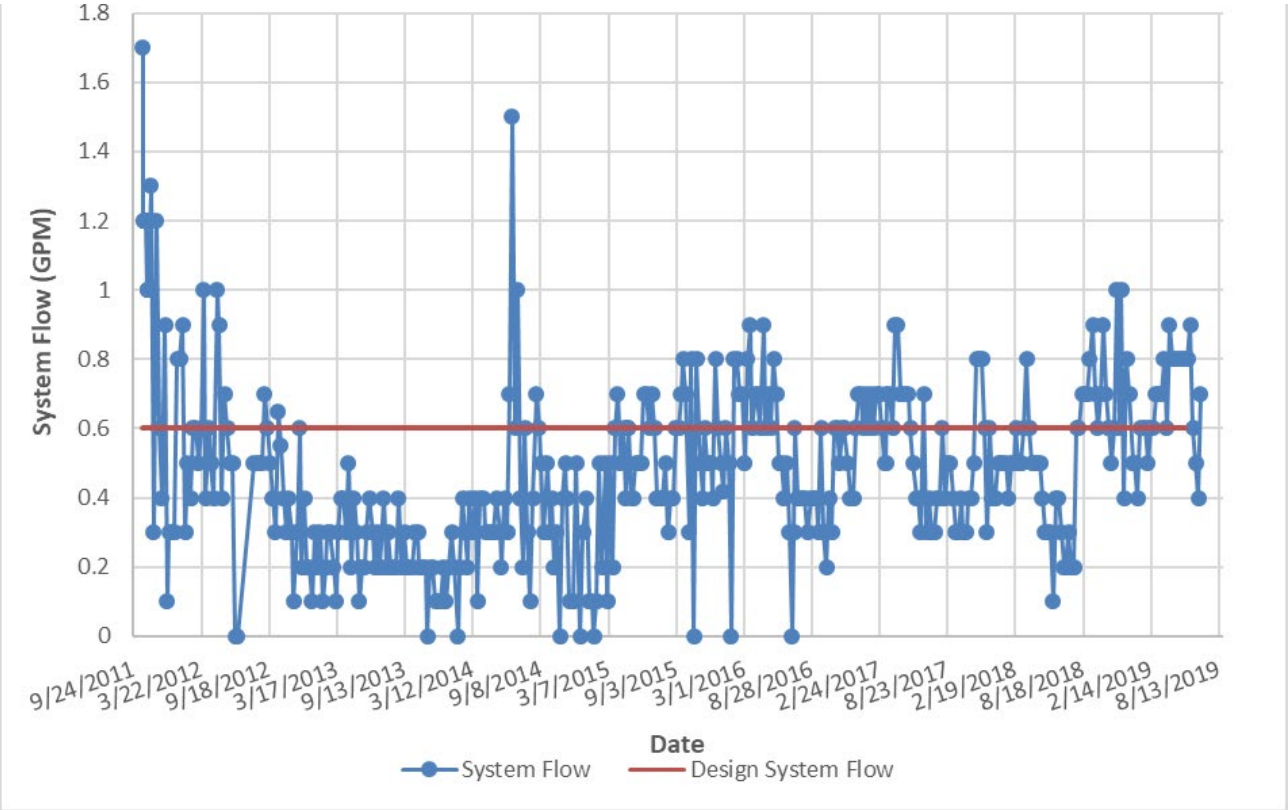


Overall, the SVE system has generally performed as expected over its eight years of operation and has achieved its goal of reducing soil concentrations to below SCOs. Although there are still measurable PCE concentrations in soil vapor at the SVE influent, it is likely attributable to off-gassing of groundwater and/or bedrock from the subsurface. This impacted soil vapor could impact indoor air concentrations at the dry cleaner building overtime, however, given the high PCE concentrations in the building subslab, they are unlikely to make conditions worse. At this point in time, a subslab depressurization system would be better suited for vapor intrusion mitigation than the ongoing operation of the SVE system.

3.2 GROUNDWATER EXTRACTION AND TREATMENT SYSTEM

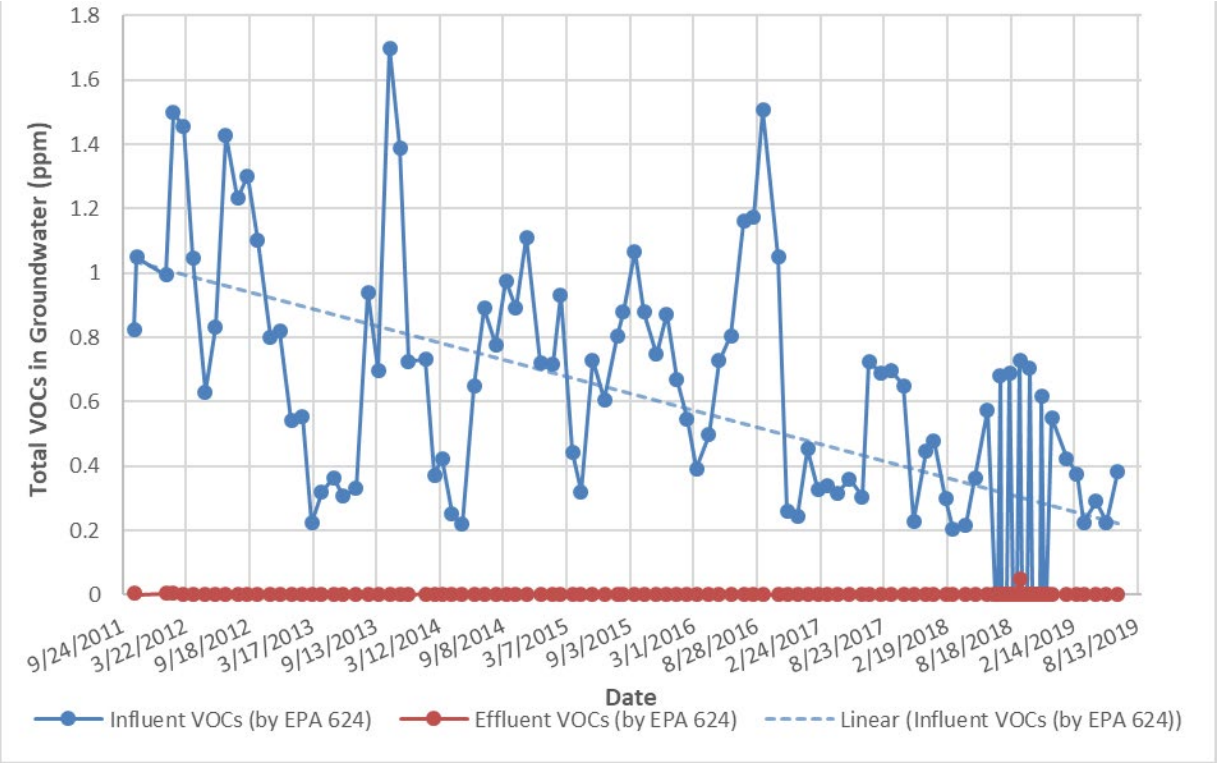
The GWETS was designed to extract and treat groundwater at a rate of 0.6 gpm. Figure 3.2 shows the GWETS flow rate since the beginning of operation. As shown on the graph, the system frequently operates at a rate less than the design flow rate. Extraction well rehabilitation is conducted periodically to improve flow rates. The tight formation, however, impedes the ability to extract water at a higher rate without the well going dry.

Figure 3.2: Groundwater Extraction and Treatment System Flow Rates



The total VOC concentration of the GWETS influent groundwater has ranged from 0.20 ppm to 1.7 ppm since the beginning of operation. The influent VOC concentration exhibits a slight downward trend as shown in Figure 3.3. The total VOC concentration in the GWETS effluent is typically non-detect but has been above non-detect on occasion. The highest total VOC concentration detected in the effluent has been 0.05 ppm. A conservative calculation using the lowest influent concentration and the highest effluent concentration, suggests a greater than 99% removal efficiency. The Monroe County Sewer Use Permit establishes a total VOC discharge limit of 2.13 mg/L. Both influent and effluent VOC concentrations have consistently been below this discharge limit since the start of GWETS operation in December 2011.

Figure 3.3: Groundwater Extraction and Treatment System Influent And Effluent Concentration



Although there is a decreasing influent VOC concentration trend at the extraction well, and the targeted extraction flowrates were generally achieved over the years, containment of the contaminant plume cannot be clearly demonstrated.

Since hydraulic containment has not been successful and the contaminant concentrations have exhibited an overall downward trend, upon the request of the NYSDEC, the GWETS was shut down in September 2020. The shut-down activities were performed by the on-site OM&M contractor (Groundwater and Environmental Services, Inc.) and included:

- Suspension of OM&M and Sampling of the GWETS.
- Week of August 31, 2020: Staff inspected the system and determined what would be needed to properly shut down and prepare the GWETS for storage.
- Week of September 7, 2020: Site gauging and GWETS shutdown (the stripper was acid treated to ensure it was scale free for storage).

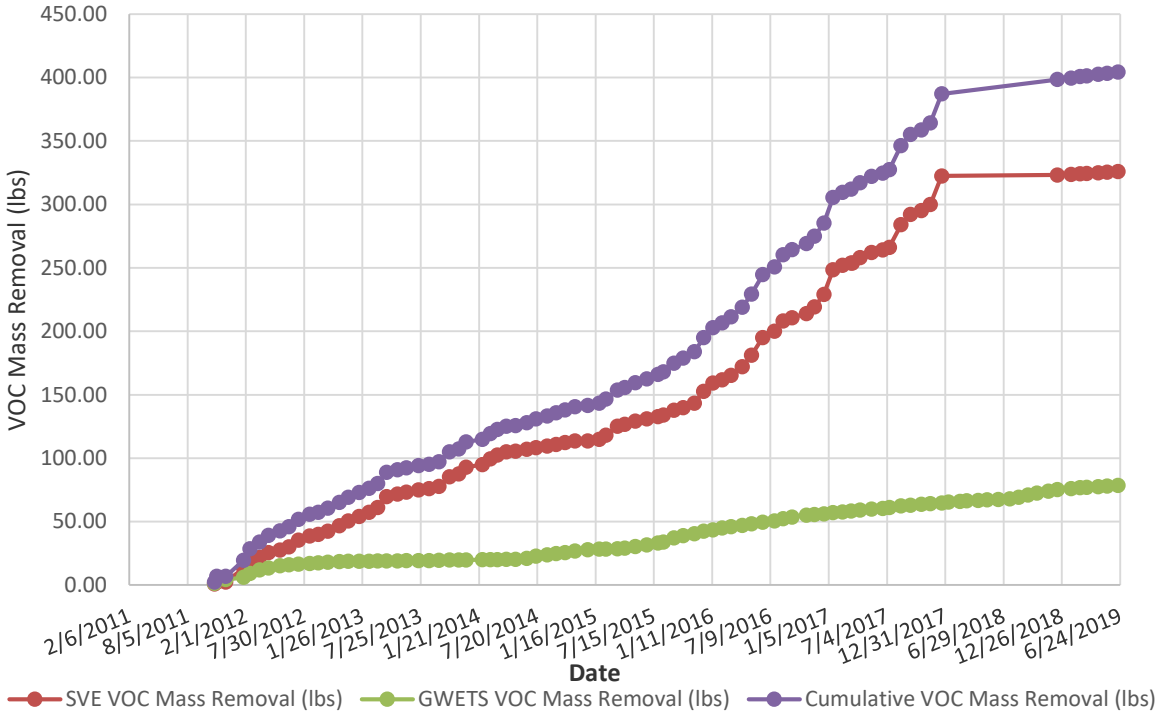
- Week of September 14, 2020: Follow-up site gauging and stripper pump out and cleaning. Drained lines and cleaned all accessible parts for storage. Monthly readings/vapor sampling.
- Week of September 21, 2020: Follow-up site gauging and O&M. Completed any final cleaning of GWET system. Pump was left in well.

To evaluate the potential groundwater migration under non-pumping conditions after the shutdown of the GWETS, a groundwater rebound study will be detailed in the RSO work plan and design.

3.3 COMBINED SYSTEM MASS REMOVAL

Since system startup in October 2011 through June 2019, the SVE system has removed approximately 325.9 lbs of VOCs from soil vapor based on United States Environmental Protection Agency (USEPA) Method TO-15 analytical results and associated SVE flow rates. During this time the GWETS has removed approximately 78.5 lbs of VOCs from groundwater based on USEPA Method 624 analytical results and associated groundwater flow rates. The cumulative mass removal rates since startup for SVE system and GWETS as well as total system removal rates are shown on Figure 3.4.

Figure 3.4: System Contaminant Mass Removal



Mass removal was not one of the objectives of either the SVE or the GWETS, and given the slow rate of mass removal of these systems combined, together they have achieved the remediation goals established in the site ROD to the extent practicable, and are not likely to contribute to achievement of ambient water quality standards and guidance values for groundwater, or to meeting the soil vapor intrusion guidance values (without the in-place SSD systems) in a timely manner.

3.4 SYSTEM DOWNTIME AND OPERATIONAL ISSUES

Since the beginning of operations in October 2011, the SVE system and the GWET system had overall uptimes of 84.8% and 97.5% respectively. For the most part, downtimes were attributable to planned or routine OM&M activities including:

SVE:

- System shutdown to convert VP-8 to VE-8
- System shutdown for nearly a year for the rebound study

GWETS:

- Weekly air stripper cleaning
- Pump and flow meter cleaning/maintenance
- Extraction well rehabilitation
- System shut-down September 2020

On a few occasions throughout the years, the SVE or GWETs was shut down due to equipment failure, power outage, or too much liquid accumulation in the SVE system. Generally, the systems were back on-line shortly after the failure. Additional information regarding uptime can be found in the quarterly OM&M reports and PRRs.

3.5 MAJOR COST COMPONENTS OF PROCESSES

The on-site SVE and GWET systems have relatively low OM&M costs. The two systems do not require consumable supplies and materials such as bag filters or treatment chemicals. The systems also do not generate waste as part of the process.

The two major cost components are electricity and labor. The system operates 24 hours per day and requires electricity to operate the SVE blower, the GWETS air stripper, the groundwater extraction well pump, and the system controls.

Labor involved for OM&M includes primarily:

1. Weekly visits for cleaning of the air stripper to avoid system shutdowns due to high pressure
2. Bi-weekly and monthly visits to record system data and collect analytical samples
3. Semi-annual groundwater sampling
4. Quarterly OM&M Report preparation.

3.6 SUSTAINABILITY EVALUATION

DER-31 (NYSDEC, 2011) includes applying green remediation concepts, such as minimizing energy consumption, reducing greenhouse gas emissions, maximizing the reuse of land, recycling

of materials, and conserving natural resources such as soil, water and habitat to the extent possible while still implementing remedies that are protective of public health and the environment. As previously stated, the on-site SVE and GWET systems, compared to similar treatment systems at other sites, have low OM&M costs, which in turn results in low energy and resource consumption and low waste generation compared to treatment systems that operate at higher rates.

The GWETS extraction rate from bedrock is low, 0.6 gpm, and does not impact the available water for consumption since the area is provided water by the public drinking water supply system. There are also no nearby surface water bodies that are impacted by the groundwater extraction. The water is treated through an air stripper that consumes electricity for continuous operation. The air stripper requires cleaning on a weekly basis to prevent clogging, however, there is no resulting waste stream that requires off-site transportation and disposal. Continuous operation of the air stripper consumes electricity, and the labor associated with cleaning it once a week requires travel and associated vehicular emissions.

The soil gas extracted by the SVE system discharges directly to the atmosphere with no treatment because the concentrations are below NYSDEC guidance values. Therefore, there are no resulting waste streams such as VGAC. The SVE system does require continuous operation of a blower that consumes electricity.

Although resource consumption at the Site is low compared to other GWETS and SVE systems, the operating systems have achieved the remediation goals established in the site ROD to the extent practicable and as such could be optimized to increase sustainability while still being protective of public health and the environment.

3.7 REGULATORY COMPLIANCE

VOC concentration in groundwater in the GWETS effluent consistently meets the discharge requirements in the Monroe County Sewer Use Permit for the Site. The influent VOC concentrations in groundwater also meet the discharge requirements of the permit, however, according to the permit (Appendix A) “All groundwater must be treated regardless of the influent concentrations.”

As previously stated, the 2008 ROD identified remediation goals for the Site. The following is an assessment of compliance with the established remediation goals for the Site.

Eliminate or reduce to the extent practicable exposure to PCE and PCE breakdown products in soil and groundwater. The limited excavation eliminated the most likely means of exposure to PCE in soil. The remaining impacted soil beneath the building have been treated by the SVE system, and results of 2017 soil samples indicate that the remedial objectives for soil cleanup have been achieved. Groundwater at and within the vicinity of the Site is not used as a drinking water source, and potential exposure would be restricted to subsurface construction workers. The GWETS is intended to prevent migration of contamination offsite, but the low pumping rate and specific capacity of the extraction well make it difficult to demonstrate its effectiveness. Contaminant concentrations are trending downward, and natural attenuation is likely occurring.

Eliminate or reduce to the extent practicable the release of contaminants from soil into groundwater that may create exceedances of groundwater quality standards. The soil excavation conducted in 2011 eliminated a significant source of contaminated soil, and the operation of the SVE system since 2011 has continued to eliminate the source. Soil sampling conducted beneath the building in 2017 indicates that the SCO for PCE has been met as previously shown in Table 3.1. The SCO of 1.3 mg/kg of PCE is the protection of groundwater standard which is the most stringent SCO for PCE and identical to the SCO for unrestricted use.

Eliminate or reduce to the extent practicable the release of contaminants from subsurface soil beneath basements into indoor air through soil vapor. The operation of the on-site SVE system reduced the soil concentrations to below the applicable SCOs. However, based on the results of the rebound study, soil vapor beneath the building slab is elevated at higher concentrations that the deeper SVE target zone and is likely attributable to PCE saturation in the floor due to years of dry-cleaning operations. Vapor concentrations at the extraction wells increased during the rebound study and are likely attributed to off-gassing of impacted groundwater and/or bedrock. Additionally, SSD systems have been installed in off-site buildings to mitigate potential vapor instruction. Therefore, the release of contaminants from subsurface soil beneath basements into indoor air through soil vapor has been reduced or mitigated to the extent possible.

To the extent practicable, attain ambient groundwater quality standards. The GWETS influent groundwater PCE concentrations show a slight downward trend since the beginning of operations. However, PCE concentrations in on-site groundwater continue to persist above the ambient groundwater standard of 5 µg/l. Table 3.3 below provides a summary of PCE concentrations in groundwater.

Table 3.3: Groundwater PCE Concentrations

Date	Groundwater PCE Concentration (µg/L)						
	MW-111I	**HA-114**	**MW-210**	**MW-8B**	**MW-9**	**MW-9B**	**MW-6B**
January 2009	**240**	-	**230**	-	-	-	-
December 2012	-	**31**	-	-	-	-	-
2/14/2013	-	-	4.3	-	-	-	-
10/10/2013	-	-	**5.1**	-	-	-	-
4/4/2014	-	-	2.6	-	-	-	-
12/17/2014	**83**	**13**	3.5	-	-	-	-
5/26/2015	**96**	**55**	1.8	**620**	-	ND	-
8/25/2015	**150**	**76**	2.8	**810**	**5.5**	ND	-
4/25/2016	**200**	**6.3**	1.1	**450**	1.9	ND	-
11/9/2016	**290**	**19**	**160**	**380**	3.9	**46**	-
5/10/2017	**190**	**2.8**	**7.5**	**140**	1.7	0.73	-
11/1/17*	**92**	**10**	**5.6**	**490**	**5.19**	ND	-
5/2/2018**	**170**	**42**	2.6	**480**	0.94	ND	-
11/14/2018	**44**	**60**	3.7	**380**	ND	**6.5**	-
5/1/2019	**49**	**30**	1.2	**290**	2.2	-	**5.8**
5/15/2019	-	-	-	**200**	-	-	-
6/12/2019	-	-	-	**300**	-	-	-
6/25/2019	-	-	-	**290**	-	-	-
7/1/2019	-	-	-	**380 F1**	-	-	-
10/16/2019	**130 E**	**140 E**	**8**	**620 E**	1.2	ND	**1000 E**
3/30/2020	**110 E**	**30**	1.7	**380**	2.3	ND	**5.3**

Notes:
1. – not sampled
2. ND – non-detect
3. *Sample for well HA-114 was collected on 11/2/2017
4. **Samples for wells HA-114 and MW-210 were collected on 5/3/2018
5. Values in **bold** exceed the ambient groundwater standard of 5 µg/L
6. F1 – MS and/or MSD Recovery is outside acceptance limits
7. E – Result exceeded calibration range

Overall, groundwater contaminant concentrations have continued to decrease since 2009. The PCE concentrations at MW-111I, HA-114, MW-210, MW-8B, and MW-6B increased in October 2019, compared to the May 2019 sampling activity, and decreased in March 2020. The concentrations in October 2019 were uncharacteristically high, but during the March 2020 sampling event

concentrations dropped to levels that appear to continue the decreasing trend previously established. The October 2019 rebound was likely due to matrix diffusion from remaining contamination in the bedrock.

MW-210 is the only downgradient well that has been monitored consistently on a semiannual basis since GWETS and SVE system startup. Historical results have indicated a seasonal fluctuation in PCE concentration, with a slight rise in concentration in the summer/fall seasons. Results from the samples collected from 2009 to 2020 were found to be within the range of past observations, except for the November 2016 concentration of 160 µg/L. This outlier can be attributed to the heterogeneity of the plume and bedrock fractures, and still indicates a decreasing trend in concentration.

A review of groundwater data collected during and since implementation of the RI, as summarized in Table 3.4, indicates that natural attenuation is likely occurring. Table 3.4 provides results for PCE and its daughter products trichloroethene, dichloroethenes (cis-, trans-, and 1,1- DCE) and vinyl chloride (VC). Based on results of groundwater sampling, some of the wells exhibit signs of natural attenuation via reductive dichlorination where PCE is reduced to TCE, then to DCE, then VC and eventually to ethene. The mechanism for natural attenuation may be tied to biological activity from the sewer (northwest side of building), where the bulk of the soil contamination was excavated during the remedial action source removal.

Methanol Extraction of Rock Chips (MERC) testing of rock core from MW-6B in 2013 indicated PCE concentrations as high as 48 mg/kg were present in the matrix of the shallow bedrock. Matrix diffusion will occur if there is a concentration gradient between the PCE-contaminated matrix and the groundwater-filled fracture. Based on other sites in which matrix diffusion has been demonstrated, it is likely that the diffusion process will continue for a period that extends beyond the lifetime of the existing GWETS at the Carriage Cleaners site. The ROD for the Carriage Cleaners site indicates that “operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible”. A technical argument can be made that ambient groundwater quality standards at Carriage Cleaners are not achievable to the extent practicable because of matrix diffusion.

To the extent practicable, attain air guidelines provided in the Guidance for Evaluating Soil Vapor Intrusion in the state of New York. There are seventeen offsite SSDS systems operating in residential homes to mitigate potential indoor air intrusion.

The goal of the SVE system is not related to vapor intrusion. Its purpose is to reduce PCE in soil to below unrestricted use SCOs, and this goal has been achieved. Based on November 2019 vapor sampling (Table 3.2), it is evident that the SVE system also reduces vapors in the sub slab of the building thus reducing potential indoor air impacts.

4.0 EVALUATION OF POTENTIAL SYSTEM MODIFICATIONS

This section presents recommendations for implementation of measures to 1) achieve remediation goals; 2) improve system performance; 3) improve sustainability; and 4) reduce operating costs.

4.1 EVALUATION OF OPTIONS TO ACHIEVE REMEDIATION GOALS

Soil vapor concentrations at the influent of the SVE system show a slight downward trend (Figure 3.4). In addition, soil sampling results from 2017 indicate contaminant reduction and achievement of the SCOs. Indoor air sampling at the dry cleaning facility during the rebound study indicates that mitigation is necessary to reduce PCE concentrations to below guidance values, however, indoor air concentrations are likely partially attributed to saturation of floors during years of dry cleaning operations. As PCE has not been used at the dry cleaner since its transfer to naphthalene in October 2018, an evaluation of the current potential sources of indoor contamination and/or SVI will be included in the RSO work plan.

The influent groundwater VOC concentration of the GWETS shows a downward trend (see influent groundwater concentration trendline, Figure 3.3). Linear regression of influent groundwater VOC concentrations over the eight years of operation shows that VOC concentrations are decreasing at a rate of approximately 0.0003 ppm (or 0.3 µg/L) per day. If VOC concentrations were to continue to decrease at this rate, it would take over 13 years to reach the 5 µg/L cleanup objective. In addition, contaminant mass from bedrock matrix is likely to continue to slowly diffuse into groundwater, prolonging the estimated treatment period even further.

4.1.1 Options for SVE System

The purpose of the SVE operating system at the Site is to decrease VOC concentrations in soil to a level that protects the potential migration into groundwater. These SCOs have been met.

The SVE system is currently operating and is capturing the volatilization of shallow PCE-contaminated groundwater and bedrock that exists below the site.

The SVE rebound study suggested that vapor concentrations were generally higher in the building's subslab area compared to the system's extraction depth, however, after resuming SVE

operations for a year and switching from PCE-based to naphthalene-based dry cleaning products, the vapor concentrations in the subslab also decreased.

Indoor air concentrations, although not measured in 2019, decreased in 2018 after the dry-cleaning facility stopped using PCE-based products. Thus, PCE concentrations in soil gas beneath the building could negatively impact indoor air quality.

The existing SVE system was not intended to be used as a vapor intrusion mitigation system and requires routine operation and monitoring. Therefore, given that impacted vapors are expected to continue to off-gas from groundwater and bedrock for years to come, and that there is likely residual PCE impacts in the building's floor from years of dry-cleaning operations, converting the SVE system to an SSDS is recommended for future vapor intrusion mitigation. An SSDS would have a much lower operating cost than the existing SVE system and would require less maintenance and monitoring. The required modifications to convert the existing SVE system to a SSDS system will be further detailed in the RSO work plan. Testing to confirm sufficient vacuum beneath the floor slab will also be detailed in the RSO work plan.

4.1.2 Options for GWETS

As previously discussed, the PCE groundwater concentration in the GWETS influent has exhibited a slight downward trend since the beginning of operations, however the groundwater concentrations remain above the ambient groundwater standard of 5 µg/l. The reported concentration of PCE in groundwater at the MW-210 located downgradient and off-site, however, decreased to below the 5 µg/l standard for the semi-annual sampling events in May 2018, November 2018, and May 2019. Since the ROI investigation in 2015 was inconclusive, the decrease in concentrations MW-210 is not necessarily indicative that the GWETS is achieving control of site groundwater, as was the purpose of the chosen remedy, but instead that natural attenuation has been occurring. The GWETS system is not expected to reduce on-site groundwater to below ambient groundwater concentrations in the near future.

The mechanism for the natural attenuation may be tied to biological activity from the sewer (northwest side of building), where the bulk of the soil contamination was excavated during the remedial action source removal. Testing for contaminant degrading bacteria (e.g., *Dehalococcoides*) in select site wells would first be necessary to properly understand the mechanisms responsible for the observed degradation (Note: MW-3 and EW-1 have shown breakdown of PCE to vc). If the natural bacteria can be enhanced, either through the introduction of complimentary bacteria or through a source of carbon, MNA could be a viable low-cost method to degrade in-situ the on-site plume. Besides a lower operating cost (requires monitoring which is already being performed), the relatively slow and persistent process by which degradation occurs would be beneficial for the reduction of any mass entrained in the bedrock matrix. MERC testing of rock core from MW-6B in 2013 indicated PCE concentrations as high as 48 mg/kg were present in the matrix of the shallow bedrock. Matrix diffusion will occur as long as there is a concentration gradient between the PCE-contaminated matrix and the groundwater-filled fracture. Based on other sites in which matrix diffusion has been demonstrated, it is likely that the diffusion process will continue for a period that extends beyond the lifetime of the existing GWETS at the Carriage Cleaners site.

The ROD for the Carriage Cleaners site indicates that "operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible". A technical argument can be made that ambient groundwater quality standards at Carriage Cleaners are not achievable to the extent practicable because of matrix diffusion.

The link below provides a list of sites that have applied for a Technical Impracticability (TI) waiver, many of which use matrix diffusion as the basis for the TI waiver:

https://semspub.epa.gov/work/HQ/175391.pdf

4.2 EVALUATION OF OPTIONS TO IMPROVE SYSTEM PERFORMANCE

4.2.1 Options for SVE System Performance

The overall performance of the SVE system is considered good. There is no treatment of the extracted vapor, therefore performance cannot be based on removal efficiency. However, the

system performs as expected in terms of flow from the various SVE wells and vacuum measurements in associated VMPs. There are no recommendations to improve performance of the existing SVE system as it has achieved its intended purpose.

4.2.2 Options for GWET System Performance

Previous activities that have taken place to improve performance of the GWETS included: well redevelopment, extraction pump replacement, flow meter bypass line, new flow meter, and recirculation of extracted groundwater to keep the well from running dry, which in turn causes stress on the extraction pump. The overall contaminant mass removal from the on-site groundwater plume is consistent, but relatively low compared to other GWET systems because the influent PCE concentrations are relatively low and the groundwater is extracted at a low rate. The pumping rate, however, cannot be increased without significant drawdown at the well which causes stress on the pump and scaling in the well.

The performance of the GWETS system in terms of percent contaminant removal is considered good, with an efficiency of over 99%. The continuous operation of the air stripper, however, requires weekly maintenance to maintain performance and prevent system shutdowns. Both effluent and influent groundwater concentrations meet the requirements for the discharge permit.

The GWETS consists of one recovery well, EW-1, which pumps on average about 0.5 gallons per minute (gpm). Due to the lack of interconnected shallow fractures, the specific capacity of EW-1 is low, and the effective radius of capture cannot be determined. A nearby shallow bedrock well, MW-8B, has similar concentrations to EW-1, but has exhibited a higher specific capacity, however, a recent collapsed within the borehole has made the well currently unusable. The high specific capacity suggests a greater lateral hydraulic connectiveness which would improve the effective radius of capture. The influent concentration of total VOCs captured by EW-1 have been fluctuating the past few years between 200 – 750 µg/L. Although the effluent from EW-1 is treated by an on-site air stripper to non-detect levels, the untreated extracted groundwater already meets the sewer discharge concentration criteria of 2.13 mg/L for the summation of purgeable aromatics and halocarbons, which is determined by the County of Monroe, New York.

As part of an ongoing groundwater containment pilot test, bedrock groundwater monitoring well

MW-8B is currently being evaluated as a potential replacement for EW-1 as an extraction well due to its similar VOC concentrations and higher specific capacity. However, on July 11, 2019 during attempts to sample MW-8B the sampling technician found the well pump to be irretrievable; upon video inspection it was concluded that the rock in the borehole had partially collapsed around the pump, preventing its retrieval. The rock failure was determined to have occurred at a depth of approximately 18 feet (the well was installed to 31 feet).Pilot test sampling at this location has been discontinued as an option to increase the GWETS performance.

As the GWETS is not achieving hydraulic control of the site groundwater, and the on-site groundwater concentrations are not expected to reduce to below ambient groundwater concentrations in the near future, upon the request of the NYSDEC, the GWETS was shut down in September 2020.

4.3 EVALUATION OF OPTIONS TO IMPROVE SUSTAINABILITY

As previously discussed, the SVE system and GWETS do not generate waste streams that require disposal, and do not consume a significant amount of natural resources such as water or natural gas. The system components do, however, operate on a continuous basis, which in turn requires a significant amount of electricity to operate the major pieces of equipment such as the SVE blower and the GWETS air stripper.

Some of the recommendations stated above could also improve sustainability:

- Converting the SVE to an SSDS would greatly reduce the electricity used by the blower.
- Shutting down the GWETS (implemented in September 2020) will save energy by eliminating the use of the air stripper.
- The alternative remedies require less maintenance than the existing systems which would reduce vehicular emissions.

4.4 RECOMMENDATIONS TO REDUCE COSTS

Measures have been taken to reduce costs of system OM&M costs. These measures include removal of the activated carbon vessels, elimination of Groundwater & Environmental Services, Inc's monthly OM&M reports, and reducing the frequency of photoionization detector and

groundwater elevation readings to monthly. Additional cost reductions could be achieved by implementing the recommendations previously mentioned, namely:

- The recommended alternative remedies would reduce electricity consumption and associated costs
- The recommended alternative remedies require less maintenance than the existing systems, reducing the frequency of site visits and associated costs.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Review of existing systems operational data as well as soil, soil gas, and groundwater data, result in the following conclusions:

1. The SVE system has operated as designed. The existing SVE system is recommended to be converted to a SSDS.
2. Hydraulic containment of site groundwater through the operation of the GWETS was not achieved and the GWETS was shut down in September 2020.
3. VOC concentrations in the SVE and GWETS influent have exhibited a downward trend.
4. Soil contaminant concentrations in the SVE area have decreased to below the SCO for unrestricted use.
5. On-site groundwater concentrations in the vicinity of extraction well EW-1 remain elevated; evidence of hydraulic connectivity between the monitoring wells and the extraction well has not been identified, and therefore the extent of hydraulic containment cannot be determined.
6. The groundwater is not being used as a drinking water source and based on the low VOC concentrations observed at MW-210 below 5 µg/L, impacts to downgradient VI have been reduced.
7. The primary cost components of system operation are electricity to operate the systems continuously and labor to conduct weekly site visits.

To decrease future OM&M costs while maintaining conformance with the remedial objectives of the site, the following recommendations are proposed:

1. Convert the existing SVE system to an SSDS.
2. Sample for the presence of contaminant degrading bacteria in groundwater and other indicating parameters of MNA such as ethenes.
3. Depending on the results of recommendation No. 2 above, proceed with a pilot study to test MNA or Enhanced MNA as a viable method to reduce the concentration of the onsite groundwater VOC plume.

6.0 REFERENCES

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Table 3.4

GW Wells - Multiple Parameters

Date		Sampling Location																	
Semi-Annual Sampling	System Sampling	EW-1 / Influent						MW-111I						HA-114					
		PCE	TCE	cis-DCE	trans-DCE	1,1-DCE	VC	PCE	TCE	cis-DCE	trans-DCE	1,1-DCE	VC	PCE	TCE	cis-DCE	trans-DCE	1,1-DCE	VC
Jan-09	NA	-	-	-	-	-	-	240	140	920	7	-	110	-	-	-	-	-	-
Dec-12	Dec-12	560	100	160	ND	ND	ND	-	-	-	-	-	-	31	15	31	ND	ND	10
2/14/2013	2/15/2013	400	66	ND	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-	-
10/10/2013	10/22/2013	960	280	ND	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-	-
4/4/2014	4/15/2019	190	27	ND	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-	-
12/17/2014	12/23/2014	400	67	ND	ND	ND	1.9	83	9.7	110	ND	ND	24	13	2.2	8.5	ND	ND	2.1
5/26/2015	5/19/2015	590	59	ND	ND	ND	ND	96	13	44	ND	ND	21	55	10	23	ND	ND	3.5
8/25/2015	8/13/2015	660	83	ND	ND	ND	6.2	150	38	130 E	0.96	ND	34	76	15	29	ND	ND	4.1
4/25/2016	4/13/2016	430	35	ND	ND	ND	ND	200	21	46	ND	ND	6.5	6.3	0.97	4.4	ND	ND	1.9
11/9/2016	10/28/2016	150	39	ND	ND	ND	4.2	290	110 E	260 E	1.6	0.5	81	19	6.2	160	ND	ND	46
5/10/2017	5/17/2017	320	21	ND	ND	ND	ND	190	28	66	ND	ND	7.3	2.8	2.9	32	ND	ND	5
11/1/17*	11/15/2017	190	19	ND	ND	ND	ND	92	18	77	ND	ND	14	10	1.8	14	ND	ND	2.1
5/2/2018**	5/9/2018	330	17	ND	ND	ND	ND	170	33	75	ND	ND	20	42	6.7	14	ND	ND	ND
11/14/2018	11/14/2018	420	66	ND	ND	ND	ND	44	0.79	ND	ND	ND	ND	60	11	16	ND	ND	0.98
5/1/2019	5/15/2019	200	13	ND	ND	13	ND	49	7.9	39	ND	ND	12	30	5.7	12	ND	ND	ND
10/16/2019	10/15/2019	600	100	140	ND	ND	ND	100	38	140	ND	ND	51	140	30	41	ND	ND	5.8
3/30/2020	3/11/2020	120	8.6	8	ND	ND	ND	88	12	69	ND	ND	18	30	5.9	12	ND	ND	ND

Notes:
1. Results are in micrograms per liter (µg/l)
2. ND = not detected above the laboratory reporting limit
3. "-" = not tested
4. PCE = tetracloroethene
5. TCE = trichloroethene
6. DCE = dichloroethene
7. VC = vinyl chloride

Prepared by JDW on 11/21/2019
Checked by LES 11/10/2020

Date		Sampling Location											
Semi-Annual Sampling	System Sampling	MW-210						MW-8B					
		PCE	TCE	cis-DCE	trans-DCE	1,1-DCE	VC	PCE	TCE	cis-DCE	trans-DCE	1,1-DCE	VC
Jan-09	NA	230						-	-	-	-	-	-
Dec-12	Dec-12	-	-	-	-	-	-	-	-	-	-	-	-
2/14/2013	2/15/2013	4.3	0.96	2.2	ND	ND	ND	-	-	-	-	-	-
10/10/2013	10/22/2013	5.1	1.5	3.1	ND	ND	1.4	-	-	-	-	-	-
4/4/2014	4/15/2019	2.6	0.71	1.7	ND	ND	ND	-	-	-	-	-	-
12/17/2014	12/23/2014	3.5	1.1	2.6	ND	ND	ND	-	-	-	-	-	-
5/26/2015	5/19/2015	1.8	0.57	0.99	ND	ND	ND	620					
8/25/2015	8/13/2015	2.8	0.68	1.1	ND	ND	ND	810	13	21	ND	ND	ND
4/25/2016	4/13/2016	1.1	ND	ND	ND	ND	ND	450	11	15	ND	ND	ND
11/9/2016	10/28/2016	160	36	33	ND	ND	1	380	28	50	ND	ND	ND
5/10/2017	5/17/2017	7.5	2.2	1.8	ND	ND	ND	140	16	12	ND	ND	ND
11/1/17*	11/15/2017	5.6	1.7	1.4	ND	ND	ND	490	17	27	ND	ND	ND
5/2/2018**	5/9/2018	2.6	0.79	ND	ND	ND	ND	480	19	21	ND	ND	ND
11/14/2018	11/14/2018	3.7	1.9	1.5	ND	ND	ND	380	7	7.5	ND	ND	ND
5/1/2019	5/15/2019	1.2	0.49	ND	ND	ND	ND	290	12	16	ND	ND	ND
10/16/2019	10/15/2019	8	8.7	45	ND	ND	3	640	46	64	ND	ND	ND
3/30/2020	3/11/2020	1.7	0.69	ND	ND	ND	ND	380	19	25	ND	ND	ND

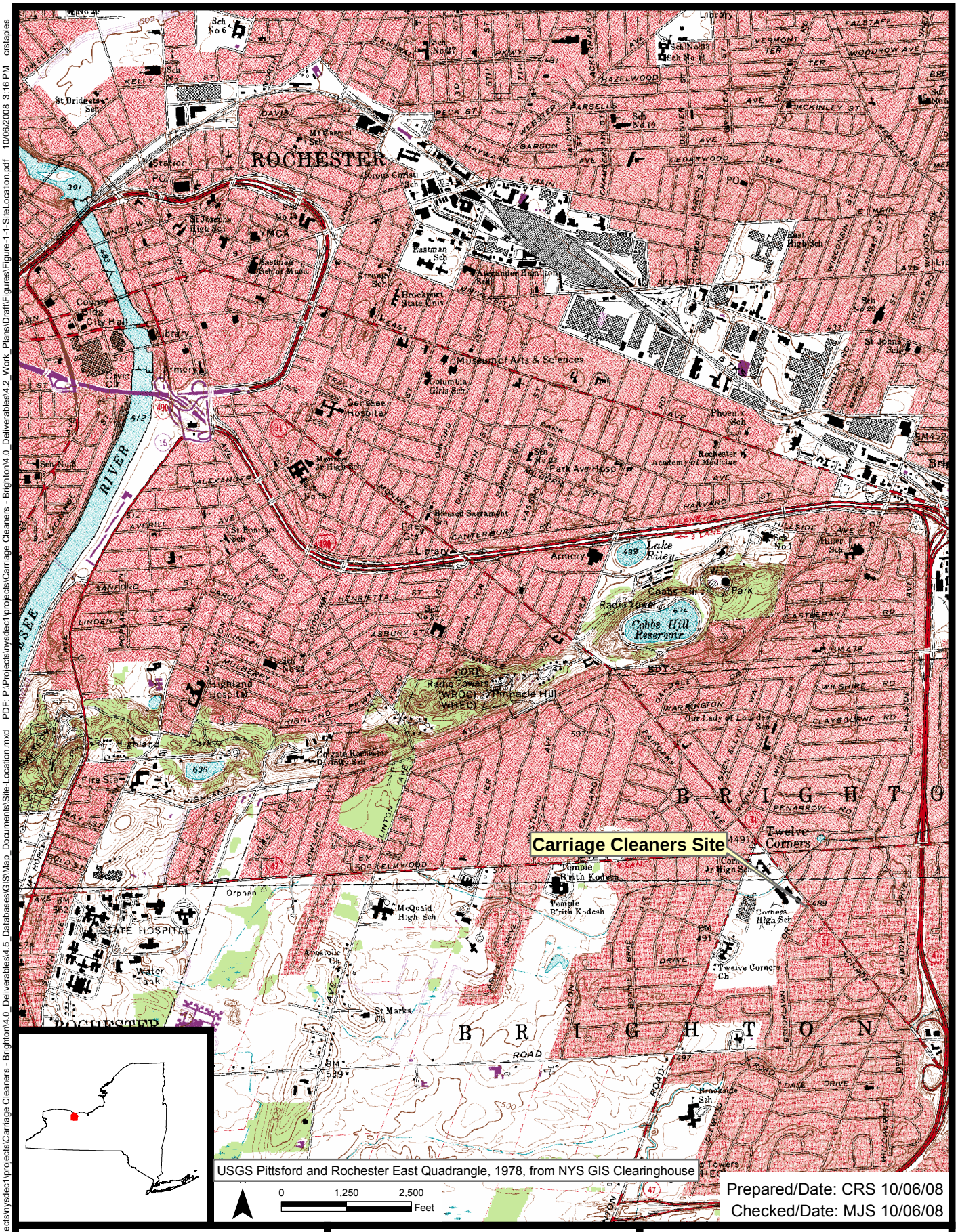
Notes:
1. Results are in micrograms per liter (µg/l)
2. ND = not detected above the laboratory reporting limit
3. "-" = not tested
4. PCE = tetracloroethene
5. TCE = trichloroethene
6. DCE = dichloroethene
7. VC = vinyl chloride

Date		Sampling Location											
Semi-Annual Sampling	System Sampling	MW-9						MW-9B					
		PCE	TCE	cis-DCE	trans-DCE	1,1-DCE	VC	PCE	TCE	cis-DCE	trans-DCE	1,1-DCE	VC
Jan-09	NA	-	-	-	-	-	-	-	-	-	-	-	-
Dec-12	Dec-12	-	-	-	-	-	-	-	-	-	-	-	-
2/14/2013	2/15/2013	-	-	-	-	-	-	-	-	-	-	-	-
10/10/2013	10/22/2013	-	-	-	-	-	-	-	-	-	-	-	-
4/4/2014	4/15/2019	-	-	-	-	-	-	-	-	-	-	-	-
12/17/2014	12/23/2014	-	-	-	-	-	-	-	-	-	-	-	-
5/26/2015	5/19/2015	-	-	-	-	-	-	ND					
8/25/2015	8/13/2015	5.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4/25/2016	4/13/2016	1.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
11/9/2016	10/28/2016	3.9	ND	ND	ND	ND	ND	46	6.4	11	ND	ND	ND
5/10/2017	5/17/2017	1.7	ND	ND	ND	ND	ND	0.73	ND	ND	ND	ND	ND
11/1/17*	11/15/2017	5.19	ND	ND	ND	ND	ND	ND	0.68	1.2	ND	ND	ND
5/2/2018**	5/9/2018	0.94	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
11/14/2018	11/14/2018	ND	ND	ND	ND	ND	ND	6.5	ND	ND	ND	ND	ND
5/1/2019	5/15/2019	2.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
10/16/2019	10/15/2019	1.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3/30/2020	3/11/2020	2.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:
1. Results are in micrograms per liter (µg/l)
2. ND = not detected above the laboratory reporting limit
3. "-" = not tested
4. PCE = tetracloroethene
5. TCE = trichloroethene
6. DCE = dichloroethene
7. VC = vinyl chloride

Prepared by JDW on 11/21/2019
Checked by LES 11/10/2020

FIGURES



Prepared/Date: CRS 10/06/08
Checked/Date: MJS 10/06/08

NYSDEC
Carriage Cleaners Site
Brighton, NY

MACTEC

Site Location
Project 3612112223
Figure 1.1

Document: P:\Projects\nysdec1\projects\Carriage Cleaners - Brighton\4.0_Deliverables\4.5_Databases\GIS\Map_Documents\Site-Location.mxd PDF: P:\Projects\nysdec1\projects\Carriage Cleaners - Brighton\4.0_Deliverables\4.2_Work_Plans\Draft\Figures\Figure-1.1-SiteLocation.pdf 10/06/2008 3:16 PM cstaples

Prepared/Date: BRP 04/21/16
Checked/Date: SLB 04/21/16

NYSDEC
Carriage Cleaners Site
Brighton, NY

MACTEC

Site Layout

Project 3612112223 Figure 2.1

Document: P:\Projects|nysdec1\Contract D007619\Projects\Carriage Cleaners - SM\4.0_Deliverables\4.5_Databases\GIS\MapDocuments\SSDS_Status_2019_11x17LS.mxd PDF: P:\Projects|nysdec1\Contract D007619\Projects\Carriage Cleaners - SM\4.0_Deliverables\4.1_Reports\RSO_Supplemental\Figure 2.2 - SSDS Locations.pdf 09/25/2019 8:03 AM brian.peters

Legend

SSDS System in Place

N

0 40 80 Feet

Monroe County color digital orthoimagery (2015) obtained from New York State GIS Clearinghouse at: gis.ny.gov

Prepared/Date: BRP 09/25/19
Checked/Date: KC 09/25/19

NYSDEC Site # 828120
Carriage Cleaners Site
Brighton, NY

MACTEC

SSDS Locations

Project 3612112223 Figure 2.2

Prepared/Date: BRP 09/18/17
Checked/Date: SLB 09/18/17

NYSDEC
Carriage Cleaners Site
Brighton, NY

MACTEC

Vapor and Soil
Sampling Locations
Project 3612112223 Figure 2.3

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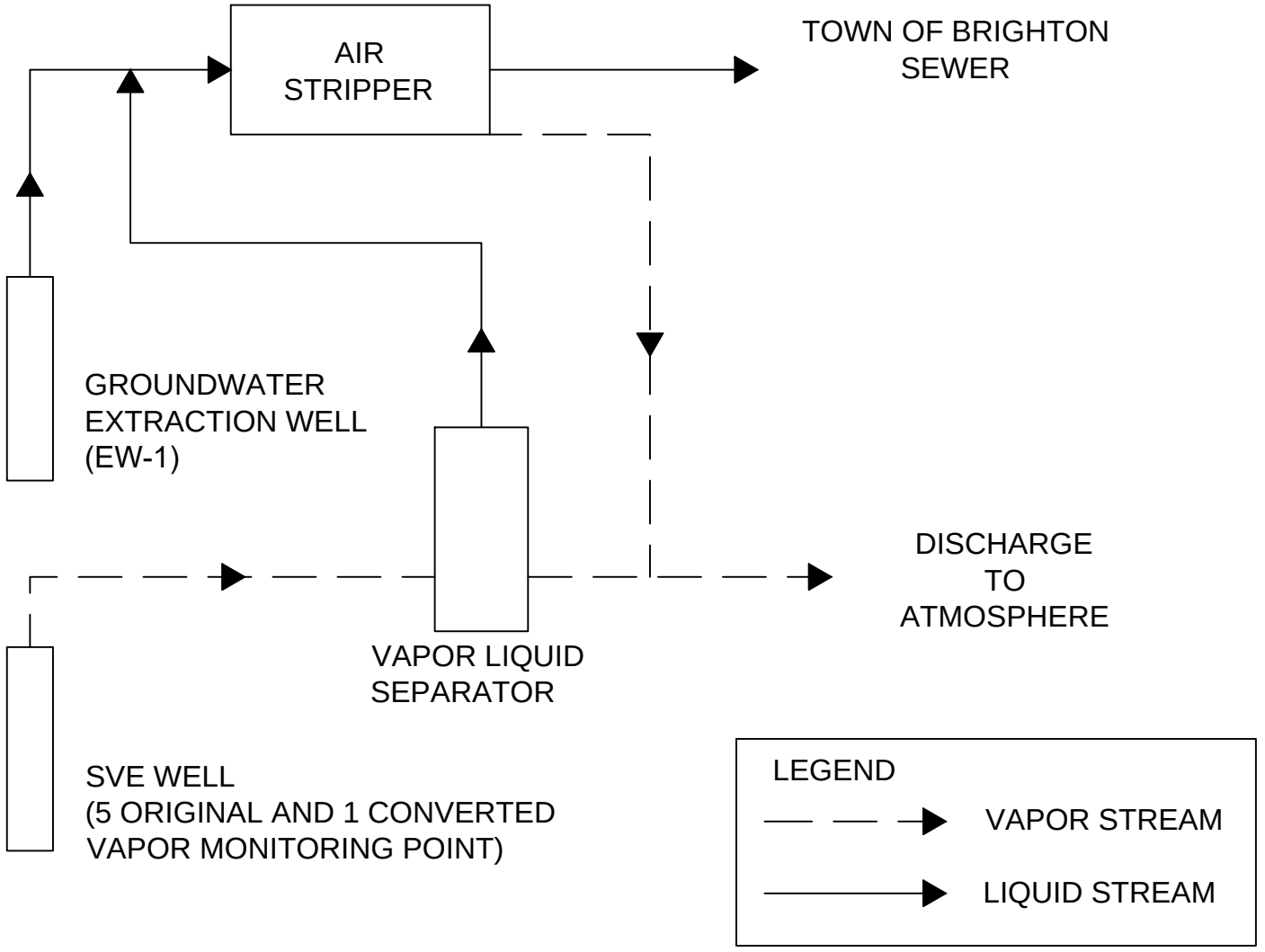
PDF: P:\Projects\nysdec1\Contract D007619\Projects\Carriage Cleaners - SM4.0_Deliverables\4.1_Reports\PRR (2017)\Figures\Figure 3 - Vapor and Soil Locations.pdf 09/18/2017 8:21 AM brian.peters



Prepared/Date: JMF 03/14/16
Checked/Date: SLB 03/14/16

NYSDEC
Carriage Cleaners Site
Brighton, New York

MACTEC

SVE and GWETS
Process Flow Diagram

Figure 2.4

APPENDIX A

MONROE COUNTY SEWER USE PERMIT

Department of **Environmental Services**

Monroe County, New York

Cheryl Dinolfo
County Executive

Michael J. Garland, P.E.
Director

October 22, 2019

Mr. David Chiusano
NYS DEC - Carriage Cleaners
625 Broadway, 12th Floor
Albany, NY 12233-7017

Re: Industrial Sewer Use Permit

Dear Mr. David Chiusano:

Attached you will find your Industrial Sewer Use Permit No . IWC-951, which will expire on October 31, 2019. Prior to expiration, we will mail you a renewal application .

Please refer to the Required Monitoring section of your permit . It will be the facility's responsibility to submit the required monitoring for the frequency listed .

If you have any questions regarding the permit, please call Sean Keenan at 585-753-7658.

CK # 496475

COUNTY OF MONROE
SEWER USE PERMIT RENEWAL

Firm Name:	NYS DEC - Carriage Cleaners 2101 MonroeAvenue	Permit Number: Fee: Expires:	IWC-951 $ 75.00 October 31, 2022
Mailing Addr:	625 Broadway, 12th Floor Albany, NY 12233-7017	W/C Expire: District No:	7/1/2020 8574
Business Type:	Pretreatment		

Has there been any revision to the plant sewer system or any change in industrial wastes discharged to the public sewer in the past twelve months

Yes: __ No: ✓ If yes, please explain in a separate letter.

Appox. monthly trend of groundwater discharged 8/18 → 8/19 - 29,000 gallons/month

Average monthly consumption for the past twelve (12) months:

Water Account No.(s) _____ (cu ft/gal) N/A

In consideration of the granting of this renewal permit the undersigned agrees to comply with all the requirements in the Initial Permit as listed under II.

Name of person to be contacted for inspection & sampling purposes:

Type or Print: Thomas Palmer (GES) Phone No: (716) 866 3590

YOUR PERMIT MUST BE SIGNED AS FOLLOWS:

1 For a corporation, by a responsible corporate officer A corporate officer means
(a) A president, secretary, treasurer or vice - president of the corporation in charge of a principal business function, or any other person who performs similar policy - or decision - making functions for the corporation or
(b) The manager of one or more manufacturing, production, or operation facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second - quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures

2. For a partnership or sole proprietorship by a general partner or the proprietor, respectively, or

3 By a duly authorized representative of the individual designated in items (1) or (2) above if

(a) The authorization is made in writing by the individual described in items (1) or (2).
(b) The authorization specifies either an individual or a position having responsibility for the overall operation of the facility from which the Industrial Discharge originates such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company; (A duly authorized representative may thus be either a named individual or any individual occupying named position), and
(c) The written authorization is submitted to this Department

Print or Type: David J. Chiusano Phone No (518) 402-9813

Signature: _____ Date 09/24/19

Title: Env Eng/PM (NYSDEC - DER)

Renewal Approved by: _____ Issued this 25 day of OCT 20 19

Michael J. Garland, P.E.
Director of Environmental Services-PureWaters
Monroe County

COUNTY OF MONROE
SEWER USE PERMIT ENCLOSURE

NYS DEC- Carriage Cleaners
625 Broadway, 12th Floor
Albany, NY 12233-7017

PERMIT NUMBER: 951
DISTRICT NUMBER: 8574

TYPE OF BUSINESS: Groundwater Remediation
LOCATION: 2101 Monroe Ave
Brighton, NY

SAMPLE POINT: IWC-951.1 – Sample Port on Treatment System

REQUIRED MONITORING & EFFLUENT LIMITS

SAMPLE POINT: IWC-951.1 – Sample Port on Treatment System

SELF-MONITORING FREQUENCY: **MONTHLY**

SAMPLING PROTOCOL: Sampling and analysis shall be performed in accordance with the techniques prescribed in 40CFR part 136 and amendments thereto. A grab sample, collected from the above noted sample point shall be analyzed for the following:

Parameter	Sewer Use Limit	Action Level
Purgeable Aromatics		2.13 mg/L*
Purgeable Halocarbons		2.13 mg/L*
Methyl tert-butyl ether	(monitor only)	

*The summation of the purgeable aromatics and purgeable halocarbons with detection levels greater than 10µg/l shall not exceed 2.13 mg/l.

SPECIAL CONDITIONS:

1. All groundwater must be treated regardless of the influent concentrations.
2. Monthly flow summaries shall be submitted for billing purposes.
3. If there is no discharge for a given month, then a letter must be submitted stating so.

TERMS AND CONDITIONS

GENERAL REQUIRMENTS:

A. The permittee agrees to accept and abide by all provisions of the Sewer Use Law of Monroe County (MCSUL) and of all pertinent rules or regulations now in force or shall be adopted in the future.

B. In addition to the parameters/limits outlined, the total facility discharge shall meet all other concentration values listed within the MCSUL and as described in Article III, Section 3.3(d) of the Law.

C. Included in Article II, Section 2.1 of the MCSUL, is the definition of "Normal Sewage". "Normal Sewage" may be discharged to the sewer system in excess of the concentrations outlined in the definition, however, the facility will be subject to the imposition of a sewer surcharge and possible self-monitoring requirements as a result. Surcharging procedures are outlined in Article X of the MCSUL.

D. Regulatory sampling for analytes not specified under "required monitoring" shall be conducted by Monroe County at a minimum frequency of once every three (3) years.

E. This permit is not assignable or transferable. The permit is issued to a specific user and location.

F. Per Article IX, section 9.9 of the MCSUL, a violation by the permittee of the permit conditions may be cause for revocation or suspension of the permit after a Hearing by the Administrative Board, or if the violation is found to be within the emergency powers of the Director under Section 9.6. The revocation is immediate upon receipt of notice to the Industrial User. If the revocation or suspension is issued under Section 9.6, a Hearing shall be held as soon as possible.

G. As provided under Article VI, Section 6.1 of the MCSUL, the Director and/or his duly authorized representatives shall gain entry on to private lands by permission or duly issued warrant for the purpose of inspection, observation, measurement sampling and testing in accordance with the provisions of this law and its implementing Rules and Regulations. The Director or his representatives shall not have authority to inquire into any processes used in any industrial operation beyond that information having a direct bearing on the kind and source of discharge to the sewers or the on-site facilities for waste treatment. While performing the necessary work on private lands, referred to above, the Director or his duly authorized representative shall observe all safety rules applicable to the premises as established by the owner and/or occupant.

H. All required monitoring shall be analyzed by a New York State Department of Health certified laboratory. All sampling and analysis must be performed in accordance with Title 40 Code of Federal Regulations Part 136.

I. The pH range for this permit is 5.0 – 12.0 su. This range is specifically permitted by the Director as allowed under Article III, Section 3.3(b) of the MCSUL. pH must be analyzed within 15 minutes of the time of collection as specified in 40 CFR, part 136.

J. Discharges of wax, fats, oil or grease shall not exceed 100 mg/l as imposed by the Director under Article III, Section 3.3 of the MCSUL.

SURCHARGE CONCENTRATIONS:

Concentration and/or characteristics of normal sewage:
"Normal Sewage" shall mean sewage, industrial wastes or other wastes, which when analyzed, show concentration values with the following characteristics based on daily maximum limits:

a. B. O. D.	300 mg/l
b. Total Suspended Solids	300 mg/l
c. Total Phosphorus, as P	10 mg/l

Annual average concentrations above normal sewage are subject to surcharge as defined in Article X, section 10.7 of the MCSUL.

DISCHARGE LIMITATIONS (SEWER USE LIMITS)

Permissible concentrations of toxic substances and/or substances the Department wishes to control:
The concentration in sewage of any of the following toxic substances and/or substances the Department wishes to control shall not exceed the concentration limits specified when discharged into the County Sewer System; metal pollutants are expressed as total metals in mg/l (ppm): the following pollutant limits are based on daily maximum values:

a. Antimony (Sb)	1.0 mg/l
b. Arsenic (As)	0.5 mg/l
c. Barium (Ba)	2.0 mg/l
d. Beryllium (Be)	5.0 mg/l
e. Cadmium (Cd)	1.0 mg/l
f. Chromium (Cr)	3.0 mg/l
g. Copper (Cu)	3.0 mg/l
h. Cyanide (CN)	1.0 mg/l
i. Iron (Fe)	5.0 mg/l
j. Lead (Pb)	1.0 mg/l
k. Manganese (Mn)	5.0 mg/l
l. Mercury (Hg)	0.05 mg/l
m. Nickel (Ni)	3.0 mg/l
n. Selenium (Se)	2.0 mg/l
o. Silver (Ag)	2.0 mg/l
p. Thallium (Tl)	1.0 mg/l
q. Zinc (Zn)	5.0 mg/l

REPORTING REQUIREMENTS:

A. Per the requirements of 40 CFR, Part 403.12, Significant Industrial Users must submit Periodic Reports on Continued Compliance to the Control Authority on a biannual (2/yr) basis. Deadline dates of submission for these reports will be August 15 and February 15, respectively.

B. Discharge monitoring reports shall be submitted to the Control Authority upon receipt from the permittee's testing laboratory. Reports submitted from industrial users identified as Significant Industrial Users (SIU) must be accompanied by a certification statement as required by 40 CFR part 403 and the MCSUL, Article VI, section 6.12.

C. Any Industrial User subject to the reporting requirements of the General Pretreatment Regulations shall maintain records of all information resulting from any monitoring activities required by 40 CFR, part 403.12 for a minimum of three (3) years. These records shall be available for inspection and copying by the Control Authority. This period of retention shall be extended during the course

of any unresolved litigation regarding the discharge of pollutants by the Industrial User or the operation of the POTW Pretreatment Program or when requested by the Director or the Regional Administrator.

D. Pursuant to Article VI, Section 6.10 (4) of the MCSUL and the reporting requirements of the Code of Federal Regulations 40 CFR part 403.12, if a permitted user elects to perform monitoring at compliance monitoring locations more often than required and uses approved laboratory procedures, the results of all such additional monitoring and any additional flow measurements shall be reported to the Director on a timely basis and shall be included in reports as outlined in the MCSUL section 6.10(1)-(4).

NOTIFICATION REQUIREMENTS:

A. Pursuant to Article VI, Section 6.10(5), the permittee shall notify the Department within 24 hours of becoming aware that discharge monitoring is in violation of any permit limit. This notification shall be directed to the Industrial Waste Section at 585-753-7600 Option 4. The User shall also repeat sampling and analysis for the analyte in non-compliance and submit the results of the repeat analysis to Monroe County within 30 days after becoming aware of the violation.

B. Notify the Director in writing when considering a revision to the plant sewer system or any change in industrial waste discharges to the public sewers. The later encompasses either an increase or decrease in average daily volume or strength of waste or new wastes.

C. Notify the Director immediately of any accident, negligence, breakdown of pretreatment equipment or other occurrence that occasions discharge to the public sewer of any waste or process waters not covered by this permit.

SLUG CONTROL

An Industrial User shall be required to report any/all slug discharges to the Monroe County sewer system by calling 585-753-7600 option 4. For the purpose of this permit enclosure, a slug discharge shall be identified as any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or a non-customary batch discharge. Following a review process, the Control Authority (Monroe County) shall determine the applicability of a facility slug control plan. If the Control Authority decides that a Slug Discharge Control Plan (SDCP) is needed, the plan shall contain, at a minimum, the following elements:

1. Description of discharge practices, including non-routine batch discharges.
2. Description of stored chemicals.
3. Procedures for immediately notifying the Control Authority of slug discharges, including any discharge that would violate a prohibition under 40 CFR 403.5 (b), with procedures for follow up written notification within five (5) days.
4. If necessary, procedures to prevent adverse impact from accidental spills, including, but not limited to, inspection and maintenance of storage areas, handling and transfer of materials, loading and unloading operations, control of plant site run-off, worker training, building of containment structures or equipment, measures for containing toxic organic pollutants (including solvents) and/or measures and equipment for emergency purposes.

SNC DEFINITION:

In accordance with 40 CFR 403.8 (f) (vii), an Industrial User is in significant noncompliance (SNC) if its violations meet one or more of the following criteria:

A. Chronic violations of wastewater discharge limits – defined as those which 66% or more of all the measurements taken during a six-month period exceed (by any magnitude) the daily maximum limit or the average limit for the same pollutant parameter (ref. Article IX, section 9.19 – MCSUL). This criteria does NOT apply to the following Monroe County surchargeable parameters: Biochemical Oxygen Demand, Total Suspended Solids, Chlorine Demand and Total Phosphorus.

B. Technical review criteria (TRC) violations – defined as those in which 33% or more of all the measurements for each pollutant parameter taken during a six month period equal or exceed the product of the daily maximum limit or the average limit times the applicable TRC (ref. Article IX, section 9.19 – MCSUL). This criteria does NOT apply to the following Monroe County surchargeable parameters: Biochemical Oxygen Demand, Total Suspended Solids, Chlorine Demand and Total Phosphorus.

C. Any other violation of a pretreatment effluent limit (daily maximum or longer-term average) that the Control Authority determines has caused, alone or in combination with other discharges, interference or pass-through (including endangering the health or POTW personnel or the general public).

D. Any discharge of a pollutant that has caused imminent endangerment to human health, welfare or the environment or has resulted in the POTW's exercise of its emergency authority under paragraph (t)(1)(vi)(8) of 40 CFR part 403 to prevent such a discharge.

E. Failure to meet, within 90 days after the scheduled date, a compliance schedule milestone contained in a local control mechanism or enforcement order, for starting construction, completing construction or attaining final compliance.

F. Failure to provide, within 30 days after the due date, required reports such as BMRs, 90 day compliance reports, periodic reports on continued compliance.

G. Failure to accurately report noncompliance.

H. Any other violation or group of violations that the Control Authority determines will adversely affect the operation and implementation of the local Pretreatment Program.

PENALTIES

Should the facility be considered in Significant Non-Compliance (SNC), based on the above mentioned criteria, the minimum enforcement response by Monroe County will be the publication of the company name in the Gannett Rochester newspaper. The company will be published as an Industrial User in Significant Non-Compliance (SNC). Fines and criminal penalties may follow this publication (ref. Article IX – MCSUL).

Nothing in this permit shall be construed to relieve the permittees from civil/criminal penalties for noncompliance under Article IX, Section 9.7(a)(5) MCSUL. Article IX provides that any person who violates a permit condition is subject to a civil penalty not to exceed $25,000 for any one case and an additional penalty not to exceed $25,000 for each day of continued violation.

ACORD®

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 09/12/2019

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME: Jane Begreen	
Insurance Solutions & Services, Inc. 619 Amboy Avenue Edison NJ 08837	PHONE (A/C, No, Ext): (732) 738-6080	FAX (A/C, No): (732) 738-6081
	E-MAIL ADDRESS: jbegreen@issi-nj.com	
	INSURER(S) AFFORDING COVERAGE	NAIC #
	INSURER A : Great Divide Insurance Company	25224
INSURED Groundwater & Environmental Services, Inc. 415 Lawrence Bell Blvd, Suite Williamsville NY 14221	INSURER B :	
	INSURER C :	
	INSURER D :	
	INSURER E :	
	INSURER F :	

COVERAGES **CERTIFICATE NUMBER:** CL1961800740 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	COMMERCIAL GENERAL LIABILITY						EACH OCCURRENCE	$
	☐ CLAIMS-MADE ☐ OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	$
							MED EXP (Any one person)	$
							PERSONAL & ADV INJURY	$
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$
	☐ POLICY ☐ PRO-JECT ☐ LOC						PRODUCTS - COMP/OP AGG	$
	OTHER:						Employee Benefits	$
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	$
	☐ ANY AUTO						BODILY INJURY (Per person)	$
	☐ OWNED AUTOS ONLY ☐ SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	☐ HIRED AUTOS ONLY ☐ NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	$
							Medical payments	$
	☐ UMBRELLA LIAB ☐ OCCUR						EACH OCCURRENCE	$
	☐ EXCESS LIAB ☐ CLAIMS-MADE						AGGREGATE	$
	☐ DED ☐ RETENTION $ 0							$
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) Y/N: N If yes, describe under DESCRIPTION OF OPERATIONS below	N/A		WCA2022992	07/01/2019	07/01/2020	☒ PER STATUTE ☐ OTH-ER	
							E.L. EACH ACCIDENT	$ 1,000,000
							E.L. DISEASE - EA EMPLOYEE	$ 1,000,000
							E.L. DISEASE - POLICY LIMIT	$ 1,000,000
					0			

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

CERTIFICATE HOLDER

Monroe County Department of Environmental Services
145 Paul Road, Building 1
Rochester NY 14624

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

STATE OF NEW YORK
WORKERS' COMPENSATION BOARD

CERTIFICATE OF NYS WORKERS' COMPENSATION INSURANCE COVERAGE

1a. Legal Name & Address of Insured (Use street address only) Groundwater & Environmental Services, Inc. 5 Technology Place Suite 4 East Syracuse, NY 13057 **NYC TRACKING CODE 601456** **Work Location of Insured** ***(Only required if coverage is specifically limited to certain locations in New York State, i.e., a Wrap-Up Policy)***	**1b. Business Telephone Number of Insured** 800-220-3068 **1c. NYS Unemployment Insurance Employer Registration Number of Insured** 83-51399 **1d. Federal Employer Identification Number of Insured or Social Security Number** 23-2335424
2. Name and Address of the Entity Requesting Proof of Coverage (Entity Being Listed as the Certificate Holder) **Monroe County Department of Environmental Services** **Industrial Waste Section** **145 Paul Road, Bldg.1** **Rochester, NY 14624**	**3a. Name of Insurance Carrier** Great Divide Insurance Company **3b. Policy Number of entity listed in box "1a"** WCA202299212 **3c. Policy effective period** 7/1/2019 to 7/1/2020 **3d. The Proprietor, Partners or Executive Officers are** ☒ **included.** **(Only check box if all partners/officers included)** ☐ **all excluded or certain partners/officers excluded.**

This certifies that the insurance carrier indicated above in box "3" insures the business referenced above in box "1a" for workers' compensation under the New York State Workers' Compensation Law. **(To use this form, New York (NY) must be listed under Item 3A on the INFORMATION PAGE of the workers' compensation insurance policy).** The Insurance Carrier or its licensed agent will send this Certificate of Insurance to the entity listed above as the certificate holder in box "2".

The Insurance Carrier will also notify the above certificate holder within 10 days IF a policy is canceled due to nonpayment of premiums or within 30 days IF there are reasons other than nonpayment of premiums that cancel the policy or eliminate the insured from the coverage indicated on this Certificate. (These notices may be sent by regular mail.) ***Otherwise, this Certificate is valid for one year after this form is approved by the insurance carrier or its licensed agent, or until the policy expiration date listed in box "3c", whichever is earlier.***

Please Note: Upon the cancellation of the workers' compensation policy indicated on this form, if the business continues to be named on a permit, license or contract issued by a certificate holder, the business must provide that certificate holder with a new Certificate of Workers' Compensation Coverage or other authorized proof that the business is complying with the mandatory coverage requirements of the New York State Workers' Compensation Law.

Under penalty of perjury, I certify that I am an authorized representative or licensed agent of the insurance carrier referenced above and that the named insured has the coverage as depicted on this form.

Approved by: Insurance Solutions & Services, Inc.
(Print name of authorized representative or licensed agent of insurance carrier)

Approved by: Frank G Jacobs 9/12/2019
(Signature) (Date)

Title: Frank G. Jacobs, President

Telephone Number of authorized representative or licensed agent of insurance carrier: (732) 738-6080

Please Note: *Only insurance carriers and their licensed agents are authorized to issue Form C-105.2. Insurance brokers are* ***NOT*** *authorized to issue it.*

NEW YORK STATE | Workers' Compensation Board

CERTIFICATE OF INSURANCE COVERAGE

DISABILITY AND PAID FAMILY LEAVE BENEFITS LAW

PART 1. To be completed by Disability and Paid Family Leave Benefits Carrier or Licensed Insurance Agent of that Carrier

1a. Legal Name & Address of Insured (use street address only)

GROUNDWATER & ENVIRONMENTAL SERVICES INC.
5 TECHNOLOGY PLACE SUITE 4
EAST SYRACUSE, NY 13057

Work Location of Insured *(Only required if coverage is specifically limited to certain locations in New York State, i.e., Wrap-Up Policy)*

1b. Business Telephone Number of Insured

800-220-3068

1c. Federal Employer Identification Number of Insured or Social Security Number

232335424

2. Name and Address of Entity Requesting Proof of Coverage (Entity Being Listed as the Certificate Holder)

Monroe County Department of Environmental Services
Industrial Waste Section
145 Paul Road, Bldg.1
Rochester, NY 14624

3a Name of Insurance Carrier

HARTFORD LIFE AND ACCIDENT

3b Policy Number of Entity Listed in Box "1a"

LNY324265

3c Policy effective period

01-01-2019 to 12-31-2019

4. Policy provides the following benefits:

- [x] A. Both disability and paid family leave benefits.
- [ ] B. Disability benefits only.
- [ ] C. Paid family leave benefits only.

5. Policy covers:

- [x] A. All of the employer's employees eligible under the NYS Disability and Paid Family Leave Benefits Law.
- [ ] B. Only the following class or classes of employer's employees:

Under penalty of perjury, I certify that I am an authorized representative or licensed agent of the insurance carrier referenced above and that the named insured has NYS Disability and/or Paid Family Leave Benefits insurance coverage as described above.

Date Signed 01-03-2019 *Elizabeth Tello*

(Signature of insurance carrier's authorized representative or NYS Licensed Insurance Agent of that insurance carrier)

Telephone Number (212) 553-8074 **Name and Title**: Elizabeth Tello – Assistant Director, Statutory Services

IMPORTANT: If Boxes 4A and 5A are checked, and this form is signed by the insurance carrier's authorized representative or NYS Licensed Insurance Agent of that carrier, this certificate is COMPLETE. Mail it directly to the certificate holder.

If Box 4B, 4C or 5B is checked, this certificate is NOT COMPLETE for purposes of Section 220, Subd. 8 of the NYS Disability and Paid Family Leave Benefits Law. It must be mailed for completion to the Workers' Compensation Board, Plans Acceptance Unit, PO Box 5200, Binghamton, NY 13902-5200.

PART 2. To be completed by the NYS Workers' Compensation Board (Only if Box 4C or 5B of Part 1 has been checked)

State of New York
Workers' Compensation Board

According to information maintained by the NYS Workers' Compensation Board, the above-named employer has complied with the NYS Disability and Paid Family Leave Benefits Law with respect to all of his/her employees.

Date Signed **By**

(Signature of Authorized NYS Workers' Compensation Board Employee)

Telephone Number **Name and Title**

Please Note: Only insurance carriers licensed to write NYS disability and paid family leave benefits insurance policies and NYS licensed insurance agents of those insurance carriers are authorized to issue Form DB-120.1. Insurance brokers are NOT authorized to issue this form.

APPENDIX B

RECORD OF DECISION

Department of Environmental Conservation

Division of Environmental Remediation

Record of Decision

Carriage Cleaners - Brighton Site
Town of Brighton, Monroe County, New York
Site Number 8-28-120

March 2008

New York State Department of Environmental Conservation
DAVID A. PATERSON, *Governor* ALEXANDER B. GRANNIS, *Commissioner*

DECLARATION STATEMENT - RECORD OF DECISION

Carriage Cleaners - Brighton Inactive Hazardous Waste Disposal Site
Town of Brighton, Monroe County, New York
Site No. 8-28-120

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedy for the Carriage Cleaners - Brighton site, a Class 2 inactive hazardous waste disposal site. The selected remedial program was chosen in accordance with the New York State Environmental Conservation Law and is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300), as amended.

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (the Department) for the Carriage Cleaners - Brighton inactive hazardous waste disposal site, and the public's input to the Proposed Remedial Action Plan (PRAP) presented by the Department. A listing of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Assessment of the Site

Actual or threatened releases of hazardous waste constituents from this site, if not addressed by implementing the response action selected in this ROD, presents a current or potential significant threat to public health and/or the environment.

Description of Selected Remedy

Based on the results of the Remedial Investigation and Feasibility Study (RI/FS) for the Carriage Cleaners - Brighton site and the criteria identified for evaluation of alternatives, the Department has selected excavation to remove contaminated soil from the site and to treat residual soil and groundwater contamination with the installation and operation of an on-site soil vapor extraction system and groundwater extraction system along with the continued operation of the existing off-site sub-slab depressurization systems and periodic vapor intrusion monitoring. The components of the remedy are as follows:

1. A remedial design program will be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program. Prior to remedial design, pre-design sampling of soil and soil vapor would be undertaken adjacent to the Carriage Cleaners building to refine any areas with high concentrations of VOCs. Additionally, pilot studies/tests will be performed for both the soil vapor and the groundwater extraction systems to optimize the system designs.

2. Excavation of contaminated soil will occur in accessible portions of the site. Excavation areas will remove, to the extent practicable, soil exhibiting concentrations of PCE greater than soil cleanup objectives for unrestricted use (1.3 ppm). It is estimated that approximately 83 cubic yards of soil ranging to a depth of 15 ft below grade exhibiting concentrations in excess of the soil cleanup objective for PCE (Figure 8). Site characteristics, including the presence of underground utilities and the building location relative to adjacent roadways represent physical limitations to the extent of excavation that will be feasible at the site. Following removal of the contaminated soil, the excavation will be backfilled with material from an approved source and a membrane will be placed in the excavation to separate soil left in place from clean fill material used as backfill. During the excavation of contaminated soil, the PCE AST located in the alleyway will be removed from the site and properly disposed of. Additionally, the floor drains located within the Carriage Cleaners building will be closed to prevent the possible discharge of dry cleaning contaminants to the storm and sanitary sewers.

3. Soil vapor extraction wells will be installed in the area below ground surface but above the water table (Figure 8 illustrates the areas where soil vapor extraction will occur under Alternative 2). At the Carriage Cleaners site, this zone extends to a depth of approximately 7 to 8 feet below ground surface. If necessary, the contaminated air from the extraction wells will then go through an activated carbon treatment system to remove the volatile contaminants before the air is discharged to the ambient air.

4. The groundwater extraction system will consist of an extraction well/wells installed to collect on-site bedrock groundwater. The recovery well/wells will be designed to optimize the extraction of contaminated groundwater from the Carriage Cleaners site and to prevent the continued off-site migration of contaminants from the site (Figure 8). Disposal of extracted groundwater will be to the municipal sewer system. It is not anticipated that pre-treatment of recovered groundwater will be required prior to disposal.

5. Institutional controls in the form of environmental easements will be used to impose land use restrictions and groundwater use restrictions at the site. Specifically, the environmental easements will require: (a) limiting the use and development of the property to commercial use (which the property is currently zoned), which will also permit industrial use; (b) land use restrictions will require proper worker protections during construction or excavation activities that would potentially cause a worker to contact contaminated soil, groundwater or soil vapor; (c) compliance with the approved site management plan; (d) groundwater use restrictions will preclude the use of groundwater at the Site without prior notification and approval from NYSDEC; (e) restrictions related to soil, groundwater, and soil vapor will be implemented on the site property; and (f) the property owner to complete and submit to the Department a periodic certification of institutional and engineering controls.

6. Development of a site management plan which will include the following institutional and engineering controls: (a) management of site excavation activities to ensure that excavated soil will be tested, properly handled to protect the health and safety of workers and the nearby community, and will be properly managed in a manner acceptable to the Department; (b) continued evaluation of the potential for vapor intrusion for any buildings developed on the site, including provision for mitigation of any impacts identified; (c) continued operation and periodic evaluation of the sub-slab

depressurization systems at the site (2111 Monroe Avenue) and at off-site properties; (d) monitoring of groundwater and soil vapor; (e) identification of any use restrictions on the site; and (f) provisions for the continued proper operation and maintenance of the components of the remedy.

7. The property owner will provide a periodic certification of institutional and engineering controls, prepared and submitted by a professional engineer or such other expert acceptable to the Department, until the Department notifies the property owner in writing that this certification is no longer needed. An environmental easement which will trigger periodic certifications can only be amended or extinguished by the Commissioner. This submittal will: (a) contain certification that the institutional controls and engineering controls put in place are still in place and are either unchanged from the previous certification or are compliant with Department-approved modifications; (b) allow the Department access to the site; and (c) state that nothing has occurred that will impair the ability of the control to protect public health or the environment, or constitute a violation or failure to comply with the site management plan unless otherwise approved by the Department.

8. The operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible.

9. Since the remedy results in untreated hazardous waste remaining at the site, a long-term monitoring program will be instituted. This program will allow the effectiveness of the soil vapor and groundwater extraction systems to be monitored and will be a component of the long-term management for the site. The groundwater samples will be analyzed for volatile organic compounds and natural attenuation parameters. The long-term monitoring will also include continued soil vapor intrusion monitoring along with continued operation and periodic evaluation of existing sub-slab depressurization systems at off-site properties.

New York State Department of Health Acceptance

The New York State Department of Health (NYSDOH) concurs that the remedy selected for this site is protective of human health.

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

MAR 3 1 2008

Date

Dale A. Desnoyers, Director
Division of Environmental Remediation

TABLE OF CONTENTS

SECTION **PAGE**

1: SUMMARY OF THE RECORD OF DECISION 1

2: SITE LOCATION AND DESCRIPTION 1

3: SITE HISTORY 2
- 3.1: Operational/Disposal History 2
- 3.2: Remedial History 3

4: ENFORCEMENT STATUS 4

5: SITE CONTAMINATION 4
- 5.1: Summary of the Remedial Investigation 4
- 5.2: Interim Remedial Measures 10
- 5.3: Summary of Human Exposure Pathways: 10
- 5.4: Summary of Environmental Assessment 11

6: SUMMARY OF THE REMEDIATION GOALS 12

7: SUMMARY OF THE EVALUATION OF ALTERNATIVES 12
- 7.1: Description of Remedial Alternatives 13
- 7.2 Evaluation of Remedial Alternatives 16

8: SUMMARY OF THE SELECTED REMEDY 17

9: HIGHLIGHTS OF THE COMMUNITY PARTICIPATION 21

Tables
- Table 1: Nature and Extent of Contamination .....
- Table 2: Remedial Alternative Costs .....

Figures
- Figure 1: Site Location Map .....
- Figure 2: Investigation Area Reference Map .....
- Figure 3: Groundwater Elevations - April 2006 .....
- Figure 4: Soil Boring Locations with PCE Results .....
- Figure 5: COC Concentrations in Groundwater - July 2005 .....
- Figure 6: COC Concentrations in Groundwater - December 2005 ...
- Figure 7: Vapor Intrusion Sampling and Mitigation Systems .....
- Figure 8: Conceptual Illustration of Remedial Alternatives .....

Appendices
- Appendix A: Responsiveness Summary .....
- Appendix B: Administrative Record .....

RECORD OF DECISION

CARRIAGE CLEANERS - BRIGHTON
Town of Brighton, Monroe County, New York
Site No. 8-28-120
March 2008

SECTION 1: SUMMARY OF THE RECORD OF DECISION

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), has selected this remedy for the Carriage Cleaners Site. The presence of hazardous waste has created significant threats to human health and/or the environment that are addressed by this remedy. As more fully described in Sections 3 and 5 of this document, past operations as a dry cleaning establishment have resulted in the disposal of hazardous wastes, including volatile organic compounds (VOCs). These wastes have contaminated the soil, groundwater, and soil vapor at the site, and have resulted in:

- a significant threat to human health associated with current and potential exposure to soil, groundwater, and soil vapor; and

- a significant environmental threat associated with the current and potential impacts of contaminants to soil, groundwater, and soil vapor.

To eliminate or mitigate these threats, the Department has selected excavation to remove contaminated soil from the site and to treat residual soil and groundwater contamination with the installation and operation of an on-site soil vapor extraction system and groundwater extraction system along with the continued operation of the existing off-site sub-slab depressurization systems and any necessary periodic vapor intrusion monitoring.

The selected remedy, discussed in detail in Section 8, is intended to attain the remediation goals identified for this site in Section 6. The remedy must conform with officially promulgated standards and criteria that are directly applicable, or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, criteria and guidance are hereafter called SCGs.

SECTION 2: SITE LOCATION AND DESCRIPTION

Carriage Cleaners is an active dry cleaning business located at 2101 Monroe Avenue in the Town of Brighton, Monroe County, New York (Figure 1). The Site is located on an approximate 0.35 acre parcel along the intersection of Brooklawn Drive and Monroe Avenue (New York State Route 31) and is situated on a commercially zoned parcel within a densely populated mixed commercial/residential area. Carriage Cleaners has been the owner/operator over the past 15

years; however, the site has apparently operated as a dry cleaning establishment for more than 25 years. The site is adjacent to a petroleum spill (Spill Number 0306131) that occurred at a former Newcomb Oil/Citgo Gasoline Station located at 2087 Monroe Avenue and within approximately 300 feet of a Class 2 Inactive Hazardous Waste Disposal Site (HW ID No. 8-28-128) identified as the Former Speedy's Cleaners site at 2150 Monroe Avenue. A reference map showing key property locations and roadways discussed in this PRAP is provided as Figure 2.

The geology beneath and near the Carriage Cleaners Site directly influences the distribution and ability for contaminants to migrate from the site. Site geology consists of a thin veneer of sandy glacial till (overburden beneath the site) comprised of loose to dense, fine and medium sand with some silt and gravel overlying a medium dark gray dolomite (bedrock beneath the site) of the Lockport Group. The thickness of overburden ranges from approximately 3 feet to 15 feet. Based on data collected as part of the RI, three zones can be distinguished within the bedrock unit. These include a weathered bedrock zone immediately below the till deposit ranging from 1 to 3 feet in thickness, a shallow fractured bedrock zone with a thickness of approximately 6 to 15 feet, and a more competent intermediate bedrock zone where fracture frequency decreases with depth. The data suggests that there is a hydraulic connection/communication between the overburden and the shallow bedrock groundwater systems.

The site investigation data suggest that the top of the bedrock surface is highly irregular and exhibits an undulating erosional surface. The presence of a bedrock trough north of the Carriage Cleaners Site, with an approximate northwest to southeast orientation, and a bedrock high northeast of the Former Speedy's Cleaners Site (Figure 2) appears to influence the local groundwater flow direction. The depth to groundwater ranges from approximately 6 feet to 10 feet below grade. In general, groundwater flow is to the northeast, but as previously mentioned, the bedrock surface appears to influence the overall flow of off-site groundwater. A map illustrating the local groundwater flow direction has been included as Figure 3.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

The site contains a commercial building and has reportedly operated as a dry cleaner for over 25 years. A Town of Brighton sewer inspection suggests that the property may have operated as a dry cleaner in 1959. Town of Brighton records also indicate that the property operated as a beauty parlor in 1963 and then again as a dry cleaner (One Hour Martinizing) in 1975. The current property use as Carriage Cleaners has occurred for over 15 years. Carriage Cleaners currently uses both tetrachloroethene (PCE) and petroleum based dry cleaning solvents in its daily operations.

Data collected as part of the RI suggest that PCE disposal may have occurred at multiple locations at the Carriage Cleaners site. Specifically, a sewer system evaluation adjacent to the west-side of the building documented a failed section of the storm sewer and the presence of PCE contamination in soil near the storm sewer at a concentration of 48 parts per million (ppm). Additional PCE disposal appears to have occurred in a narrow alleyway between the site building

and an adjacent residential property (2111 Monroe Avenue). The alleyway currently contains an abandoned 275 gallon above ground storage tank (AST) historically used to store PCE, 55 gallon and 30 gallon drums used to store PCE and a rear entrance/exit to the site building. Soil samples collected from two separate areas within the alleyway contained PCE at concentrations of 1.3 and 1.5 ppm. Data collected during the RI did not provide information on when and for what duration PCE disposal actually occurred at the site. The data does generally show that PCE handling practices over a period of more than 25 years has contributed to the on-site PCE contamination.

3.2: Remedial History

In 2004, the Department listed the site as a Class 2 site in the Registry of Inactive Hazardous Waste Disposal Sites in New York. A Class 2 site is a site where hazardous waste presents a significant threat to the public health or the environment and action is required.

During a series of investigations related to a petroleum spill at the former Newcomb Oil/Citgo Gasoline Station (Figure 2) at 2087 Monroe Avenue, chlorinated solvents were detected in groundwater samples collected downgradient of the Carriage Cleaners Site. The most prevalent chlorinated compound detected was tetrachloroethene (PCE) which is commonly associated with dry cleaning operations. Specifically, the highest PCE concentrations (710 parts per billion (ppb)) were detected in a groundwater sample collected from a shallow bedrock groundwater monitoring well located along the north-side of the Carriage Cleaners property. Given the proximity to the former Newcomb Oil/Citgo Gasoline Station and the presence of a contaminant (PCE) commonly used in the dry cleaning industry, the Carriage Cleaners property was implicated as the suspected source of chlorinated solvents detected in groundwater.

The owner of Carriage Cleaners subsequently completed a limited Phase II Environmental Site Assessment (Phase II ESA) in 2004. The results of the site assessment reportedly did not identify a source for the PCE, but did indicate that soil and groundwater at the Carriage Cleaners property were contaminated with PCE. The site assessment report concluded that possible breaks in the storm and sanitary sewer lines may represent a potential source for the PCE contamination. During the site assessment, the highest concentration (34.5 ppm) of PCE in soil was detected in a soil boring advanced adjacent to the underground sewer lines servicing the west-side of the Carriage Cleaners building. In groundwater, PCE was detected at a maximum concentration (4,380 ppb) in an overburden monitoring well located near the PCE AST in the alleyway that separates the Carriage Cleaners building from the adjacent residential building located at 2111 Monroe Avenue.

In addition to on-site investigation activities, the Department completed an off-site vapor intrusion program in January of 2004. A total of six vapor intrusion sample sets (sub-slab, indoor air, and ambient air samples) were collected at four residential properties. Three vapor intrusion sample sets were collected at one large apartment complex on Monroe Avenue. Based on this off-site vapor intrusion sampling one basement/crawlspace ventilation system and four sub-slab depressurization systems were installed as part of an interim remedial measure in February 2004.

The data collected as part of these investigation activities led to the listing of the Site as a Class 2 Inactive Hazardous Waste Disposal site in June 2004, the subsequent completion of the Carriage Cleaners RI/FS, and the development of this ROD.

SECTION 4: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The PRPs for the site, documented to date, include: M.I.J. Enterprises, Inc.

The PRPs declined to implement the RI/FS at the site when requested by the Department. After the remedy is selected, the PRPs will again be contacted to assume responsibility for the remedial program. If an agreement cannot be reached with the PRPs, the Department will evaluate the site for further action under the State Superfund. The PRPs are subject to legal actions by the state for recovery of all response costs the state has incurred.

SECTION 5: SITE CONTAMINATION

A remedial investigation/feasibility study (RI/FS) has been conducted to evaluate the alternatives for addressing the significant threats to human health and the environment.

5.1: Summary of the Remedial Investigation

The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site. The RI was conducted between March 2005 and November 2007. The field activities and findings of the investigation are described in the RI report.

The RI included the following activities:

- environmental samples were collected from the following media and submitted for laboratory analysis: soil vapor, subsurface soil, indoor air, and groundwater;
- ten (10) groundwater monitoring wells were installed;
- evaluation and subsequent repair of an underground storm sewer utility; and
- permeability testing of the newly installed monitoring wells.

5.1.1: Standards, Criteria, and Guidance (SCGs)

To determine whether the soil, groundwater, and indoor air contain contamination at levels of concern, data from the investigation were compared to the following SCGs:

- Groundwater, drinking water, and surface water SCGs are based on the Department's "Ambient Water Quality Standards and Guidance Values" and Part 5 of the New York State Sanitary Code.

- Soil SCGs are based on the Department's Cleanup Objectives ("Technical and Administrative Guidance Memorandum [TAGM] 4046; Determination of Soil Cleanup Objectives and Cleanup Levels.") and 6 NYCRR Subpart 375-6 - Remedial Program Soil Cleanup Objectives.

- Concentrations of VOCs in air were evaluated using the air guidelines provided in the NYSDOH guidance document titled "Guidance for Evaluating Soil Vapor Intrusion in the State of
New York," dated October 2006. Specifically, the sub-slab and indoor air data were compared to Soil Vapor/Indoor Air Matrix 1 for TCE, carbon tetrachloride, and vinyl chloride and Soil Vapor/Indoor Air Matrix 2 for PCE, 1,1-dichloroethene, cis-1,2-DCE, and 1,1,1-trichloroethane.

- Concentrations of VOCs in air were compared to typical background levels of VOCs in indoor and outdoor air using the background levels provided in the NYSDOH guidance document titled "Guidance for Evaluating Soil Vapor Intrusion in the State of New York," dated October 2006. The background levels are not SCGs and are used only as a general tool to assist in data evaluation.

Based on the RI results, in comparison to the SCGs and potential public health and environmental exposure routes, certain media and areas of the site require remediation. These are summarized in Section 5.1.2. More complete information can be found in the RI report which is available at the document repositories.

5.1.2: Nature and Extent of Contamination

This section describes the findings of the investigation for all environmental media that were investigated.

As described in the RI report, soil, groundwater and soil vapor samples were collected to characterize the nature and extent of contamination. As illustrated in Figures 4, 5, and 6 and summarized in Table 1, the main categories of contaminants that exceed their SCGs are volatile organic compounds (VOCs). The primary contaminant of concern at the site is PCE, a volatile organic compound, that was used at the site for dry cleaning operations. PCE breakdown products, including TCE, DCE, and vinyl chloride, along with gasoline related VOCs associated with the petroleum spill at the former Newcomb Oil/Citgo Gasoline Station (Spill No. 0306131) were also detected in samples collected as part of the RI. For comparison purposes, where applicable, SCGs are provided for each medium.

Chemical concentrations are reported in parts per billion (ppb) for water and parts per million (ppm) for soil. Air samples are reported in micrograms per cubic meter ($\mu g/m^3$).

Figures 4, 5, and 6 and Table 1 summarize the degree of contamination for the contaminants of concern in soil and groundwater and compare the data with the SCGs for the site. Figure 7 illustrates the vapor intrusion sampling locations and the locations where sub-slab

depressurization systems are operating to prevent vapor intrusion. The following are the media which were investigated and a summary of the findings of the investigation.

Surface Soil

No site-related surface soil contamination of concern was identified during the RI/FS. Therefore, no remedial alternatives were evaluated for surface soil.

Subsurface Soil

Subsurface soil samples collected during the Phase II Environmental Site Assessment for Carriage Cleaners in 2004 documented the presence of PCE in site subsurface soil. Subsurface soil sampling completed during the Carriage Cleaners RI expanded on this initial sampling. During the RI, a total of 18 soil samples were collected from 18 soil borings installed adjacent to the site building to locate previously unidentified source areas and to better understand the relationship between the storm sewer utility and site contamination. The results from these samples document PCE in site soil at concentrations ranging from 0.008 ppm to 48 ppm and above the SCG of 1.3 ppm for unrestricted use.

During the Carriage Cleaners RI, the highest concentration of PCE (48 ppm) was detected in a soil sample collected from a depth of 12 to 14 feet below ground surface near the storm sewer utility (SB-DEC-7 on Figure 4). Two soil samples collected at a depth of 8 to 10 feet below ground surface from the alleyway where a PCE above ground storage tank, a backdoor to the facility, and drums are stored contained PCE at concentrations of 1.6 ppm and 1.3 ppm from SB-DEC-9 and SB-DEC-29 respectively (Figure 4). Figure 4 illustrates the RI soil sampling locations with corresponding PCE concentrations (concentrations in ppm) and Table 1 includes a summary of the soil samples obtained during the RI. PCE was detected in three (3) site soil samples at concentrations at or above the unrestricted use SCG. Although additional VOCs were detected in soil samples collected at the Carriage Cleaners Site, these VOCs were not detected in site soil at concentrations exceeding the unrestricted use SCGs.

In addition to the 18 subsurface soil samples being collected for VOC laboratory analysis from the Carriage Cleaners Site, a total of three (3) soil samples were additionally analyzed for semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, and inorganic compounds. Based on this sampling and as summarized in Table 1, no SVOCs or PCBs were detected above their respective SCGs in these soil samples. Iron was detected in three (3) and zinc was detected in two (2) of the soil samples at concentrations slightly above the respective SCGs. One pesticide, 4,4'-DDT, was detected in two (2) of the subsurface soil samples at concentrations of 0.0045 ppm and 0.0037 ppm and slightly above the SCG of 0.0033 ppm.

The subsurface soil contamination identified during the RI/FS will be addressed in the final remedy.

Groundwater

During the RI, groundwater samples were collected from a network of existing monitoring wells installed as part of the former Newcomb Oil/Citgo Gasoline Station spill investigation and from monitoring wells installed as part of the Carriage Cleaners RI during three separate sampling events (July 2005, December 2005, and November 2007).

Figures 5 and 6 illustrate the groundwater sampling results for the July 2005 and December 2005 sampling events respectively. As described in Section 2.0, the monitoring wells are categorized to assess groundwater quality in the overburden, shallow bedrock interface, and the intermediate bedrock. The following discussion on the nature and extent of groundwater contamination has been divided according to these three categories. It should be noted, and as previously mentioned, that there is an apparent hydraulic connection between the upper two zones (overburden wells and shallow bedrock interface wells) and even some hydraulic connection with the intermediate bedrock at the Carriage Cleaners site.

1) Overburden wells screened in silt and sand, and the top of the underlying till and include MW-1, MW-2, MW-3, MW4, MW-5, and MW-206S on Figures 5 and 6. The overburden wells were installed to depths of approximately 10 to 12 feet below ground surface (bgs).

2) Shallow bedrock interface wells screened in the top of till, weathered bedrock zone, and the upper portion of the underlying fractured bedrock and include HA-104, HA-107 HA-108, HA-109, HA-111, HA-112, HA-113, HA-114, HA-115, HA-117, HA-118, HA-119, HA-122, HA-123, DEC Well, MW-201, MW-202, MW-203S, MW-204S, MW-205S, MW-207S, MW-208S, and MW-209S on Figures 5 and 6. The shallow bedrock interface wells were installed to depths of approximately 15 to 20 feet bgs.

3) Intermediate bedrock wells screened in a slightly more competent and deeper bedrock zone immediately below the upper fractured bedrock zone and include MW-104I, MW-111I, and MW-202I on Figures 5 and 6. The intermediate bedrock wells were installed to depths of approximately 30 to 50 feet bgs.

Overburden Groundwater

Since the occurrence of groundwater in the overburden system is discontinuous, only six (6) wells are constructed in the overburden unit; five (5) of which are located on the Carriage Cleaners property and installed as part of the Carriage Cleaners Phase II ESA (Labella Associates, P.C., July 2005). PCE was the chlorinated volatile organic compound (CVOC) detected at the highest concentration (7,100 ppb in MW-1) and well above the SCG of 5 ppb. As shown in Figures 5 and 6, monitoring well MW-1 is located in the alleyway and near the PCE AST on the Carriage Cleaners property. PCE, along with cis-1,2-Dichloroethene (cis-1,2-DCE) were also detected above the SCG of 5 ppb in monitoring well MW-3. MW-3 is located along the west-side of the Carriage Cleaners building, east of Brooklawn Drive, and in close proximity to the underground sewer utilities servicing the site building. Several gasoline range VOCs were detected in MW-3 above the respective SCGs. These petroleum contaminants are associated with the petroleum spill at the former Newcomb Oil/Citgo Gasoline Station and are being addressed under NYSDEC Petroleum Spill No. 0306131. Based on the discontinuous occurrence

of groundwater in the overburden and the presence of CVOCs in only two (2) monitoring wells, the extent of groundwater contamination in the overburden is restricted to the Carriage Cleaners property.

Shallow Bedrock Interface Groundwater
As summarized in Table 1, PCE, TCE, cis-1,2-DCE, and vinyl chloride were detected at concentrations exceeding their respective SCGs in 13 of the shallow bedrock interface groundwater monitoring wells. PCE was detected above the SCG of 5 ppb, at concentrations ranging from 6 ppb at MW-203S and 1,500 ppb at MW-202. Monitoring well MW-202 is located approximately 40 ft downgradient of the former Speedy's Cleaners property (NYSDEC Site 8-28-128 and shown on Figures 5 and 6). TCE was detected in four (4) monitoring wells at concentrations above the SCG of 5 ppb at concentrations ranging from 7.6 ppb at HA-114 to 25 ppb at MW-202. Cis-1,2-DCE was detected above the SCG of 5 ppb in 11 monitoring wells at concentrations ranging from 6.2 ppb in HA-123 to 160 ppb at HA-119. Vinyl chloride was detected within three (3) shallow bedrock interface wells at concentrations above the SCG of 2 ppb at concentrations between 10 ppb at MW-204S and 110 ppb at HA-115.

Similar to the overburden groundwater sample results, petroleum contamination was identified at concentrations exceeding the respective SCGs in 19 of the groundwater samples collected. These petroleum contaminants are associated with the petroleum spill at the former Newcomb Oil/Citgo Gasoline Station and are being addressed under NYSDEC Petroleum Spill No. 0306131.

As shown on Figures 5 and 6, the highest concentrations of CVOCs have been detected in shallow bedrock interface groundwater immediately downgradient of the former Speedy's Cleaners property, with lesser concentrations beneath the Carriage Cleaners property. Downgradient from these properties, to the northeast and east, CVOC concentrations decline considerably. The concentrations and distribution of PCE and PCE breakdown products suggest limited or slow attenuation near the source areas, but increased natural attenuation as the contaminants migrate horizontally through the shallow bedrock zone.

Intermediate Bedrock Groundwater
PCE, TCE, and cis-1,2-DCE were detected at maximum concentrations of 440 ppb, 18 ppb, and 25 ppb respectively in MW-111I located on the Carriage Cleaners property. Each of these compounds were detected at concentrations exceeding their respective SCGs. MW-111I is paired with shallow bedrock monitoring well HA-111 and based on similarities in groundwater contamination and water levels between the two (2) wells there also appears to be hydraulic communication between the two (2) groundwater zones. No CVOCs were detected within the intermediate bedrock zone at MW-104I and MW-202I at concentrations that exceeded the SCGs. As shown on Figures 5 and 6, MW-104I is located upgradient of Carriage Cleaners and MW-202I is located downgradient of the former Speedy's Cleaners site.

Methyl-tert-butyl ether (MTBE) was detected in MW-104I and MW-202I at maximum concentrations of 95 ppb and 12 ppb respectively. The MTBE is associated with the petroleum spill at the former Newcomb Oil/Citgo Gasoline Station and is being addressed under NYSDEC Petroleum Spill No. 0306131.

Groundwater contamination identified during the RI/FS will be addressed in the final remedy.

Surface Water

No site-related surface water contamination of concern was identified during the RI/FS. Therefore, no remedial alternatives were evaluated for surface water.

Sediments

No site-related sediment contamination of concern was identified during the RI/FS. Therefore, no remedial alternatives were evaluated for sediment.

Soil Vapor/Sub-Slab Vapor/Air

Since investigation activities associated with the Carriage Cleaners site began in 2004, vapor intrusion (VI) sampling has been completed during four separate events. This sampling has included the collection of sub-slab soil vapor, indoor air, and outdoor air samples to evaluate the potential for exposures via soil vapor intrusion. The first VI sampling event occurred in January 2004 and was completed prior to the start of the Carriage Cleaners RI. The January 2004 sampling event included the collection of soil vapor intrusion samples at six locations. Based on this initial sampling, sub-slab depressurization systems were installed at four locations and a basement ventilation system was installed at one location (Figure 7).

During the Carriage Cleaners RI, vapor intrusion sampling was performed at a total of 45 locations during three (3) separate sampling events. PCE and TCE were the only VOCs detected in indoor air samples at concentrations above the SCGs of 100 $\mu g/m^3$ and 5 $\mu g/m^3$ respectively. Specifically, PCE was detected in three (3) of the 109 indoor air samples at concentrations above the SCG and TCE was detected in two (2) of the 58 indoor air samples at concentrations above the SCG. The VI sampling locations are shown on Figure 7 and a summary of the VOCs detected in sub-slab vapor and indoor air samples is provided in Table 1.

The following summarizes the evaluation of the vapor intrusion samples relative to Soil Vapor/Indoor Air Matrix 1 and 2 included in the Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006:

- No Further Action is considered appropriate at 37 of the 45 properties. At these locations, detected CVOC concentrations are considered to be associated with indoor and/or outdoor sources rather than vapor intrusion given the concentration detected in the sub-slab samples.
- Additional monitoring is needed at seven (7) residential properties to evaluate whether concentrations change over time and if mitigation is necessary at these locations.
- Mitigation is necessary at one commercial property (former Speedy's Cleaners at 2150 Monroe Avenue) due to the presence of PCE and TCE at elevated concentrations in air samples. Following the vapor intrusion sampling, a mitigation system was installed by the current owner of 2150 Monroe Avenue in 2007.

Other VOCs detected in the vapor intrusion samples mainly included petroleum and refrigerant compounds, many of which were detected in each of the sub-slab, basement air, and first floor air samples. The presence and concentrations of these compounds is consistent with typical background levels of VOCs in indoor and outdoor air. NYSDOH has not established air guidance values for these compounds. It should be noted however, that 11 mitigation systems were installed by Newcomb Oil to address petroleum odors caused by the gasoline spill that occurred on the Former Newcomb Oil/Citgo Gasoline Station property. The locations of these mitigation systems are shown on Figure 7.

Soil vapor and indoor air contamination identified during the RI/FS will be addressed in the final remedy.

Soil vapor and indoor air contamination identified prior to the RI/FS was addressed during an IRM implemented in February 2004 and described in Remedial History (Section 3.2).

5.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS.

As described above, four sub-slab depressurization systems and one basement ventilation system was installed as part of an IRM prior to the start of the Carriage Cleaners RI/FS. Three of the depressurization systems were installed in one large apartment building, one depressurization system was installed in an on-site residential building, and the basement ventilation system was installed in an off-site residential property.

During the Carriage Cleaners RIFS, the depressurization systems were periodically inspected to confirm continued operation. In addition, post mitigation samples were collected at the apartment complex and it was determined that the system is effectively preventing vapor intrusion. The basement ventilation system was also evaluated and the exhaust discharge point was extended from near the ground surface to above the building roof line.

5.3: Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the human exposure pathways can be found in Section 6.0 of the RI report which is available at the document repositories established for this site. An exposure pathway describes the means by which an individual may be exposed to contaminants originating from a site. An exposure pathway has five elements: [1] a contaminant source; [2] contaminant release and transport mechanisms; [3] a point of exposure; [4] a route of exposure; and [5] a receptor population.

The source of contamination is the location where contaminants were released to the environment (any waste disposal area or point of discharge). Contaminant release and transport mechanisms carry contaminants from the source to a point where people may be exposed. The

exposure point is a location where actual or potential human contact with a contaminated medium may occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (e.g., ingestion, inhalation, or direct contact). The receptor population is the people who are, or may be, exposed to contaminants at a point of exposure.

An exposure pathway is complete when all five elements of an exposure pathway exist. An exposure pathway is considered a potential pathway when one or more of the elements currently does not exist, but could in the future.

For current use scenarios, there is the potential for exposure to volatile organic compounds via inhalation of vapor, incidental ingestion, or dermal contact with contaminated subsurface soil and groundwater for workers who remove soils onsite and who work on the utility lines off site.

For future use scenarios, there is the potential for exposure to volatile organic compounds via inhalation of vapor, incidental ingestion, or dermal contact with residual contaminated soil and groundwater for workers who work in soils onsite and who work on the utility lines off site.

The potential exists for exposure through inhalation of indoor air which is impacted from contaminated soil vapor through the soil vapor intrusion pathway. Seven (7) homes which currently do not warrant mitigation will be monitored to evaluate whether the concentration of contaminated volatile organic compounds increase in the subslab vapor and/or indoor air over time. Exposures to indoor air which was impacted from contaminated soil vapor has been eliminated through the installation of four subslab depressurization systems; three (3) at one apartment complex and one at one home; and one basement ventilation system at one home. These systems will continue to operate until future testing shows that operation is no longer necessary.

Future exposures to indoor air which is impacted from contaminated soil vapor would be addressed in a site management plan and include any necessary evaluation of the potential for soil vapor intrusion into any future buildings developed on the site and those off the site and include provisions for mitigation should any impacts be identified.

The entire area is served by a public water supply, therefore exposure to contaminated groundwater is not expected.

5.4: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts include existing and potential future exposure pathways to fish and wildlife receptors, as well as damage to natural resources such as aquifers and wetlands.

Site contamination has impacted the groundwater resources in the overburden, shallow bedrock, and intermediate bedrock groundwater units. Data collected during the RI indicates that groundwater contamination in the overburden and intermediate bedrock units is generally restricted to the limits of the Carriage Cleaners site. Groundwater contamination in the shallow

bedrock interface groundwater occurs on-site and extends approximately 1,200 feet off-site. However, the area is served by municipal water and sewer. Contaminated groundwater does not discharge to surface water bodies. The contaminated groundwater would be addressed in the proposed remedy.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The remediation goals for this site are to eliminate or reduce to the extent practicable:

- exposures of persons at or around the site to PCE, and PCE breakdown products in soil and groundwater;
- the release of contaminants from soil into groundwater that may create exceedances of groundwater quality standards; and
- the release of contaminants from subsurface soil beneath basements into indoor air through soil vapor.

Further, the remediation goals for the site include attaining to the extent practicable:

- ambient groundwater quality standards;
- the soil cleanup objectives included in the Technical and Administrative Guidance Memorandum [TAGM] 4046 and 6 NYCRR Subpart 375-6 - Remedial Program Soil Cleanup Objectives; and
- the air guidelines provided in the Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006.

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy must be protective of human health and the environment, be cost-effective, comply with other statutory requirements, and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the Carriage Cleaner Site were identified, screened and evaluated in the FS report which is available at the document repositories established for this site.

Both the United States Environmental Protection Agency (EPA) and the Department have identified soil vapor extraction (SVE) as a primary presumptive remedy for sites contaminated with volatile organic compounds in soil and groundwater. The NYSDEC DER-15 -

Presumptive/Proven Remedial Technologies (NYSDEC 2006) also identifies excavation as a conventional remedial method. The screening of cleanup technologies included in the Carriage Cleaners FS was focused and specifically included both SVE and soil excavation.

In addition to the consideration of a presumptive remedy for the Carriage Cleaners site, site conditions limit the alternatives available for remediation of groundwater at the site. Specifically, the presence of contaminants beneath the currently occupied building and the existence of a separate off-site source of CVOCs at the former Speedy's Cleaners (NYSDEC HW Site ID 8-28-128) may limit the technical practicability of groundwater remediation technologies at this site.

A summary of the remedial alternatives that were considered for this site is discussed below. The present worth represents the amount of money invested in the current year that would be sufficient to cover all present and future costs associated with the alternative. This enables the costs of remedial alternatives to be compared on a common basis. As a convention, a time frame of 30 years is used to evaluate present worth costs for alternatives with an indefinite duration. This does not imply that operation, maintenance, or monitoring would cease after 30 years if remediation goals are not achieved.

7.1: Description of Remedial Alternatives

The following potential remedies were considered to address the contaminated soil, groundwater, soil vapor, and air at the site.

Alternative 1: No Action

The No Action Alternative is evaluated as a procedural requirement and as a basis for comparison. It requires continued monitoring only, allowing the site to remain in an unremediated state. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

The no further action alternative consists of groundwater monitoring, environmental easements, and five-year reviews. Environmental easements related to indoor air refer to only those systems currently in operation. No new additional sub-slab depressurization systems are proposed under this alternative.

Present Worth: *$980,000*
Capital Cost: *$180,000*
Annual Costs:
(Years 1-5): *$70,000*
(Years 5-30): *$32,000*

Alternative 2: Presumptive Remedy Combined with Soil Excavation and On-Site

Groundwater Extraction and Treatment

Consistent with the Department's and the EPA's presumptive remedy recommendations, Alternative 2 includes soil vapor extraction (SVE) for VOCs in site soil, along with extraction of on-site groundwater, monitored natural attenuation for off-site groundwater, vapor intrusion mitigation and monitoring, and on-site excavation of PCE contaminated soil.

The Carriage Cleaners RI has determined that approximately 635 cubic yards of soil contains PCE contamination exceeding the pre-release conditions at the site. The overall goal of returning the site to pre-release conditions would consist of removal of this 635 cubic yards contaminated soil. Investigation data indicate that the contaminated soil is located adjacent to the current facility and possibly beneath it. The attainment of the pre-release goals through soil excavation is not feasible in this instance as it would involve discontinuing the active business enterprise, removing the physical buildings, and excavation in the area of underground utilities. As part of the remedy evaluation, the cost and time to accomplish pre-release conditions through soil excavation has been determined to not be feasible.

Alternative 2 would include the excavation and off-site disposal of approximately 83 cubic yards of contaminated soil in the area where contaminated soil was identified at concentrations above the unrestricted use soil cleanup objective near the site's underground storm sewer utility. Specifically excavation would occur in an approximate 10 foot by 15 foot area between the Carriage Cleaners building and Brooklawn Drive. As described below, the remaining contaminated soil in the inaccessible portions of the site and beneath the facility would be addressed through the installation and operation of a soil vapor extraction system. Following removal of the 83 cubic yards of contaminated soil, the excavation would be backfilled with clean fill from an approved source. Prior to backfilling the excavation, a demarcation fabric would be placed in the excavation to serve as a demarcation between soil left in place and the material used as backfill.

A soil vapor extraction (SVE) system represents the presumptive remedy to remove VOC contamination from site soil, prevent exposures, and eliminate the source area. The SVE system would consist of approximately three (3) extraction wells to recover soil vapor. With SVE, a vacuum would be applied to the extraction wells to draw air through the contaminated soils. The VOCs would vaporize from the soil into the air and the air containing the VOCs would be drawn into the extraction wells. Figure 8 illustrates the areas where some of the soil vapor extraction would occur. If necessary, the recovered soil vapor would be treated by activated granular carbon prior to release to the atmosphere. An SVE pilot study may be completed to provide data for the final system.

To supplement the SVE system, this alternative would include a groundwater extraction system to collect contaminated on-site bedrock groundwater. Following appropriate approvals, disposal of extracted groundwater would be to the municipal sewer system. It is not anticipated that pre-treatment of recovered groundwater would be required prior to disposal. Extraction of groundwater would also serve to control the off-site migration of contaminated groundwater. Figure 8 illustrates the areas where hydraulic control would be achieved with groundwater extraction as part of Alternative 2. For existing off-site contaminated groundwater, this

alternative would utilize natural attenuation mechanisms to achieve off-site groundwater remedial action objectives. Data collected as part of the remedial investigation have shown that breakdown products of PCE exist in the off-site plume suggesting that natural attenuation is occurring. Natural attenuation monitoring would consist of groundwater monitoring at representative wells for natural attenuation parameters. Additionally, this alternative would include groundwater monitoring to assess variations in VOC concentrations in on-site and off-site groundwater over time and to assess any further threat to human health.

Vapor intrusion activities would be completed in accordance with NYSDOH guidance. Based on an evaluation of the RI vapor intrusion sampling results, any necessary monitoring would occur on a periodic basis at up to 10 buildings.

The components are readily implementable and reliable technologies. Upon implementation, Alternative 2 would readily address site contamination and prevent continued off-site migration of contaminants. It is expected that the long-term reduction of compounds in off-site groundwater to the NYS Class GA Ground Water Standards would not be achieved in the foreseeable future. Costs are based on excavation of soil and the installation of the SVE and groundwater extraction systems, followed by continued monitoring over a 30 year period.

Present Worth: *$3,200,000*
Capital Cost: *$543,000*
Annual Costs:
(Years 1-5): *$180,000*
(Years 5-30): *$120,000*

Alternative 3: Presumptive Remedy with On-Site and Off-Site Groundwater Treatment

Similar to Alternative 2, soil vapor extraction (SVE) would be used for VOCs in site soil, contaminated groundwater would be extracted from an on-site recovery system, vapor intrusion mitigation and monitoring would be completed, and site soil excavation would occur. In addition, a groundwater extraction system would be included that would recover the off-site groundwater plume and accelerate the attainment of the remedial action objectives. The extraction wells would be installed to depths up to 50 feet below ground surface in order to contain and recover the existing off-site plume. Disposal of extracted groundwater would be to the municipal sewer system. It is not anticipated that pre-treatment of recovered groundwater would be required prior to disposal. Unlike Alternative 2, Alternative 3 would not include natural attenuation monitoring.

As with Alternative 2, the remedial technologies are reliable and readily implementable. Costs are based on excavation of soil and the installation of the on-site SVE system and the on-site and off-site groundwater extraction systems, followed by continued monitoring over a 30 year period.

Present Worth: *$4,070,000*
Capital Cost: *$1,420,000*
Annual Costs:
(Years 1-5): *$176,000*

(Years 5-30): *$123,000*

7.2 Evaluation of Remedial Alternatives

The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375, which governs the remediation of inactive hazardous waste disposal sites in New York. A detailed discussion of the evaluation criteria and comparative analysis is included in the FS report.

The first two evaluation criteria are termed "threshold criteria" and must be satisfied in order for an alternative to be considered for selection.

1. Protection of Human Health and the Environment - This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

2. Compliance with New York State Standards, Criteria, and Guidance (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.

The next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. 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.

4. 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.

5. 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.

6. Implementability - The technical and administrative feasibility of implementing each alternative are 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.

7. Cost-Effectivness - 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 two or more alternatives have met

the requirements of the other criteria, it can be used as the basis for the final decision. The costs for each alternative are included in Section 7.1 (Description of Remedial Alternatives) and summarized in Table 2.

This final criterion is considered a "modifying criterion" and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

8. Community Acceptance - Concerns of the community regarding the RI/FS reports and the PRAP have been evaluated. The responsiveness summary (Appendix A) presents the public comments received and the manner in which the Department addressed the concerns raised.

In general, the public comments received were supportive of the selected remedy. Several comments were received, however, pertaining to the duration of the cleanup, the ability to monitor changes in groundwater and indoor air quality, and the possibility that continued dry cleaning operations at Carriage Cleaners may continue to result in contamination to the environment.

In response to public concerns that the facility contains floor drains that may convey possible dry cleaning contaminants to the environment and into the storm sewer system, the Department has modified the proposed remedy to include closure of the floor drains as part of the final remedy.

During the public meeting, general questions related to the costs of implementing Alternative 2 were raised. As a follow-up to these questions, the cost assumptions used in developing the Feasibility Study and subsequently used in the PRAP were assessed. Based on this, costs associated with Alternative 2 and Alternative 3 were modified since the Department will not be instituting off-site environmental easements. Although these costs were included in the FS and the PRAP, the actual use of off-site environmental easements were not included in either remedy outlined in Alternative 2 or 3. The capital costs along with the associated indirect capital costs for Alternatives 2 and 3 have been reduced by approximately $537,000 (102 off-site environmental easements at an estimated individual cost of $3,500 per easement plus the indirect capital costs). The costs shown in Section 7.1 of this document reflect these adjustments.

SECTION 8: SUMMARY OF THE SELECTED REMEDY

Based on the Administrative Record (Appendix B) and the discussion presented below, the Department has selected Alternative 2, Presumptive Remedy Combined with Soil Excavation and On-Site Groundwater Extraction and Treatment, as the remedy for this site. The individual elements of this remedy are described at the end of this section. The selected remedy is based on the results of the RI and the evaluation of alternatives presented in the FS.

Alternative 2 has been selected because, as described below, it satisfies the threshold criteria and provides the best balance of the primary balancing criteria described in Section 7.2. It will achieve the remediation goals for the site by removing soil that creates the most significant threat to public health and the environment, it will greatly reduce the source of contamination to groundwater, and it will create the conditions needed to restore groundwater quality to the extent

practicable. Alternative 3 will also comply with the threshold selection criteria but may not be effective for addressing the off-site plume due to an off-site PCE source (former Speedy's Cleaners property located at 2150 Monroe Avenue).

The "no further action" alternative (Alternative 1) would not be protective of human health. Institutional controls alone (i.e., environmental easements) would be protective of on-site workers, but would do nothing to address the contaminated soil and groundwater. Environmental easements included in both Alternative 2 and 3 will provide protection to human health related to potential exposures to indoor air, soil and groundwater. Protection of human health is also afforded by on-site groundwater extraction and treatment. Soil excavation and treatment under Alternatives 2 and 3 also afford protection of human health related to soil exposures. Additional protection to human health and the environment is provided under Alternative 3 through the off-site groundwater extraction and treatment.

Alternative 1 would rely on natural attenuation to achieve groundwater SCGs. Alternative 1 would not be anticipated to achieve NYS Class GA Ground Water Standards in the foreseeable future. SCGs for soil and indoor air would not be achieved for Alternative 1. Alternative 2 will rely on natural attenuation to achieve groundwater SCGs in off-site groundwater, in conjunction with hydraulic control of on-site groundwater. Extraction and treatment of on-site groundwater included in Alternative 2 is not anticipated to achieve NYS Class GA Ground Water Standards in the foreseeable future due to the presence of contaminants in fractured bedrock. SCGs for soil will be addressed through soil treatment and excavation. Through the continued operation of existing sub-slab depressurization systems and periodic vapor intrusion monitoring, the indoor air SCGs will be achieved for affected off-site properties under Alternative 2.

Alternative 3 would rely on groundwater extraction and treatment of both on-site and off-site groundwater. Extraction and treatment of groundwater included in Alternative 3 would not be anticipated to achieve NYS Class GA Ground Water Standards in the foreseeable future. SCGs for soil would be addressed through soil treatment and excavation. Indoor air SCGs would be achieved for affected off-site properties under Alternative 3 through the continued operation of the existing vapor intrusion mitigation systems and annual vapor intrusion monitoring.

Because Alternatives 2 and 3 satisfy the threshold criteria, the five (5) balancing criteria are particularly important in selecting a final remedy for the Carriage Cleaners site.

The groundwater treatment alternatives (2 and 3) would be effective in both the short term and long term and will, to various degrees, reduce the toxicity, mobility, and volume of hazardous wastes at the site. They differ, however, in implementability and cost effectiveness. Alternative 3, with the component to treat off-site groundwater, would be more difficult to implement since it would necessitate a more complex treatment system in the off-site residential area and would require a place to discharge the effluent, probably the local sewer system. Due to the nature of the site's geology (fractured bedrock) and the presence of an off-site source, Alternative 3 could also operate for many years, treating only a small volume of contaminated water, and not necessarily having a noticeable effect on the overall quality of groundwater.

Based on the concentrations of contaminants in existing groundwater, and given that

groundwater is not used as a source of supply, any off-site treatment of groundwater would not be cost effective. Groundwater monitoring included in Alternative 2 will allow for the evaluation of residual risks associated with this alternative. Indoor air mitigation and monitoring components included in Alternative 2 will be effective in reducing risks associated with off-site indoor air.

Treatment of the on-site contaminated soil and groundwater is warranted because it is a continuing VOC source to both the on-site and off-site groundwater and to indoor air through soil vapor intrusion. Treatment of the soil and groundwater at this site is best done via soil excavation combined with the presumptive remedy for VOCs.

Alternative 2 would be expected to be implemented quickly and operated until the remedial action objectives are achieved. It has a lower cost to implement and to operate and maintain relative to Alternative 3. Lastly, the on-site soil vapor and groundwater extraction system will not be intrusive to the off-site residential setting of the area. The technology used for soil vapor and groundwater extraction (presumptive remedy) is relatively inexpensive and proven through numerous applications across the country. The estimated present worth cost to implement the remedy is $3,200,000. The cost to construct the remedy is estimated to be $543,000 and the estimated average annual cost for the first five (5) years is $180,000, and if necessary $120,000 per year for the next 25 years.

The elements of the selected remedy are as follows:

1. A remedial design program will be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program. Prior to remedial design, pre-design sampling of soil and soil vapor would be undertaken adjacent to the Carriage Cleaners building to delineate areas with high concentrations of VOCs. Additionally, pilot studies/tests may be performed for both the soil vapor and the groundwater extraction systems to optimize the system designs.

2. Excavation of contaminated soil will occur in accessible portions of the site. Excavation areas will remove, to the extent practicable, soil exhibiting concentrations of PCE greater than soil cleanup objectives for unrestricted use (1.3 ppm). It is estimated that approximately 83 cubic yards of soil ranging to a depth of 15 ft below grade exhibiting concentrations in excess of the soil cleanup objective for PCE (Figure 8). Site characteristics, including the presence of underground utilities and the building location relative to adjacent roadways represent physical limitations to the extent of excavation that will be feasible at the site. Following removal of the contaminated soil, the excavation will be backfilled with material from an approved source and a demarcation fabric will be placed in the excavation to identify where soil is left in place from clean fill material used as backfill. During the excavation of contaminated soil, the PCE AST located in the alleyway will be removed from the site and properly disposed of. Additionally, the floor drains located within the Carriage Cleaners building will be closed to prevent the possible discharge of dry cleaning contaminants to the storm sewers.

3. Soil vapor extraction will occur in the area below ground surface but above the water table (Figure 8 illustrates the areas where some of the soil vapor extraction will occur under

Alternative 2). At the Carriage Cleaners site, this zone extends to a depth of approximately 7 to 8 feet below ground surface. If necessary, the contaminated air from the extraction wells will then go through an activated carbon treatment system to remove the volatile contaminants before the air is discharged to the ambient air. It may be necessary to install soil vapor extraction points beneath the operating facility.

4. The groundwater extraction system will consist of an extraction well/wells installed to collect on-site bedrock groundwater. The recovery well/wells will be designed to optimize the extraction of contaminated groundwater from the Carriage Cleaners site and to prevent the continued off-site migration of contaminants from the site (Figure 8). Disposal of extracted groundwater will be to the municipal sewer system. It is not anticipated that pre-treatment of recovered groundwater will be required prior to disposal.

5. Institutional controls in the form of environmental easements will be used to impose land use restrictions and groundwater use restrictions at the site. Specifically, the environmental easements will require: (a) limiting the use and development of the property to commercial use (which the property is currently zoned), which will also permit industrial use; (b) land use restrictions will require proper worker protections during construction or excavation activities that would potentially cause a worker to contact contaminated soil, groundwater or soil vapor; (c) compliance with the approved site management plan; (d) groundwater use restrictions will preclude the use of groundwater at the Site without prior notification and approval from NYSDEC; (e) restrictions related to soil, groundwater, and soil vapor will be implemented on the site property; and (f) the property owner will complete and submit to the Department a periodic certification of institutional and engineering controls.

6. Development of a site management plan which will include the following institutional and engineering controls: (a) management of site excavation activities to ensure that excavated soil will be tested, properly handled to protect the health and safety of workers and the nearby community, and will be properly managed in a manner acceptable to the Department; (b) continued evaluation of the potential for vapor intrusion for any buildings developed on the site, including provision for mitigation of any impacts identified; (c) continued operation and periodic evaluation of the sub-slab depressurization systems at the site (2111 Monroe Avenue) and at off-site properties; (d) monitoring of groundwater and soil vapor; (e) identification of any use restrictions on the site; and (f) provisions for the continued proper operation and maintenance of the components of the remedy.

7. The property owner will provide a periodic certification of institutional and engineering controls, prepared and submitted by a professional engineer or such other expert acceptable to the Department, until the Department notifies the property owner in writing that this certification is no longer needed. An environmental easement which will trigger periodic certifications can only be amended or extinguished by the Commissioner. This submittal will: (a) contain certification that the institutional controls and engineering controls put in place are still in place and are either unchanged from the previous certification or are compliant with Department-approved modifications; (b) allow the Department access to the site; and (c) state that nothing has occurred that will impair the ability of the control to protect public health or the environment, or constitute a violation or failure to comply with the site management plan unless otherwise approved by the

Department.

8. The operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible.

9. Since the remedy results in untreated hazardous waste remaining at the site, a long-term monitoring program will be instituted. This program will allow the effectiveness of the soil vapor and groundwater extraction systems to be monitored and will be a component of the long-term management for the site. The groundwater samples will be analyzed for volatile organic compounds and natural attenuation parameters. The long-term monitoring will also include any necessary soil vapor intrusion monitoring along with continued operation and periodic evaluation of existing sub-slab depressurization systems at off-site properties.

SECTION 9: HIGHLIGHTS OF THE COMMUNITY PARTICIPATION

As part of the remedial investigation process, a number of Citizen Participation activities were undertaken to inform and educate the public about conditions at the site and the potential remedial alternatives. The following public participation activities were conducted for the site:

- Repositories for documents pertaining to the site were established.
- A public contact list, which included nearby property owners, elected officials, local media and other interested parties, was established.
- A project specific website was established at the following address: **http://www.dec.ny.gov/chemical/8666.html**
- A fact sheet was distributed to local residents on November 5, 2004 prior to the start of the RIFS.
- A public availability session was held on November 18, 2004 to update the public on recent and upcoming activities occurring at the Newcomb Oil site and Carriage Cleaners site.
- Postcard updates were mailed to local residents on February 8, 2005 and July 21, 2005.
- Department staff met with Town of Brighton on January 24, 2008 to discuss the remedial alternatives considered for the Carriage Cleaners site.
- A public meeting was held on March 13, 2008 to present and receive comment on the PRAP.
- A responsiveness summary (Appendix A) was prepared to address the comments received during the public comment period for the PRAP.

TABLE 1
Nature and Extent of Contamination
March 2006 - November 2007

SUBSURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG (ppm)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Benzene	0.0008 - 0.015	0.06	0 of 18
	Carbon Disulfide	0.001 - 0.002	2.7	0 of 18
	Chlorobenzene	ND - 0.0009	1.1	0 of 18
	Cyclohexane	0.002 - 0.010	NS	NA
	Ethylbenzene	0.015 - 0.780	1.0	0 of 18
	Isopropylbenzene	0.002 - 0.140	2.3	0 of 18
	Methyl Ethyl Ketone	ND - 0.017	0.12	0 of 18
	Methyl Tert-Butyl Ether	ND - 0.001	0.93	0 of 18
	Methylcyclohexane	0.001 - 0.570	NS	NA
	Methylene Chloride	0.0008 - 0.018	0.05	0 of 18
	Toluene	0.001 - 0.110	0.7	1 of 18
	Xylenes	0.002 - 3.2	0.26	6 of 18
	Tetrachloroethene	0.008- 48	1.3	3 of 18
	Trichloroethene	0.004- 0.520	0.47	1 of 18
	cis-1,2-Dichloroethene	0.002 - 0.740	0.25	1 of 18
	Vinyl Chloride	ND - 0.001	0.02	0 of 18
Semivolatile Organic Compounds (SVOCs)	Acenaphthylene	ND - .079	100	0 of 3
	Benzo(a)anthracene	0.014 - 0.076	1	0 of 3
	Benzo(a)pyrene	0.011 - 0.110	1.0	0 of 3
	Benzo(b)fluoranthene	0.017 - 0.150	1.0	0 of 3
	Benzo(ghi)perylene	0.010 - 0.280	100	0 of 3
	Benzo(k)fluoranthene	ND - 0.078	0.8	0 of 3
	Bis(2-ethylhexyl)phthalate	ND - 1.9	50	0 of 3
	Chyrsene	0.011 - 0.062	1.0	0 of 3

SUBSURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG (ppm)[a]	Frequency of Exceeding SCG
Semivolatile Organic Compounds (SVOCs)	Dibenzo(a,h)anthracene	ND - 0.058	0.33	0 of 3
	Fluoranthene	0.038 - 0.120	100	0 of 3
	Indeno(1,2,3-cd)pyrene	0.008 - 0.150	0.5	0 of 3
	Phenanthrene	ND - 0.032	100	0 of 3
	Pyrene	0.013 - 0.090	100	0 of 3
Pesticides	4,4'-DDD	ND - 0.00063	0.0033	0 of 3
	4,4'-DDE	ND - 0.002	0.0033	0 of 3
	4,4'-DDT	ND - 0.0045	0.0033	2 of 3
	alpha-BHC	ND - 0.0011	0.02	0 of 3
	delta-BHC	ND - 0.0017	0.04	0 of 3
	Dieldrin	ND - 0.00079	0.005	0 of 3
	Endosulfan II	ND - 0.00035	2.4	0 of 3
Inorganic Compounds	Aluminum	4,540 - 11,900	SB	NA
	Arsenic	3.1 - 4.9	13	0 of 3
	Barium	35.3 - 58.4	350	0 of 3
	Beryllium	0.25 - 0.60	7.2	0 of 3
	Calcium	2,470 - 49,900	SB	NA
	Chromium	5.3 - 13.5	30	0 of 3
	Cobalt	3.4 - 7.4	30	0 of 3
	Copper	13.7 - 21.1	50	0 of 3
	Iron	8,300 - 15,600	2,000 or SB	3 of 3
	Lead	15.5 - 51.2	63	0 of 3
	Magnesium	3,130 - 22,300	SB	NA
	Manganese	382 - 644	1,600	0 of 3
	Mercury	0.039 - 0.064	0.18	0 of 3
	Nickel	6.4 - 14.3	30	0 of 3
	Potassium	741 - 1,150	SB	NA

TABLE 1
Nature and Extent of Contamination (Continued)

SUBSURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG (ppm)[a]	Frequency of Exceeding SCG
Inorganic Compounds	Sodium	ND - 698	SB	NA
	Vanadium	8.8 - 19.3	150	0 of 3
	Zinc	65.4 - 153	109	2 of 3

TABLE 1
Nature and Extent of Contamination (Continued)

GROUNDWATER	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG (ppb)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Acetone	1.0 - 2.0	50	0 of 70
	Benzene	ND - 760	1	16 of 70
	Bromodichloromethane	0.6 - 4.0	50	0 of 70
	Carbon Disulfide	0.5 - 3.0	60	0 of 70
	Chloroform	ND - 22	7	4 of 70
	Cyclohexane	ND - 440	NS	NA
	Ethylbenzene	ND - 2,200	5	12 of 70
	Isopropylbenzene	ND - 78	5	10 of 70
	Methyl Acetate	ND - 3.0	NS	NA
	Methyl Chloride	ND - 5.0	5	0 of 70
	Methyl Ethyl Ketone	ND - 4.0	50	0 of 70
	Methyl Tert-Butyl Ether	ND - 1,500	10	19 - 70
	Methylcyclohexane	ND - 150	NS	NA
	Toluene	ND - 5,900	5	13 of 70
	Xylenes	ND - 14,000	5	14 of 70
	Tetrachloroethene	ND - 7,100	5	26 of 70
	Trichloroethene	ND - 28	5	10 of 70
	cis-1,2 Dichloroethene	ND - 180	5	27 of 70
	trans-1,2 Dichloroethene	ND - 1.0	5	0 of 70
	Vinyl Chloride	ND - 110	2	7 of 70
PCB/Pesticides	Dieldrin	ND - 0.012	0.004	1 of 3
	Endosulfan I	ND - 0.030	0.009	1 of 3
	Heptachlor	ND - 0.012	0.04	0 of 3
Inorganic Compounds	Aluminum	2,300 - 24,000	NS	NA
	Arsenic	ND - 14	25	0 of 3

TABLE 1
Nature and Extent of Contamination (Continued)

GROUNDWATER	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG (ppb)[a]	Frequency of Exceeding SCG
Inorganic Compounds	Barium	79 - 270	1000	0 of 3
	Cadmium	ND - 1.4	5	0 of 3
	Calcium	59,100 - 142,000	NS	NA
	Chromium	ND - 30	50	0 of 3
	Cobalt	ND - 12	5	2 of 3
	Copper	ND - 46	200	0 of 3
	Iron	4,400 - 27,400	300	3 of 3
	Lead	9.3 - 96	25	2 of 3
	Magnesium	20,100 - 67,000	35,000	2 of 3
	Manganese	1,400 - 7,100	300	3 of 3
	Mercury	ND - 0.7	0.7	0 of 3
	Nickel	ND - 28	100	0 of 3
	Potassium	2,500 - 8,000	NS	NA
	Sodium	28,600 - 170,000	20,000	3 of 3
	Vanadium	ND - 43	14	2 of 3
	Zinc	52 - 340	2,000	0 of 3

TABLE 1
Nature and Extent of Contamination (Continued)

SUB-SLAB SOIL VAPOR	Contaminants of Concern	Concentration Range Detected ($\mu g/m^3$)[a]	SCG ($\mu g/m^3$)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	1,1,1-Trichloroethane	0.22 - 5.5	NS	NA
	1,2,4-Trimethylbenzene	1.8 - 78	NS	NA
	1,2-Dichloroethane	ND - 1.2	NS	NA
	1,3,5-Trimethylbenzene	1.5 - 26	NS	NA
	1,3-Dichlorobenzene	ND - 1.8	NS	NA
	1,4-Dichlorobenzene	0.61 - 0.98	NS	NA
	2,2,4-Trimethylpentane	0.52 - 36	NS	NA
	4-Ethyltoluene	0.6 - 28	NS	NA
	Acetone	20 - 1,600	NS	NA
	Benzene	0.49 - 110	NS	NA
	Bromodichloromethane	0.48 - 12	NS	NA
	Bromoform	ND - 1.3	NS	NA
	Carbon Disulfide	0.38 - 34	NS	NA
	Carbon Tetrachloride	0.26 - 1.2	NS	NA
	Chlorobenzene	0.28 - 0.42	NS	NA
	Chloroform	0.3 - 390	NS	NA
	Chloromethane	0.13 - 1.8	NS	NA
	cis-1,2-Dichloroethene	0.48 - 260	NS	NA
	Cyclohexane	1.1 - 250	NS	NA
	Ethyl Acetate	1.4 - 1.7	NS	NA
	Ethylbenzene	0.71 - 160	NS	NA
	Freon 11	0.97 - 230	NS	NA
	Freon 113	0.39 - 1.2	NS	NA
	Freon 12	1.9 - 71	NS	NA
	Heptane	2.8 - 260	NS	NA

TABLE 1
Nature and Extent of Contamination (Continued)

SUB-SLAB SOIL VAPOR	Contaminants of Concern	Concentration Range Detected (µg/m³)[a]	SCG (µg/m³)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Hexane	1.3 - 280	NS	NA
	Isopropyl Alcohol	0.35 - 230	NS	NA
	m&p-Xylene	1.4 - 470	NS	NA
	Methyl Butyl Ketone	ND - 1.1	NS	NA
	Methyl Ethyl Ketone	1.1 - 6.6	NS	NA
	Methyl Isobutyl Ketone	0.58 - 31	NS	NA
	Methyl Tert-Butyl Ether	1.4 - 130	NS	NA
	Methylene Chloride	0.42 - 290	NS	NA
	o-Xylene	0.53 - 250	NS	NA
	Styrene	0.78 - 36	NS	NA
	Tetrachloroethene	0.69 - 47,000	NS	NA
	Tetrahydrofuran	1.6 - 4.5	NS	NA
	Toluene	6.2 - 300	NS	NA
	trans-1,2-Dichloroethene	0.52 - 21	NS	NA
	trans-1,3-Dichloropropene	0.69 - 1.8	NS	NA
	Trichloroethene	0.22 - 2,100	NS	NA

AIR	Contaminants of Concern	Concentration Range Detected (µg/m³)[a]	SCG (µg/m³)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	1,1,1-Trichloroethane	0.39 - 27.2	NS	NA
	1,2,4-Trimethylbenzene	1.05 - 58	NS	NA
	1,3,5-Trimethylbenzene	0.7 - 15	NS	NA
	1,3-Dichlorobenzene	ND - 0.18	NS	NA
	1,4-Dichlorobenzene	0.18 - 34	NS	NA
	2,2,4-Trimethylpentane	0.47 - 10	NS	NA

TABLE 1
Nature and Extent of Contamination (Continued)

AIR	Contaminants of Concern	Concentration Range Detected ($\mu g/m^3$)[a]	SCG ($\mu g/m^3$)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	4-Ethyltoluene	0.4 - 14	NS	NA
	Acetone	13 - 22,000	NS	NA
	Benzene	0.649 - 14	NS	NA
	Benzyl Chloride	ND - 1.52	NS	NA
	Bromodichloromethane	1 - 1.2	NS	NA
	Carbon Disulfide	0.317 - 12	NS	NA
	Carbon Tetrachloride	0.38 - 1.92	NS	NA
	Chloroform	0.298 - 11	NS	NA
	Chloromethane	0.31 - 46	NS	NA
	Cyclohexane	0.175 - 23	NS	NA
	Ethyl Acetate	0.879 - 490	NS	NA
	Ethylbenzene	0.53 - 14	NS	NA
	Freon 11	1.26 - 190	NS	NA
	Freon 113	0.31 - 1	NS	NA
	Freon 114	ND - 2.8	NS	NA
	Freon 12	2.11 - 60	NS	NA
	Heptane	0.54 - 22	NS	NA
	Hexane	0.716 - 19	NS	NA
	Isopropyl Alcohol	0.75 - 4,400	NS	NA
	m&p-Xylene	1.32 - 65	NS	NA
	Methyl Ethyl Ketone	1.71 - 300	NS	NA
	Methyl Isobutyl Ketone	1.37 - 34	NS	NA
	Methyl Tert-Butyl Ether	0.92 - 6.7	NS	NA
	Methylene Chloride	0.46 - 69	60	1 of 58

TABLE 1
Nature and Extent of Contamination (Continued)

AIR	Contaminants of Concern	Concentration Range Detected (µg/m³)[a]	SCG (µg/m³)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	o-Xylene	0.53 - 18	NS	NA
	Styrene	0.563 - 9.09	NS	NA
	Tetrachloroethene	0.69 - 360	100	3 of 109
	Tetrahydrofuran	0.659 - 6.1	NS	NA
	Toluene	2.91 - 820	NS	NA
	trans-1,3-Dichloropropene	ND - 0.88	NS	NA
	Trichloroethene	0.273 - 36	5	3 of 58
	Vinyl Chloride	ND - 0.36	NS	NA

[a] ppb = parts per billion, which is equivalent to micrograms per liter, ug/L, in water;
ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
ug/m^3 = micrograms per cubic meter

[b] SCG = standards, criteria, and guidance values;

1. Groundwater, drinking water, and surface water SCGs are based on the Department's "Ambient Water Quality Standards and Guidance Values" and Part 5 of the New York State Sanitary Code.
2. Soil SCGs are based on the Department's Cleanup Objectives ("Technical and Administrative Guidance Memorandum [TAGM] 4046; Determination of Soil Cleanup Objectives and Cleanup Levels.") and 6 NYCRR Subpart 375-6 - Remedial Program Soil Cleanup Objectives.
3. Concentrations of VOCs in air were evaluated using the air guidelines provided in the NYSDOH guidance document titled "Guidance for Evaluating Soil Vapor Intrusion in the State of New York," dated October 2006. Specifically, the sub-slab and indoor air data were compared to Soil Vapor/Indoor Air Matrix 1 for TCE, carbon tetrachloride, and vinyl chloride and Soil Vapor/Indoor Air Matrix 2 for PCE, 1,1-dichloroethene, cis-1,2-DCE, and 1,1,1-trichloroethane.
4. Concentrations of VOCs in air were compared to typical background levels of VOCs in indoor and outdoor air using the background levels provided in the NYSDOH guidance document titled "Guidance for Evaluating Soil Vapor Intrusion in the State of New York," dated October 2006. The background levels are not SCGs and are used only as a general tool to assist in data evaluation.

ND = Not Detected
NS = SCG Not Specified for this compound
NA = Not Applicable
SB = Site Background

Table 2
Remedial Alternative Costs

Remedial Alternative	Capital Cost ($)	Annual Costs ($)	Total Present Worth ($)
Alternative 1 - No Further Action	$180,000	$103,000*	$980,000
Alternative 2 - Presumptive Remedy and Off-Site Monitored Natural Attenuation	$543,000	$244,000*	$3,200,000
Alternative 3 - Presumptive Remedy and Off-Site Pump and Treat	$1,420,000	$224,000*	$4,070,000

* Annual operations and maintenance costs vary for each year as a result of different monitoring programs and remedial technologies.

FIGURES