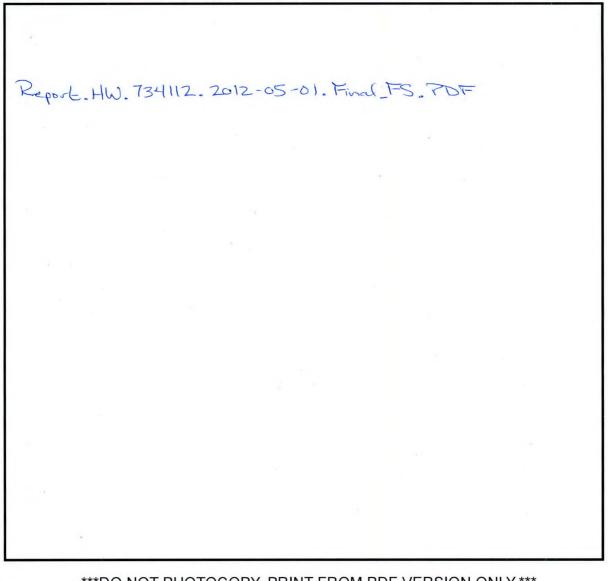




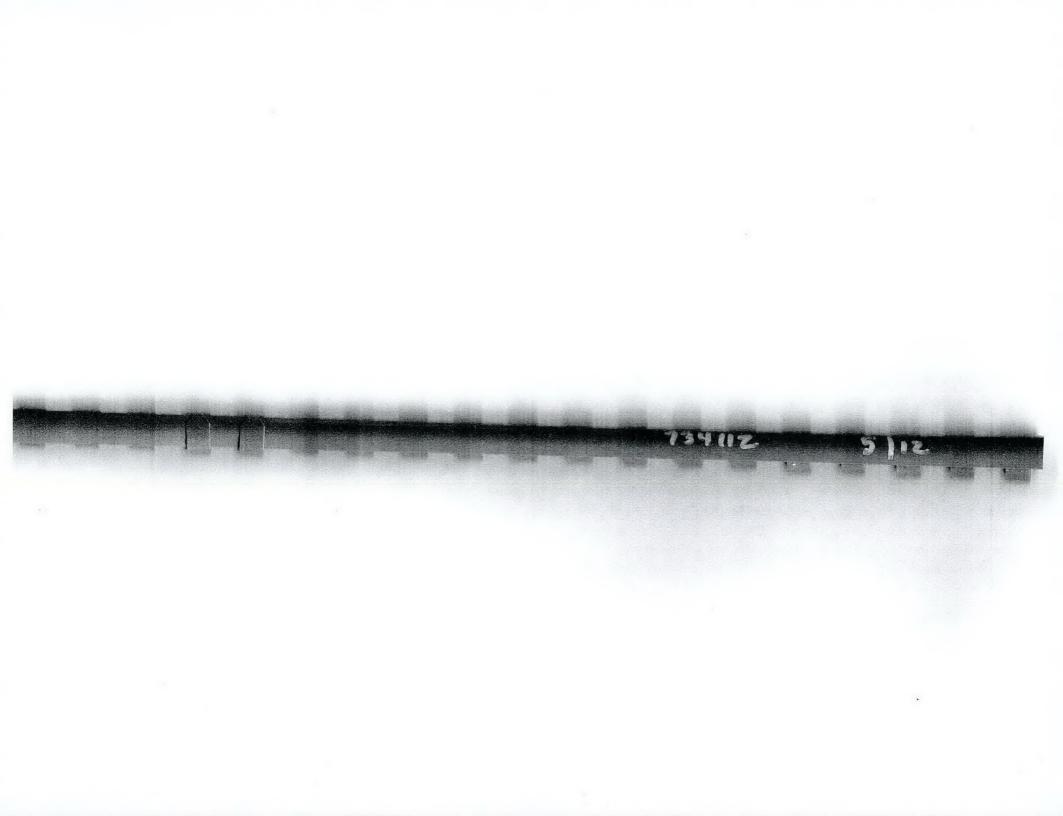
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FEASIBILITY STUDY

Jack's Drycleaners Site (734112) Village of Brewerton, Town of Cicero, Onondaga County, New York



New York State Department of Environmental Conservation Division of Environmental Remediation

Prepared by:



EA ENGINEERING, P.C. and Its Affiliate EA SCIENCE and TECHNOLOGY



Feasibility Study Jack's Drycleaners Site (734112) Brewerton, New York

Prepared for

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LIST OF ACRONYMS

AWQS	Ambient Water Quality Standard
bgs	Below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminant of concern
CVOC	Chlorinated Volatile Organic Compound
DCE	Dichloroethene
DER	Division of Environmental Remediation
EA	EA Engineering, P.C. and its affiliate EA Science and Technology
FS	Feasibility Study
GRA	General response actions
IRM	Interim remedial measure
NRCS	Natural Resources Conservation Service
NYCRR	New York Code of Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PCE	Perchloroethene (Tetrachloroethene)
RAO	Remedial action objective
RI	Remedial investigation
SCG	Standards, Criteria, and Guidance
SCO	Soil Cleanup Objectives
SVI	Soil vapor intrusion
SVOC	Semivolatile organic compound
TAGM	Technical and Administrative Guidance Memorandum
TCE	Trichloroethene
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
VC	Vinyl chloride
VOC	Volatile organic compound

1. INTRODUCTION AND PROJECT OVERVIEW

The New York State Department of Environmental Conservation (NYSDEC) issued EA Engineering, P.C. and its affiliate EA Science and Technology (EA), a Work Assignment to perform a focused feasibility study (FS) at the Jack's Drycleaners site in the village of Brewerton, town of Cicero, Onondaga County, New York (Figures 1 and 2).

1.1 PURPOSE AND SCOPE

This FS has been prepared to develop and evaluate options for remedial action. The FS will determine which option is the most appropriate, cost effective, and protective of public health and the environment at the Jack's Drycleaners site. The selected option will restore the site conditions allowing it to be designated for unrestricted use. A remedial investigation (RI) report was prepared by EA and approved by the NYSDEC in December 2010. A soil vapor intrusion (SVI) investigation was completed and was amended to the RI in May 2011.

The FS has been conducted in accordance with the most recent versions of the 1988 United States Environmental Protection Agency (USEPA) *Guidance for Conducting Remedial Investigations and Feasibility Studies under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)* (1988) and NYSDEC *Division of Environmental Remediation (DER)-10, Technical Guidance for Site Investigation and Remediation* (2010) and focuses on a limited number of remedial alternatives proven effective at addressing remediation at drycleaner sites.

1.2 REPORT ORGANIZATION

The FS report has been organized as follows:

- Section 1—Introduction, Site Background, and Characterization
- Section 2—Summary of Remedial Investigation and Exposure Assessment
- Section 3—Development of Remedial Action Objectives
- Section 4—General Response Actions
- Section 5—Identification and Screening of Technologies
- Section 6—Scoping and Development of Remedial Alternatives
- Section 7-Detailed Analysis of Alternatives
- Section 8—Recommendations
- Section 9—References.

1.3 BACKGROUND

The following section provides a brief discussion of the site background for the Jack's Drycleaners site.

1.3.1 Site Location

The subject site is located at 9628 Brewerton Road in the village of Brewerton, town of Cicero, Onondaga County, New York (Figure 2). The area surrounding the site is primarily residential and commercial, with most businesses located along Brewerton Road. Located to the east and southeast of the site are several hundred feet of wooded and open land that transition to the backyards of several residential properties.

1.3.2 Property Information

Jack's Drycleaners site is currently utilized as a dry-cleaning facility and is owned by Mr. Young Kyu Shin. The parcel is approximately 0.17-acres and is zoned as commercial. According to discussions with the property owner and nearby residents, the site was historically utilized as a gasoline station in the 1950s and as a dry-cleaning facility since at least 1972. According to a review of town of Cicero assessment information for the site, the property was developed with the current 1,400 ft² structure in 1945. The structure was previously connected to a septic system which was located directly behind the facility. The septic system was disconnected and removed in 2009 as directed by the NYSDEC during the site investigation and interim remedial investigation. The septic system consisted of three perforated drainage tiles exiting from three different locations along the eastern wall of the building. No septic tank was encountered during excavation activities. Drainage pipe and surrounding gravel were excavated and disposed of offsite. Following septic system removal, the building was plumbed to the municipal sanitary sewer system. The site is serviced with other public utilities including natural gas, electricity, and municipal water.

A petroleum spill was reported at the adjacent property south of Jack's Drycleaners during a tank removal project. A subsurface investigation was conducted at the adjacent property in October 2006 by Nature's Way Environmental Consultants and Contractor's, Inc. (Nature's Way). Nature's Way reported the presence of volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) in soil and groundwater at concentrations exceeding NYSDEC guidance values set forth in Technical and Administrative Guidance Memorandum (TAGM) 4046.

Nature's Way was retained to complete soil excavation in the impacted areas. Excavation activities began on 27 November 2006 and were completed on 7 December 2006. Two 1,000-gal underground storage tanks (USTs) containing petroleum impacted water were uncovered. Water was removed from the USTs prior to their excavation. Approximately 1,145 tons of impacted soil were removed from the site and disposed of at the Ontario County Landfill located in Stanley, New York. Excavation sidewall and bottom soil samples indicated that concentrations of SVOCs and VOCs in soils were greater than NYSDEC TAGM 4046 guidance

values.

Nature's Way was also retained to facilitate the installation of five groundwater monitoring wells on the adjacent site on 18-19 April 2007. Some of the wells were installed close to the Jack's Drycleaners property. Groundwater monitoring conducted in 2007 indicated that concentrations of chlorinated VOCs (CVOCs) were present in groundwater located at the site and appeared to be from a source area located immediately behind the Jack's Drycleaners property.

1.3.3 Physiography

The subject site is located on the U.S. Geological Survey (USGS) Brewerton, New York 7.5-minute topographic quadrangle map, dated 1978 (Figure 3). The topography at the site is generally flat, but slopes slightly to the east and southeast. Adjoining properties located to the east and southeast consist of low-lying wet areas, open grassy areas, and wooded lots.

Elevation at the site is approximately 402 ft above mean sea level. The nearest surface water feature, as noted on the topographic map is the Oneida River located approximately 0.25 mi to the northeast of the subject site. The Oneida River flows from Oneida Lake and discharges into the Seneca and Oswego rivers, and ultimately into Lake Ontario.

1.3.4 Site Geology

A review of the geologic map of New York, Finger Lakes Sheet published by the University of the State of New York, the State Education Department, dated 1970, indicates that the bedrock located at the site lies within the Silurian Clinton Group, which consists of the Herkimer Sandstone, Kirkland Hematite (grayish-red, quartzose, calcareous, hematitic dolomite), Willowvale Shale (gray to greenish-gray fossiliferous shales), Westmoreland Hematite, Sauquoit Formation (sandstone, shale), and the Oneida Conglomerate. Bedrock cores collected at the site indicate the bedrock consists of highly weathered gray shale to depths of approximately 14-25 ft across the area. Bedrock surfaces in general dip to the southeast and include a trough feature southeast of the site (EA 2010).

According to the Natural Resources Conservation Service (NRCS) in Onondaga County, the site is underlain by the Collamer silt loam, with 2-6 percent slopes. This soil is usually located within lake plains. This soil is described as being moderately well drained. It has formed from a parent material of silty and clayey glaciolacustrine deposits. The site is also underlain by the Madrid fine sandy loam, with 2-8 percent slopes. This soil is usually located within drumlinoid ridges, hills, and till plains. This soil is described as being well drained. It has formed from a parent material of loamy till derived mainly from sandstone and limestone.

Based on documented soil boring site investigations conducted in 2006, 2008, and 2009, the site is underlain by silt and clay with alternating layers of fine to coarse sand.

1.3.5 Site Hydrogeology

Based on work completed at the site and the historical data review, shallow groundwater was typically encountered between 2 and 13 ft below ground surface (bgs) at the site, and in areas east and southeast of the site. Based upon the groundwater elevation data from multiple nested wells installed on- and off-site, the overburden and shallow bedrock groundwater is part of the same aquifer. The regional groundwater flows in a southeasterly direction across the site and surrounding properties. The hydraulic gradient across the site is approximately 0.01 and the estimated (conservative low) seepage velocity is approximately 12 ft per year based on known flow path and commercial records showing that the property has been used as a drycleaners since 1972.

2. SUMMARY OF REMEDIAL INVESTIGATION AND EXPOSURE ASSESSMENT

The following sections briefly summarize the environmental impacts at the Jack's Drycleaners site. This section is organized by media and areas of potential concern. Areas of concern and the impacts associated with the environmental media are based on analytical results and their comparison with the appropriate standards, criteria, and guidance (SCGs). Analytical results used in this FS were obtained from the following:

- The NYSDEC Spill No. 06-06504 RI, SVI report, subsurface investigation, and quarterly groundwater monitoring reports prepared by Nature's Way in 2007.
- The Jack's Drycleaners Site Characterization Report prepared by EA in 2008.
- The Jack's Drycleaners RI prepared by EA in 2010.

The potential areas of concern discussed are soil, soil vapor, and groundwater.

2.1 SOIL

Volatile Organic Compounds

According to the adjacent property subsurface investigation (Nature's Way 2006), and EA's Jack's Drycleaners site characterization (2008) and RI (2010), elevated VOC concentrations were detected in subsurface soils located on the Jack's Drycleaners property. In November and December 2006, NYSDEC contracted Nature's Way to excavate and dispose of underground tanks and impacted soil relating to petroleum compounds detected at the southern portion of the property. Confirmatory sampling indicated that the extent of soil impacts from petroleum compounds were significantly reduced by source removal in this area.

Chlorinated VOCs were detected in soil borings installed immediately behind Jacks Drycleaners. The septic system for the property was located in this area and was removed as part of the interim remedial measure (IRM) activities conducted in September 2009. The septic system was identified as the likely source of soil and groundwater impacts onsite. Impacted soil was excavated from this area down to approximately 2 ft below the water table (12 ft bgs). Confirmatory soil samples were collected on the bottom and the walls of the excavation. Bottom samples contained concentrations of CVOCs, but were less than than Part 375 Unrestricted Use and Protection of Groundwater SCGs. Side wall samples contained concentrations of trichloroethene (PCE), but were less than Unrestricted Use and Protection of Groundwater SCGs. Soil borings located further downgradient did not contain concentrations of CVOCs. VOCs in soil are no longer considered a media of concern on the site.

Semivolatile Organic Compounds

SVOCs were identified during the UST investigation and removal completed by the NYSDEC in 2006-2007. Impacted soil was excavated from the area and disposed. Based on confirmatory samples collected at the site, soil impacts were successfully remediated in this area. SVOCs in soil are no longer considered a media of concern for this site.

2.2 SOIL VAPOR

A limited soil vapor investigation was completed in 2010 at the buildings located adjacent to the site (EA 2010). High water table conditions limited the investigation in some areas. Soil vapors were not detected in buildings adjacent to the site. A SVI investigation was completed downgradient of the groundwater plume in 2011. SVI evaluations were conducted at eight structures within the study area. A total of 23 air/vapor samples were collected during the SVI evaluations in March and April 2011. Samples were analyzed for VOCs by USEPA method TO-15. CVOCs were detected in samples collected from the structures. However, the CVOCs detected within soil vapor/crawlspace air, indoor air, and outdoor air, no compounds were detected in concentrations greater than the applicable New York State Department of Health (NYSDOH) air guideline values for PCE, TCE, or methylene chloride. In addition, when compared to the NYSDOH Soil Vapor/Indoor Air Matrices I and II, the concentrations of CVOCs detected within the structures evaluated do not indicate a need to monitor and/or mitigate any of the structures (EA 2010). Soil vapor is not considered a media of concern for off-site properties.

Sub-slab vapor sampling was also conducted for the on-site building and indicated an elevated PCE concentration of $1,100 \ \mu g/m^3$. Further evaluation and potential installation of a mitigation system is to take place only if there is a future change in the current use of the on-site building. Details of this will be included in a Site Management Plan following the implementation of the selected remedy.

2.3 GROUNDWATER

Groundwater at the site was generally encountered between 4 and 5 ft bgs, but can fluctuate from 1.5 to 12 ft bgs depending on seasonal conditions. Groundwater within 500 ft down-gradient of the site has been impacted by dissolved phase CVOCs (EA 2008 and 2010). The *Ambient Water Quality Standards (AWQS) and Guidance Values and Groundwater Effluent Limitations* (NYSDEC 1998) was used during the RI/FS and will be used when developing alternatives.

Groundwater flows southeast across the site. The source area was identified as the septic system and leach field located directly behind Jack's Drycleaners. The dissolved-CVOC plumes highest concentrations are located in the area of the former septic system and decrease in concentration as groundwater flows across the site. CVOC impacts were observed as far down-gradient as monitoring well MW-15, approximately 500 ft from the source area. Groundwater data collected

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in July 2011 indicate that concentrations in groundwater are decreasing since the IRM was completed in 2009.

Volatile Organic Compounds

Groundwater at the site and down-gradient of the site is impacted with VOCs. The majority of compounds detected and ones in the highest concentration are CVOCs. Other compounds including benzene, toluene, and xylene have been detected in groundwater samples and are likely the residual impacts of the petroleum spill evaluated in 2006-2008. Based on the relative concentrations and known source areas, CVOCs including PCE, TCE, DCE, and vinyl chloride (VC) are identified as the contaminants of concern (COCs) in this FS. Highest concentrations were detected in monitoring wells located near the former source area. PCE, TCE, DCE and VC are detected in concentrations greater than AWQS as far as 500 ft down-gradient of the source area. A groundwater plume map for data collected in July 2011 illustrates the extent of the groundwater plume at the site (Figures 4A and 4B).

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3. DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES

Goals for the remedial program have been established through the remedy selection process stated in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, May 2010. The remedial goal for all remedial actions is considered to be the restoration of the site to the pre-disposal/pre-release conditions to the extent practicable and legal. Remedial action objectives (RAOs) are defined as the medium specific or operable-unit specific cleanup objectives to provide protection of public health and the environment. The RAOs are based on contaminant-specific SCGs.

3.1 CLEANUP STANDARDS, CRITERIA, AND GUIDANCE

COCs at the Jack's Drycleaners site were determined based on the frequency of detections exceeding SCGs and the range of concentrations in groundwater samples. COCs are PCE, TCE, *cis*-1,2-DCE, *trans*-1,2-Dichloroethene (*trans*-1,2-DCE), and VC. Cleanup standards for groundwater are presented in the following table.

Parameter List USEPA Method 8260B	Range of Concentrations (µg/L)	Frequency of Detection	Frequency Exceeding SCGs	NYSDEC Ambient Water Quality Standard Class GA (µg/L)
1,1,1-Trichloroethane	0.86 - 2.9	2/67	0	5
1,1-Dichloroethane	0.72 - 2.3	6/67	0	5 (s)
1,1-Dichloroethene	0.62 - 6.2	11/67	1	5 (s)
1,2-Dichlorobenzene	ND - 0.54	1/67	0	3
Chloroethane	1.1 - 42	17/67	6	5 (s)
Chloroform	0.61 - 10.8	10/67	1	7 (s)
cis-1,2-Dichloroethene	1.3 - 10,300	36/67	31	5 (s)
Tetrachloroethene	0.96 - 41,300	41/67	34	5
trans-1,2-Dichloroethene	0.6 - 190	22/67	15	5
Trichloroethene	1.5 - 4,470	34/67	28	5 (s)
Vinyl chloride	0.99 - 2,100	25/67	22	5 (s)

3.2 REMEDIAL ACTION OBJECTIVES

The medium-specific Remedial Action Objectives (RAOs) for groundwater at Jack's Drycleaners site are displayed in the following table.

GROUNDWATER – RAOs	
Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards	
Restore groundwater aquifer to pre-release conditions, to the extent practicable	
Prevent contact with contaminated groundwater	

3.3 OTHER POTENTIALLY APPLICABLE REQUIREMENTS

The NYSDEC Environmental Remediation Programs guidance (6 New York Code of Rules and Regulations [NYCRR] Part 375) requires that site remedies "conform to standards and criteria that are generally applicable, consistently applied, and officially promulgated, that are either directly applicable, or that are not directly applicable but are relevant and appropriate, unless good cause exists why conformity should be dispensed with [6 NYCRR Part 75, 375-1.8(f)(2)]". The primary requirements are presented in the following table.

Requirement	Rationale
FEDERAL	Kationale
Clean Water Act National Pollution Discharge Elimination System 40 Code of Federal Regulations (CFR) Part 122 The National Pollution Discharge Elimination System establishes permitting requirements, technology-based limitations and standards, control of toxic pollutants, and monitoring of effluents to assure discharge permit conditions and limits are not exceeded.	Applicable if groundwater will be extracted from ground and discharged.
Safe Drinking Water Act (National Primary and Secondary Drinking Water Regulations) (42 U.S.C. 300f, 40 CFR Part 141, 40 CFR Part 143) The Safe Drinking Water Act provides a national framework to ensure the quality and safety of drinking water. The primary standards establish maximum contaminant levels and maximum contaminant level goals for chemical constituents in drinking water. Secondary standards pertain primarily to the aesthetic qualities of drinking water.	The removal action is being conducted to reduce chemical concentrations in soil and groundwater, with a goal of meeting cleanup levels at the property boundary.
Clean Air Act, as Amended (42 U.S.C. 7401) The Clean Air Act is a comprehensive law which is designed to regulate any activities that affect air quality, and provides the national framework for controlling air pollution. The National Primary and Secondary Ambient Air Quality Standards (40 CFR Part 50) set standards for ambient pollutants which are regulated within a region. The National Emissions Standards for Hazardous Air Pollutants (40 CFR Part 61) establishes numerical standards for hazardous air pollutants.	The Clean Air Act will be required if any remediation alternatives produce air emissions.
Resource Conservation and Recovery Act Provides the governing regulations for owners and operators of hazardous waste treatment, storage, and disposal facilities; and for the generators and transporters of hazardous waste.	All waste generated during the removal action will be characterized and handled per Resource Conservation and Recovery Act regulations, as implemented by WAC 173-303
Occupational Safety and Health Act (29 CFR 1910) Establishes the worker health and safety requirements for operations at hazardous waste sites.	Site activities will be conducted under appropriate Occupational Safety and Health Act standards

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SCGS FOR THE JACK'S DRYCLEANERS SIT Requirement	Rationale
FEDERAL	I Nationale
	T
Rules for Transport of Hazardous Waste (49 CFR 107, 171) The U.S. Department of Transportation establishes requirements for packaging, handling, and manifesting hazardous waste.	Any hazardous waste generated during site activities will be characterized as needed to determine packaging, handling, and transport requirements.
SCGS FOR THE JACK'S DRYCLEANERS SIT	Έ
Requirement	Rationale
STATE	
NYSDEC Environmental Remediation Programs. 6 NYCRR Part 375 This program applies to the development and implementation of remedial programs for environmental restoration sites.	Site cleanup will be conducted i accordance with 6 NYCRR Part 375.
Solid Waste Management Facilities. 6 NYCRR Part 360 Provides standards and regulations for permitting and operating solid waste management facilities. Waste Transporter Permits. NYCRR Part 364 Provides standards and regulations for waste transporters.	
Land Disposal Restrictions. 6 NYCRR Part 376	1
Hazardous Waste Management System. 6 NYCRR Part 370, 371, 372, 373, 375 Provides standards and regulations for the state hazardous waste management system, identification and listing of hazardous wastes, and provides standards, regulations, and guidelines for the manifest system, as well as additional standards for generators, transporters, and facilities.	These regulations will be followed for off site treatment and disposal of hazardous waste
New York State Department of Transportation Rules for Hazardous Materials Transport. 49 CFR, Parts 107, 171.1-500. Addresses requirements for marking, manifesting, handling, and transport of hazardous materials; applicable if offsite treatment or disposal of wastes is required.	
Water Quality Regulations for Surface Waters and Groundwater. 6 NYCRR Part 700-706 Provides standards, regulations, and guidelines for the protection of waters within the state.	Water discharged from the site will comply with this guidance.
Implementation of NPDES Program in NYS. 6 NYCRR Part 750-757 Provides regulations regarding the SPDES program.	A SPDES permit may be required depending on selected remedial action.
Permits and Registration (Air). 6 NYCRR Part 201 Describes permits and registration requirements	Permit or registration may be required depending on selected remedial action.
Air Quality Standards. 6 NYCRR Part 257 Air quality standards are designed to provide protection from the adverse health effects of air contamination; and they are intended further to protect and conserve the natural resources and environment.	All substantive requirements of the State air pollution control regulations will be followed during implementation of the remedial action.
LOCAL	
Land development standards, storm water and surface water regulations, and clearing and grading requirements.	Local permits are required depending on the selected remedial action.
Building permits and building codes.	Local permits are required depending on the selected remedial action.

4. GENERAL RESPONSE ACTIONS

In general, remedial technologies fit into one or more category of general response actions (GRA). GRAs are generic, medium-specific, remedial actions that will satisfy the RAOs discussed earlier. GRAs may include no action, institutional controls, containment, removal, treatment, disposal, monitoring, or a combination thereof (USEPA 1988). The development of remedial alternatives for this FS begins with the identification of GRAs that can meet RAOs. These GRAs are then screened based on their effectiveness, implementability, and cost; and developed into remedial alternatives to address all contaminated media at the site.

4.1 GROUNDWATER

Technologies for the remediation of groundwater will fall into GRAs no further action, monitored natural attenuation, containment, removal, and treatment.

No Further Action

The no further action alternative is included to be used as the baseline alternative against which the effectiveness of all other remedial alternatives are judged.

Monitored Natural Attenuation

For groundwater contaminated with VOCs, monitored natural attenuation consists of sampling groundwater for contaminant concentrations and natural attenuation parameters. Natural attenuation with monitoring allows natural processes to achieve site-specific remedial objectives without enhancement or aggressive treatment. The "natural attenuation processes" that are at work in such a remediation approach include physical, chemical, or biological processes, that under favorable conditions, reduce the mass, toxicity, mobility, volume, or concentration of contaminants in the groundwater. Natural attenuation processes that could occur include biodegradation (aerobic or anaerobic), abiotic transformation (e.g., hydrolosis), adsorption, dispersion, or dilution.

Containment

Containment can be accomplished via containment walls or via physical extraction of groundwater for *ex-situ* treatment. Once groundwater is extracted, treatment technologies for groundwater could include air stripping, granular activated carbon, etc.

In-Situ Treatment

In-well ozone sparging is considered a potential *in-situ* treatment technology for groundwater. In-well ozone sparging consists of injecting ozone into the VOC-contaminated groundwater, which dissolves in the water and oxidizes the contaminants. Because the contaminants are treated and not volatilized, vapor does not need to be managed. EA Engineering, P.C. and its Affiliate EA Science and Technology

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Another *in-situ* technology for groundwater contaminated with VOCs is enhanced reductive dechlorination, which is achieved by the injection of an electron donor emulsified product into the aquifer. Contaminants fully degrade to ethene and ethane.

5. IDENTIFICATION AND SCREENING OF TECHNOLOGIES

5.1 PRELIMINARY SCREENING

Two preliminary screening criteria (effectiveness and implementability) were used to screen the remedial technologies listed in Section 4. Definitions for these criteria are presented below and the technology screening is presented in Table 1.

5.1.1 Effectiveness

This criterion is a measure of the ability of an option to: (1) reduce toxicity, mobility, or volume of contamination; (2) minimize residual risks; (3) afford long-term protection; (4) comply with applicable or relevant and appropriate requirements; (5) minimize short-term impacts; and (6) achieve protectiveness in a limited duration. Technologies that offer significantly less effectiveness than other proposed technologies may be eliminated from the alternative development process. Options that do not provide adequate protection of human health and the environment likewise may be eliminated from further consideration.

5.1.2 Implementability

Implementability is a measure of the technical feasibility and availability of the option and the administrative feasibility of implementing it (e.g., obtaining permits for off-site activities, rightsof-way, or construction). Options that are technically or administratively infeasible or that would require equipment, specialists, or facilities that are not available within a reasonable period may be eliminated from further consideration.

5.2 SCREENING SUMMARY

The results of the technology screening are summarized in the following two sections. The first section discusses technologies that were not retained for further analysis, and the reasons for exclusion. The second section lists technologies that were retained for further analysis as individual components in remedial alternatives. The screening is presented in greater detail in Table 1.

5.2.1 Technology Not Retained for Further Analysis

From the list of technologies potentially applicable for remediation of the chemicals and media of concern at this site, numerous technologies were excluded from further consideration because they were considered ineffective, not implementable at this site, or too costly relative to the other alternatives under consideration. The reasons for exclusion are explained in the following paragraph.

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Technologies Not Retained for Groundwater Remediation

Containment walls will not treat contaminated groundwater and when implemented alone, do not prevent the further contamination of groundwater. Containment walls can only alter the groundwater flow direction and, thus, are considered ineffective for remediation of groundwater.

5.2.2 Technologies Retained for Further Analysis

Technologies that passed through screening and will be retained and combined to create remedial alternatives for the site are listed below for each media of concern.

The focused list of remedial technologies considered in this FS for groundwater is:

- No further action
- Monitored natural attenuation
- In-situ treatment
- *Ex-situ* treatment

6. SCOPING AND DEVELOPMENT OF REMEDIAL ALTERNATIVES

EA has completed the alternative comparison in accordance with DER-10 and the 1988 USEPA publication *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA 1540IG-891004). The screening of alternatives was designed to provide a basis for an overall assessment of applicable technologies based on impacted media identified at the site during the RI. The list of alternatives was limited to three to focus the FS on known and frequently implemented alternatives used for remediation of the COCs in the environment.

The five remedial alternatives evaluated are:

- No further action
- Long-term monitoring with monitored natural attenuation
- In-situ enhanced reductive dechlorination
- *In-situ* ozone-enhanced aquifer air sparging
- Groundwater extraction and treatment.

6.1 ALTERNATIVE 1: NO FURTHER ACTION

The no further action alternative is evaluated as a procedural requirement and as a basis for comparison. This alternative would leave the site in its present condition.

6.2 ALTERNATIVE 2: LONG TERM MONITORING WITH MONITORED NATURAL ATTENUATION

Natural attenuation with monitoring consists of monitoring groundwater COCs to ensure the contamination footprint and contaminant concentrations are stable or decreasing. This alternative includes long-term groundwater monitoring for VOCs and natural attenuation parameters. Existing monitoring wells would be used.

Monitoring will be implemented as follows:

• Groundwater samples would be collected semiannually for the first 5 years and annually thereafter to measure the concentration of VOCs and natural attenuation parameters (monitoring is estimated to be conducted for 30 years). Monitored Natural Attenuation (MNA) parameters have not been collected at the site yet. Samples would be collected from 20 existing monitoring wells.

6.3 ALTERNATIVE 3: IN-SITU ENHANCED REDUCTIVE DECHLORINATION

Direct-push methods would be used to inject an electron donor emulsion into the contaminated aquifer. This emulsion would optimize anaerobic biodegradation, speeding up natural degradation processes. While only one injection event was included in this alternative, it is possible that

additional events may be required to attain SCGs. The need for supplementary injections would depend on field conditions.

In-situ enhanced reductive dechlorination would be implemented as follows and as shown on Figure 5:

- A utility locator would be brought onsite to locate any underground utilities or other obstructions that may prove problematic to drilling.
- Pre-design sampling would be conducted to determine whether or not MNA is occurring at the site.
- Electron donor emulsion would be injected into the aquifer using direct-push equipment and a diaphragm pump with a rating of 800 psi. Emulsion would be diluted 10:1 prior to application.
- Emulsion would be injected into 42 points within the source area in a $15-ft \times 20-ft$ grid.
- Emulsion would be injected into 105 points within the plume area in 7 rows of 15 points, spaced 10 ft apart. Each row would run in a northeast-southwest direction, and the rows would be parallel, in an east-west direction, 60 ft apart.
- Following injection, injection points would be filled with sand to the top of the treatment zone, then sealed with bentonite and a concrete or asphalt cap, as needed to prevent surfacing of the emulsion.
- Groundwater samples would be collected quarterly for the first 2 years and annually thereafter to measure the concentration of VOCs (monitoring is estimated to be conducted for 10 years or until soil cleanup objectives [SCOs] are achieved). Samples would be collected from 20 existing monitoring wells.

6.4 ALTERNATIVE 4: IN-SITU OZONE SPARGING

Air combined with ozone would be forced into the aquifer via a network of wells installed as a grid designed to cover the extent of the plume; thereby, promoting contaminant degradation vertically and horizontally within the dissolved phase plume. This remedy would involve the installation of treatment infrastructure at the site. Ozone sparging would operate continuously until pre-disposal conditions are achieved.

In-situ ozone sparging would be implemented as follows and as shown on Figure 6:

- A utility locator would be brought onsite to locate any underground utilities or other obstructions that may prove problematic to well installation.
- A pump test would be performed to determine radius of influence for the design.

- A network of 116 wells would be installed at a 30-ft grid throughout the plume footprint.
- An ozone generator would introduce ozone to an air sparger, which would force the air/ozone into the wells by a network of hoses and pipes.
- Ozone/air sparging would be conducted within network wells on an alternating basis, so as to avoid creating treatment pathways and maximize the radius of influence.
- Groundwater samples would be collected quarterly for the first 2 years and annually thereafter to measure the concentration of VOCs (monitoring is estimated to be conducted for 10 years or until SCOs are achieved). Samples would be collected from 20 existing monitoring wells.

6.5 ALTERNATIVE 5: GROUNDWATER EXTRACTION AND TREATMENT

Extraction wells within and along the plume boundary would be used to continuously pump water into a granular activated carbon treatment system, and then discharged. Groundwater extraction and treatment would be implemented as follows and as shown on Figure 7:

- A utility locator would be brought onsite to locate any underground utilities or other obstructions that may prove problematic to well installation.
- A pump test would be performed to determine radius of influence for the design.
- 10 new extraction wells would be installed to approximately 35 ft bgs, 30 ft apart within the southeastern part of the plume.
- Water will be pumped at a rate of 375 ft³ per day (2 gal per minute). Extracted groundwater will be treated on-site via three granular activated carbon vessels in series. Effluent will be discharged to the municipal storm sewer system pending permit application and acceptance.
- Groundwater samples would be collected from 20 existing monitoring wells.
- For this cost estimate, it is assumed the remedial goals would be achieved within 30 years and groundwater monitoring would occur semi-annually for the first 2 years of remediation and annually thereafter, for a total of 30 years.

7. DETAILED ANALYSIS OF ALTERNATIVES

This section describes the process for the detailed analysis of remedial alternatives for the Jack's Drycleaners site and also presents the cost estimates used as part of the analysis.

The detailed analysis of the remedial alternatives including comparison using the criteria listed below is presented in Table 3.

7.1 CRITERIA USED FOR ANALYSIS OF ALTERNATIVES

The criteria to which potential remedial alternatives are compared (and used during this detailed analysis) are defined in 6 NYCRR Part 375, which governs the remediation of inactive hazardous waste disposal sites in New York, and are listed below:

- Overall protectiveness of the public health and the environment
- SCGs
- Long-term effectiveness and permanence
- Reduction in toxicity, mobility, or volume of contamination through treatment
- Short-term impacts and effectiveness
- Implementability
- Cost-effectiveness
- Land use
- Community acceptance.

A description of the criteria and how alternatives are evaluated against them follows.

Overall Protectiveness of the Public Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

Standards, Criteria, and Guidance. Compliance with SCGs addresses whether a remedy would meet environmental laws, regulations, and other standards and criteria. The SCGs are presented in Section 3.

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

Reduction of Toxicity, Mobility, or Volume of Contamination Through Treatment. The degree to which the alternative permanently reduces the toxicity, mobility, or volume of hazardous substances including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases,

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the degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility, or volume of the wastes at the site.

Short-term Impacts and Effectiveness. Evaluation of the short-term effectiveness for an alternative includes consideration of the risk to human health and the environment associated with the alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks. Impacts from remedial action implementation include vehicle traffic; temporary relocation of residences/buildings; temporary closure of public facilities; odor; open excavations; and noise, dust, and safety concerns associated with extensive heavy equipment activity. The greatest short-term risk to human health is related to safety and general construction activity.

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.

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

Land Use. The current and anticipated future use of the site will be considered. Land use must comply with applicable zoning laws and maps.

Community Acceptance. Public comments will be considered after the close of the public comment period.

7.2 COST ASSUMPTIONS

An unrestricted use cost was developed for each remedial alternative as part of the FS process. Cost assumptions were prepared for each alternative using USEPA's *Guide to Developing and Documenting Cost Estimates during the Feasibility Study* (1996). Net present value of the project costs were estimated using an interest rate of 5 percent. The cost assumptions were calculated using the most common products and application methods available for a remedial alternative. The USEPA guidance was used in conjunction with *DER-10 Technical Guidance for Site Investigation and Remediation* (NYSDEC 2010).

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7.2.1 Costs

Based on the results of the remedial technology screening in Table 1, the following cost estimates were prepared for Alternatives 1 through 5. Appendix A shows the detailed cost estimates.

Alternative 1: No Further Action

Present Worth	\$0
Capital Cost	
Annual Costs	

Alternative 2: Long-Term Monitoring with Monitored Natural Attenuation

Present Worth	\$438,000
Capital Cost	
Annual Costs (Years 1-5)	\$45,000
Annual Costs (Years 6-30)	

Alternative 3: In-Situ Enhanced Reductive Dechlorination

Present Worth	\$602,000
Capital Cost	
Annual Costs (Years 1-2)	
Annual Costs (Years 3-10)	\$16,000

Alternative 4: In-Situ Ozone-Enhanced Aquifer Air Sparging

Present Worth	\$2,041,000
Capital Cost	\$1,087,000
Annual Costs (Years 1-2)	
Annual Costs (Years 3-10)	

Alternative 5: Groundwater Extraction and Treatment

Present Worth	\$1,400,000
Capital Cost	\$479,000
Annual Costs (Years 1-5)	
Annual Costs (Years 6-30)	\$56,000

8. RECOMMENDATIONS

The purpose of this FS was to develop, screen, and evaluate potential remedial alternatives for the Jack's Drycleaners site. Remedies were identified and screened in accordance with USEPA and NYSDEC guidance.

Five remedial alternatives were developed in this FS, as identified below.

- Alternative 1—No Further Action
- Alternative 2—Long-Term Monitoring with Monitored Natural Attenuation
- Alternative 3—In-Situ Enhanced Reductive Dechlorination
- Alternative 4—In-Situ Ozone-Enhanced Aquifer Air Sparging
- Alternative 5—Groundwater Extraction and Treatment.

Alternative 1 does not meet any of the RAOs. Alternative 2 may meet RAOs over time through naturally occurring degradation, but needs to be proven through long-term monitoring. Alternatives 3, 4 and 5 will meet RAOs and in less time than Alternative 2, but at a greater cost. Alternative 5 will take a significantly longer time (30 years) than Alternatives 3 and 4 to meet RAOs, as well as cost more than Alternative 3. Alternatives 3 and 4 should take a similar amount of time if one treatment event is sufficient to reach SCGs in Alternative 3. However, Alternative 4 is more expensive and involves the installation of site remedial facilities and infrastructure. Alternative 3 is recommended because it is an effective treatment solution with minimal site construction requirements and will meet RAOs in a short amount of time at a significantly lower cost.

9. REFERENCES

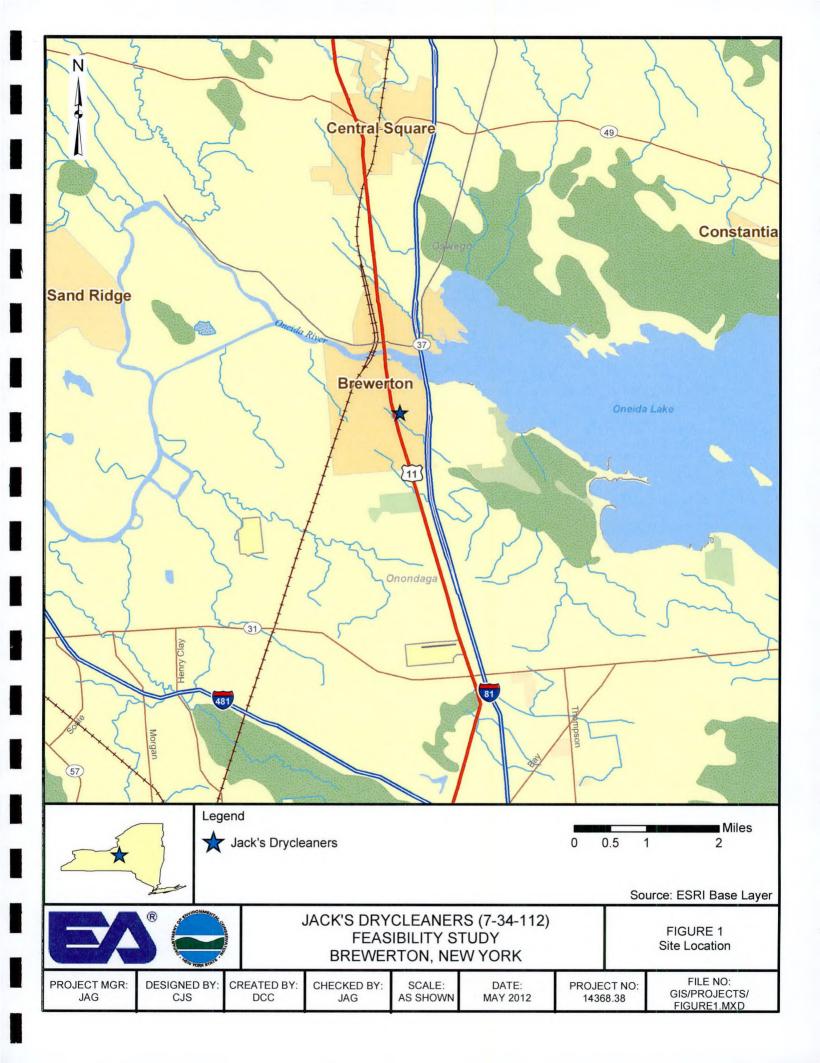
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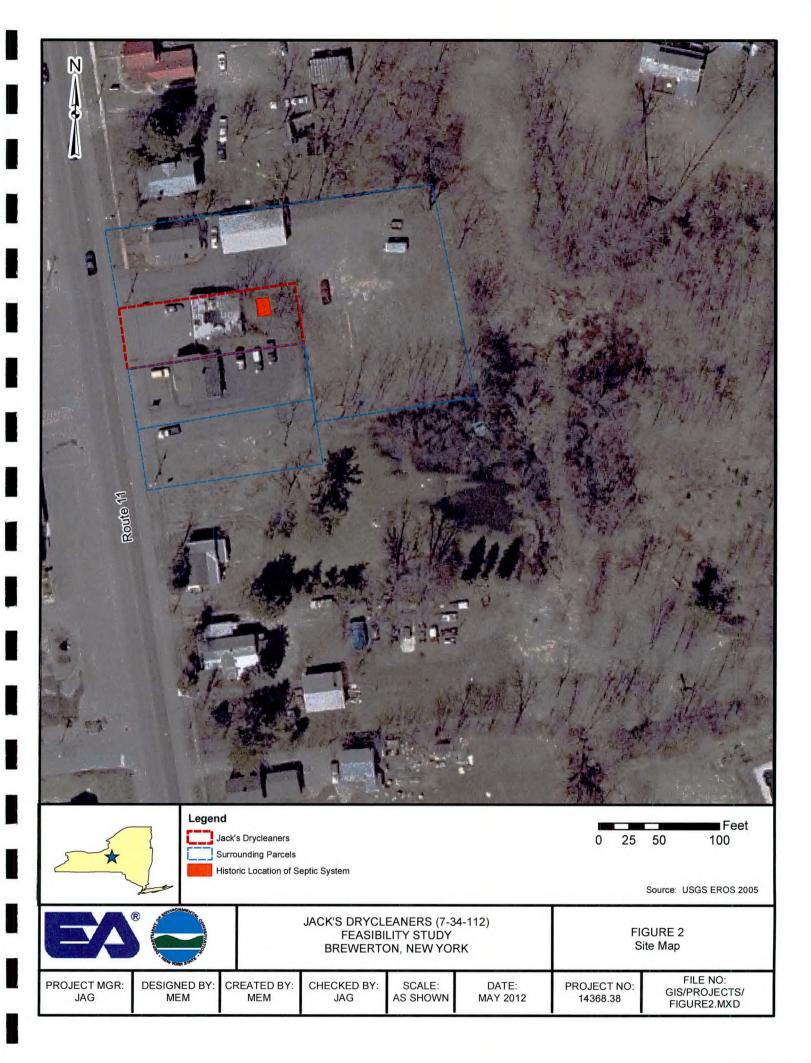
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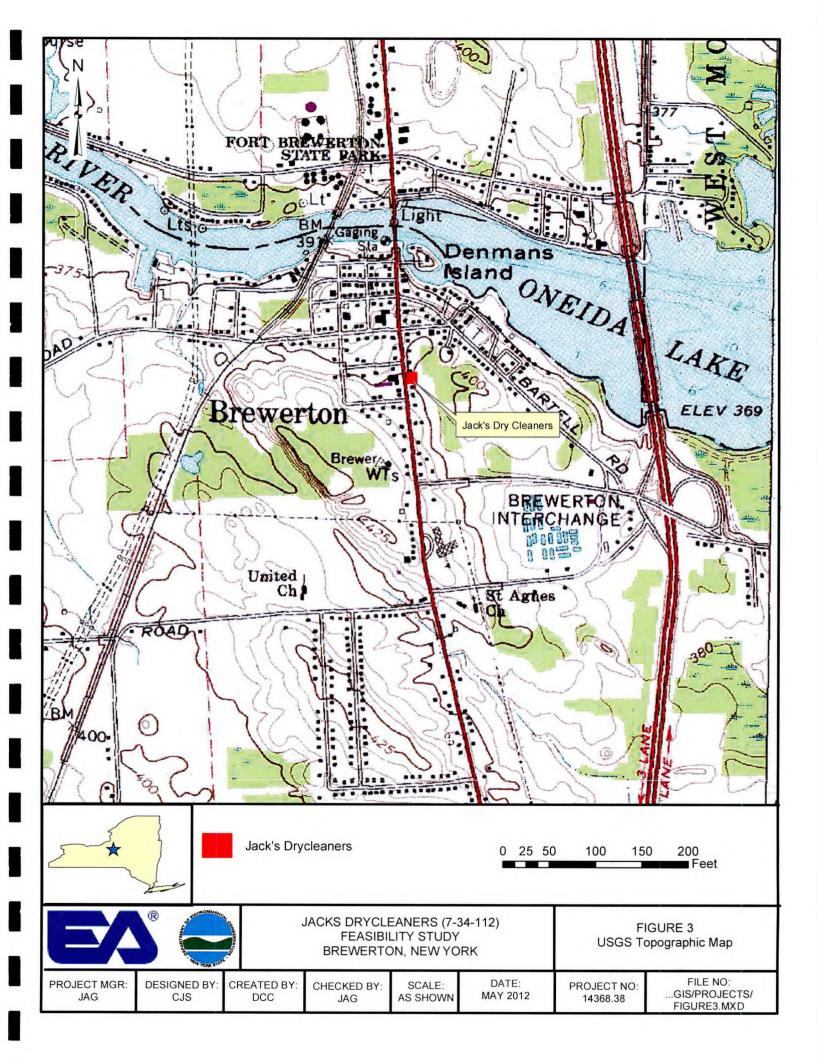
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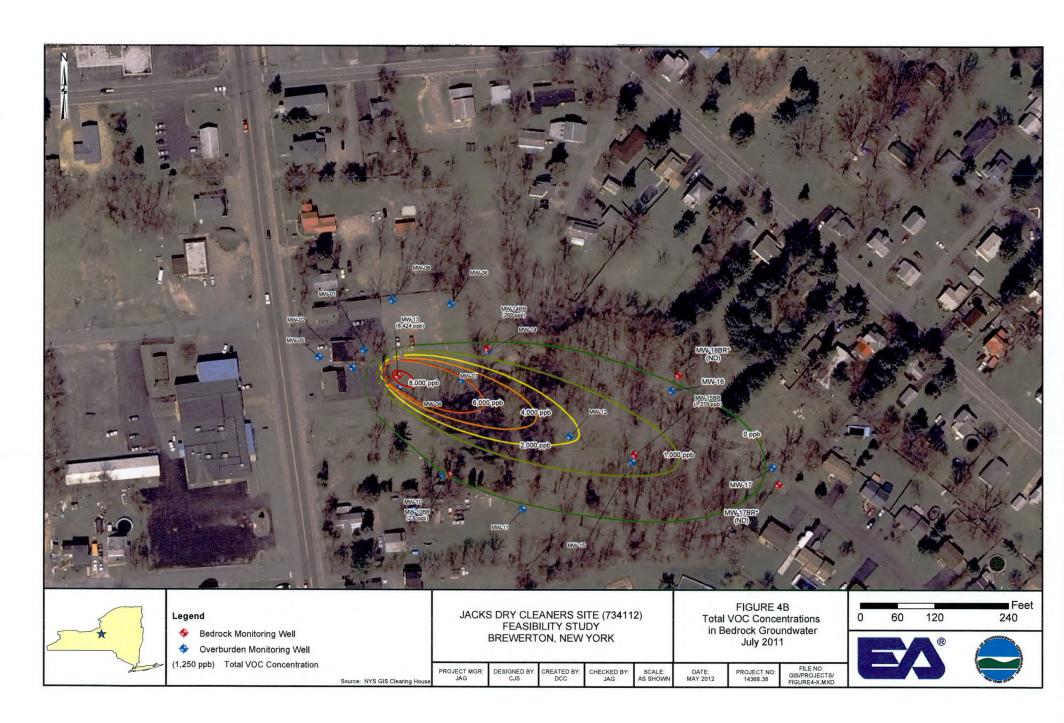
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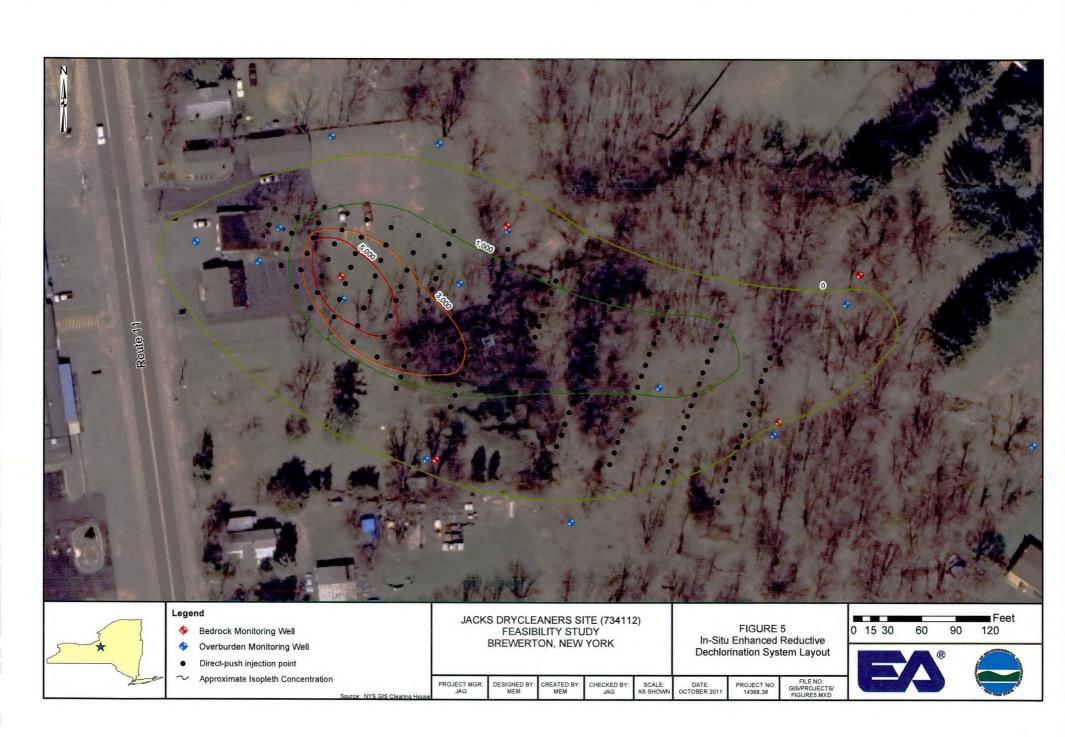


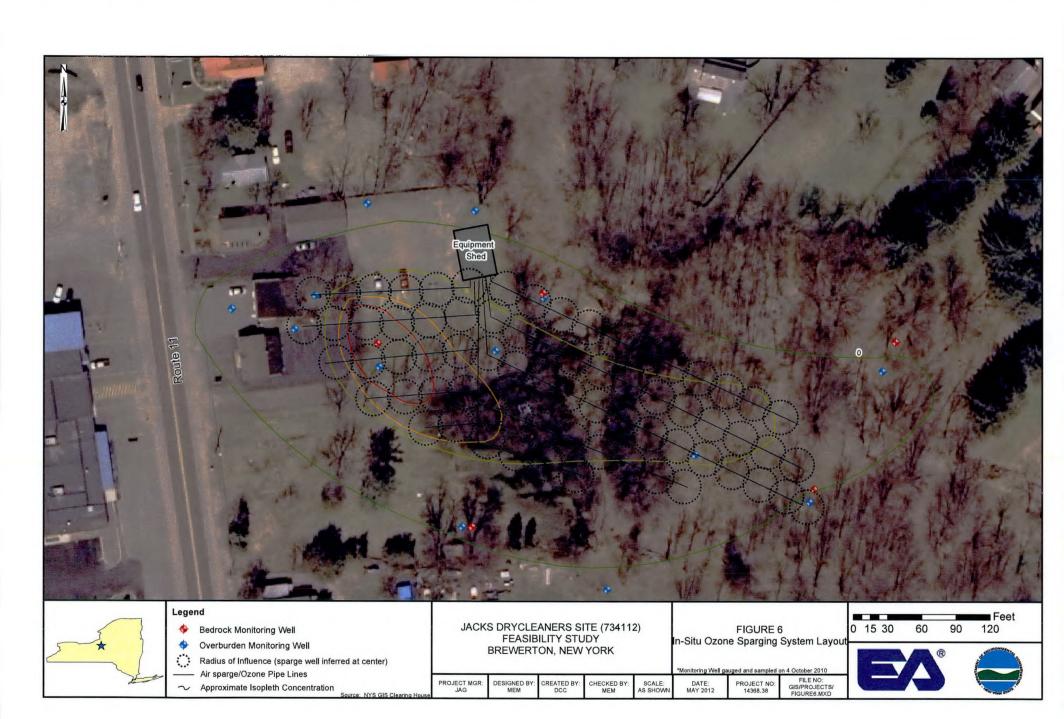














EA Engineering, P.C. and its Affiliate EA Science and Technology

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TABLE 1 REMEDIAL TECHNOLOGY SCREENING

General Response Action	Technology	Effectiveness	Implementability	Status
		Media: Groundwater	•	
	Ta	rget Contaminant of Concern: Volatile	Organic Compounds	
No Further Action	No Further Action	Not effective	Easy to implement	Retained
Monitoring	Long-Term Monitoring with Monitored Natural Attenuation	Effectiveness depends on conditions, including groundwater flow, oxidation reduction potential, and dissolved oxygen levels within the plume	Implementable	Retained
In-Situ Biological	Reductive Dechlorination	Effective at promoting degradation of contaminants within aquifer.	Easy to implement, with no infrastructure required. Requires long-term treatment and monitoring.	Retained
Treatment	Ozone Sparging	Effective at promoting degradation of contaminants within aquifer.	Implementable, but requires infrastructure. Requires long-term operation and maintenance.	Retained
Removal and Treatment	Groundwater Extraction and Treatment	Effective at removing contamination from extracted groundwater.	Implementable. Requires long-term operation and maintenance	Retained

Feasibility Study

EA Engineering, P.C. and its Affiliate EA Science and Technology

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	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
	No Further Action	Long-Term Monitoring with Monitored Natural Attenuation	<i>In-Situ</i> Enhanced Reductive Dechlorination	In-Situ Ozone Sparging	Groundwater Extraction and Treatment
Size and Configuration of Process Options	None.	Groundwater samples would be collected semiannually for the first five years, and annually for the next twenty five, or until cleanup goals are achieved.	An injectable substrate would be applied via 147 direct push locations. Groundwater samples would be collected following injection to evaluate the need for further treatment, and for up to 10 years, or until cleanup goals are achieved.	the Jack's Drycleaners site. Air with ozone	Ten extraction wells would be installed along the downgradient edge of the contaminated groundwater plume. Contaminated groundwater would be pumped to a treatment trailer on the site property, then discharged. Groundwater samples would be collected semiannually for the first five years and annually for the next five, or until cleanup goals are achieved.
Time for Remediation	NA	Approximately 30 years.	Approximately 1-2 years.	Approximately 10 years.	Approximately 30 years.
Spatial Requirements	None	None	None	Area for equipment and treatment (~50,000 sq ft)	Area for equipment and treatment (~20,000 sq ft).
Options for Disposal	NA	NA	NA	NA	Water would be treated and sampled prior to discharge.
Substantive Technical Permit Requirements	None	None	None	None	SPDES equivalency permit would be required for discharging treated water to storm sewers, or approval by sewer authorities for disposal to sanitary sewer.
Limitations or Other Factors Necessary to Evaluate Alternatives	Will not remove contaminants from groundwater.	Will not remove contaminants from groundwater, as it relies on natural degradation processes.	Groundwater sampling will be necessary to track progress.	Groundwater sampling will be necessary to track progress	Pump test will be required to finalize design Groundwater sampling will be necessary to track progress.
Public Impacts	None	None	None	Equipment may be loud in the treatment area.	Extraction wells will need to be installed on private property to achieve hydraulic contro of the plume.
Beneficial and/or Adverse Impacts on Fish and Wildlife Resources	No known impacts on fish and wildlife resources.	No known impacts on fish and wildlife resources.	No known impacts on fish and wildlife resources.	No known impacts on fish and wildlife resources.	No known impacts on fish and wildlife resources.
Net Present Worth	\$0.00	\$438,000	\$597,000	\$2,051,000	\$1,400,000

TABLE 2 GROUNDWATER ALTERNATIVES SCREENING

Jack's Drycleaners Site (734112) Brewerton, New York

TABLE 3 GROUNDWATER ALTERNATIVE EVALUATION SUMMARY

			Media: Groundwater		
	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
	No Further Action	Long-Term Monitoring with Monitored Natural Attenuation	In-Situ Enhanced Reductive Dechlorination	In-Situ Ozone Sparging	Groundwater Extraction and Treatment
1) Overall Protection of	of the Public Health and the Environment				
	There is no reduction of risk with this alternative. The groundwater pathways would continue to pose unacceptable risk to all receptors.	There is no reduction of risk with this alternative. The groundwater pathways would continue to pose risk to all receptors.	No risk remains because entire plume will be treated.	No risk remains because entire plume will be treated.	No risk remains because entire plume will be treated.
(2) Standards, Criteria	and Guidance (SCGs)				
ay oranioards, cracia	Does not meet SCG criterion.	Does not meet SCG criterion.	Will meet SCG criterion for groundwater in the treated area.	Will meet SCG criterion for groundwater in the treated area.	Will meet SCG criterion for groundwater in the treated area.
(3) Long-Term Effectiv	eness and Permanence		u cu.	arva.	arca.
	This alternative will not provide long-term effectiveness or permanence. This alternative offers no controls. The plume may expand and contaminate previously uncontaminated portions of the aquifer.	This alternative will only track long-term migration and natural degradation of the plume. It will not prevent the plume from expanding and contaminating previously uncontaminated portions of the aquifer.	In-situ treatment will provide long-term effectiveness and permanence for groundwater within plume. Monitoring will provide a means to recognize remedy failure and implement a more aggressive remedy, if necessary.	In-situ treatment will provide long-term effectiveness and permanence for groundwater within plume. Monitoring will provide a means to recognize remedy failure and implement a more aggressive remedy. if necessary.	Ex-situ treatment will provide long-term effectiveness a permanence for groundwater within plume. Monitoring will provide a means to recognize remedy failure and implement a more aggressive remedy, if necessary.
(4) Reduction of Toxici	ty, Mobility, or Volume of Contamination Through Trea	atment			
Amount of Hazardous Materials Destroyed, Treated, or Removed	None	None	In-situ treatment will break down COCs in groundwater within plume.	In-situ treatment will break down COCs in groundwater within plume.	Ex-situ filtration treatment will remove COCs from groundwater within plume.
Degree of Expected Reductions in Toxicity, Mobility, or Volume	None	None	Contaminant toxicity and volume will be reduced.	Contaminant toxicity and volume will be reduced.	Contaminant toxicity and volume will be reduced.
Irreversible Treatment?	No	No	Yes	Yes	Yes
Residuals Remaining After Treatment	Yes	Yes	No	No	No
(5) Short-Term Impact	and Effectiveness				
Community Protection	There is no action and therefore, no additional risk to the community.	No additional risk to the community.	Increased short-term risks to the public during installation activities and transport of equipment and materials to and from site. These can be mitigated through standard construction practices and permitting.		Increased short-term risks to the public during installatit activities and transport of equipment and materials to an from site. These can be mitigated through standard construction practices and permitting.
Worker Protection	Workers can potentially be exposed to contaminated groundwater by trenching activities south of the site.	Workers can potentially be exposed to contaminated water during groundwater sampling activities. Risks can be minimized by implementing health and safety controls.	Workers can potentially be exposed to contaminated vapors or water during activities. Work around heavy equipment and electrical power carries potential risk to workers. Risks can be minimized by implementing health and safety controls.	Workers can potentially be exposed to contaminated vapors or water during activities. Work around heavy equipment and electrical power carries potential risk to workers. Risks can be minimized by implementing health and safety controls.	Workers can potentially be exposed to contaminated vapors or water during activities. Work around heavy equipment and electrical power carries potential risk to workers. Risks can be minimized by implementing hea and safety controls.
Environmental Impacts	None	None	Wastes produced will include contaminated PPE. Wastes will be managed in compliance with ARARs.	Wastes produced will include contaminated PPE. Wastes will be managed in compliance with ARARs.	Wastes produced will include contaminated PPE. Was will be managed in compliance with ARARs.
Fime Until Action Complete (Field Construction Time)	No action taken	30 years	1-2 years- dependent upon groundwater sampling	10 years (Approximately 6 months construction time) - dependent upon groundwater sampling	30 years (Approximately 2 months construction time) - dependent upon groundwater sampling

TABLE 3 GROUNDWATER ALTERNATIVE EVALUATION SUMMARY

	Alternative 1	Alternative 2	11		
	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
	No Further Action	Long-Term Monitoring with Monitored Natural Attenuation	In-Situ Enhanced Reductive Dechlorination	In-Situ Ozone Sparging	Groundwater Extraction and Treatment
(6) Implementability					
Ability to Construct and Operate	Not Applicable.	Not Applicable.	In-situ bioremediation is easy to implement.	In-situ aquifer air sparging with ozone is implementable.	Ex-situ treatment of groundwater is implementable.
Monitoring Requirements	Not Applicable.	Monitoring would take place semiannually for the first five years, and annually thereafter.	confirmed. Monitoring would take place semiannually for	Groundwater requires monitoring until cleanup confirmed. Monitoring would take place semiannually for the first five years, and annually thereafter.	Groundwater requires monitoring until cleanup confirmed. Monitoring would take place semiannually fo the first five years, and annually thereafter.
Availability of Equipment and Specialists	Not Applicable.	Equipment and specialists are available for the implementation of this alternative.	Equipment and specialists are available for the implementation of this alternative.	Equipment and specialists are available for the implementation of this alternative.	Equipment and specialists are available for the implementation of this technology.
Ability to Obtain Approvals and Coordinate with Other Agencies	Not Applicable.	Ability to obtain approvals and coordinate with other agencies assumed to be possible.	Ability to obtain approvals and coordinate with property owners assumed to be possible.	Ability to obtain approvals and coordinate with property owners assumed to be possible.	Ability to obtain approvals and coordinate with other agencies assumed to be possible.
(7) Cost Effectiveness					
Cost	\$0	\$438,000	\$597,000	\$2,051,000	\$1,400,000
8) Land Use				54,051,000	51,400,000
	Unrestricted	Unrestricted	Unrestricted	Unrestricted	Unrestricted
9) Community Acceptan					
	TBD	TBD	TBD	TBD	TBD

Appendix A

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Cost Estimates

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Undytical cost Onemtech VOCY: 820 9913 bp pr sample Chemtech MCA (2008; nifflatd 3 yr) 9913 bp pr sample 99307 ap For each sampling over, assumed: 9913 bp pr sample 9900 ap Vork day comsite over 10 yr 9000 ap Store Castle Netser-Inderect ASA and 10% Profit 707.40 pr day Vark castle Netser-Inderect ASA and 10% Profit 707.40 pr day Vark castle Netser-Inderect ASA and 10% profit 910.30 pr day Vark castle Netser-Inderect ASA and 10% profit 910.30 pr day Vark castle Netser-Inderect ASA and 10% profit 910.30 pr day Vark castle Netser-Inderect ASA and 10% profit 910.30 pr day Vark castle Netser-Inderect ASA and ID% profit 910.30 pr day Vark castle Netser-Inderect ASA and ID% profit 910.30 pr day Vark castle Netser-Inderect ASA and ID% profit 910.30 pr day Vark castle Netser-Inderect ASA and ID% profit 910.30 pr day Vark castle Netser-Inderect ASA and ID% profit 910.30 pr day Vark castle Netser-Inderect ASA and ID% profit 910.30 pr day Vark castle Netser-Inderect ASA and ID% profit 910.30 pr day Vark castle Netser-Inderect ASA and ID% profit			20	wells		Events per year		2		event	\$85	Cost per hr	
Chemitech VOC/s 4250 981.86 per sample Chemitech MDA (2008, inflated 3 yr) For each sampling event, asumed: 3507.62 Staff, and	Sampling Long Term Monitoring Fint 5 years will be on a semiannual sampling schedule.		20 3	wells hrs for travel	per event	Events per year		2		event	\$85	Cost per hr	
Chemitedh NNA (2008; niflated 3 yr) 537/42 For atek sampling event, assumed: 558 State and the second sampling event, assumed: 558 Spicar Restar Restar Sampling event, assumed: 10 Water Level Neter 513.98 Submership: Pump 511.39 General Restar 20 Submership: Pump 511.39 General Restar 516.40 Submership: Pump 511.39 General Restar 516.40	Sampling Long Term Monitoring First 5 years will be on a semiannual sampling schedule. After 5 years, monitoring will occur on an annual basis.		20 3	wells hrs for travel	per event	Events per year		2		event	\$85	Cost per hr	
For each sampling event, assumed: 555 for materials (gloves, notebooks, etc.) Vork day consists of: 10 Jus Vpical Rental Rates - Includes G&A and 10% Profit 570,74 pref day Truck SUV (1/2 ton or smaller) 570,74 pref day Water Level Meter 5119,00 pref day Submerible Pump 5111,501 per day Generation: 200 Volt Vote 5120,00 per day Submerible Pump 5111,501 per day Submerible Pump 5111,501 per day Submerible Pump 5112,501 per day Submerible Pump 512,501 per day <td>Sampling Long Term Monitoring Finit 5 years will be on a semiannual sampling schedule. After 5 years, monitoring will occur on an annual basis. Analytical cost</td> <td>8260</td> <td>20 3 20%</td> <td>wells hrs for travel added for QA</td> <td>per event</td> <td>Events per year</td> <td></td> <td>2</td> <td></td> <td>event</td> <td>\$85</td> <td>Cost per hr</td>	Sampling Long Term Monitoring Finit 5 years will be on a semiannual sampling schedule. After 5 years, monitoring will occur on an annual basis. Analytical cost	8260	20 3 20%	wells hrs for travel added for QA	per event	Events per year		2		event	\$85	Cost per hr	
Verk day consists of: 10 brs 'ypical Rental Rates - Includes G&A and 10% Profit Trade/SUV (1/2 ton or smaller) Trade/SUV (1/2 ton or smaller) 510,740 per day Water Coulty Nation 5159,000 per day Water Level Neter 51,800 per day Subacrishic Pump 511,531 per day Generatorn: 200 Volt 5122,460 per day Kotes acch	Sampling Long Term Monitoring Finit 5 years will be on a semiannual sampling schodule. After 5 years, monitoring will occur on an annual basis. Analytical cost Chemicab VOCs-1		20 3 20% 381.86	wells hrs for travel added for QA per sample	per event	Events per year		2		event	\$85	Cost per hr	
ypical RentsI Rates - Includes G&A and 10% Profit Track/SUV (12 ton or smaller) S100,74 per day Water Quality Analyzer S1500,00 per day Water Level Neter S1100 per day Submersible Pump S113,541 per day Generators: 220 Volt S122,66 per day Notes a each	Sampling Long Term Monitoring Fint 5 years will be on a semiannual sampling schedule. After 5 years, monitoring will occur on an annual basis. Analytical cost Chemtech NDA (2008, inflated 2) Chemtech NDA (2008, inflated 2)		20 3 20% \$81.86 \$207.62	wells hrs for travel added for QA per sample	per event /QC			2		event	\$85	Cost per hr	
Truck SUV (1/2 ten or smaller) \$70,74 per day Water Quality Analyzer \$159,00 per day Water Level Meter \$31,300 per day Submershile Pump \$113,91 per day Generators: 200 Volt \$122,460 per day Notes a each	Sampling Long Term Monitoring Fint 5 years will be on a semiannual sampling schedule. Afte 5 years, monitoring will occur on an annual basis. Analytical cost Chemicch MNA (2008, inflated 3 For each sampling event, assumed:	yrs)	20 3 20% \$81.86 \$207.62 \$50	wells hrs for travel added for QA per sample	per event /QC			22		event	\$85	Cost per hr	
Water Caulity Analyzer \$159,000 per day Water Laved Netter \$31,300 per day Submervible Pump \$113,911 per day Generators: 20 Volt \$82,460 per day	Sampling Long Term Monitoring Fint 5 years will be on a semiannual sampling schedule. After 5 years, monitoring will occur on an annual basis. Analytical cost Chemtech VOC+-5 Chemtech MNA (2008, inflated 3 For each sampling event, assumed: Work day consists of:	yrs)	20 3 20% \$81.86 \$207.62 \$50	wells hrs for travel added for QA per sample	per event /QC			22		event	\$85	Cost per hr	
Water Level Meter \$31.00 per day Submershile Pump \$11.30 per day Generators: 20 Volt \$12.48 per day	Sampling Fint 5 years will be on a semiannual sampling schedule. After 5 years, monitoring will occur on an annual basis. Analytical cost Chemtech MNA (2008, inflated 3 For each sampling event, assumed: Work day consists of: Typical Rental Rates - Includes G&A and 10% Profit	yrs) 10	20 3 20% \$81.86 \$207.62 \$50 hrs	wells hrs for travel added for QA per sample	per event /QC			22		event	\$85	Cost per hr	
Submership Pump 9113.91 per day Generators: 2:0 Volt 982.68 per day Kotes a each	Sampling Long Term Monitoring Fint 5 years will be on a semiannual sampling schedule. After 5 years, monitoring will occur on an annual basis. Analytical cost Chemtech VOC%+ Chemtech MNA (2008, inflated 3 For each sampling event, assumed: Work day consults of: Typical Rental Rats - Includes G&A and 10% Profit TruckSUV (/12 on or smaller)	yrs) 10 \$70.74	20 3 20% \$81.86 \$207.62 \$50 hrs per day	wells hrs for travel added for QA per sample	per event /QC			2		event	585	Cost per hr	
Generators: 220 Volt S82.68 per day Notes a each	Sampling Long Term Monitoring Fint 5 years will be on a semiannaal sampling schedule. Afte 5 years, monitoring will occur on an annual basis. Analytical cost Chemicoh NDA (2008, inflated 3 For each sampling event, assumed: Work day consists of: Fypical Rental Rates - Includes G&A and 10% Profit TruckSUV (12 ion or imaller) Water Quilty Analyzer	yrs) 10 \$70.74 \$159.00	20 3 20% \$81.86 \$207.62 \$50 hrs per day per day	wells hrs for travel added for QA per sample	per event /QC			2		event	\$85	Cost per hr	
Notes a cach	Sampling Long Term Monitoring Fint 5 years will be on a semiannal sampling schedule. Afte 5 years, will be on a semiannal sampling schedule. Afte 5 years, monitoring will occur on an annual basis. Natlytical cost Chemtech VOCs-1 Chemtech VNC4 (2008, inflated 3 For each sampling event, assumed: Work day consists of: Fypical Rental Rates - Includes G&A and 10% Profit Truck/SUV (1/2 on or smaller) Water (Jourd Mater Water (Jourd Mater	yn) 10 570.74 5159.00 531.80	20 3 20% 581.86 5207.62 550 hrs per day per day per day	wells hrs for travel added for QA per sample	per event /QC			2		event	585	Cost per hr	
a each	Sampling Long Term Monitoring Fint 5 years will be on a semiannal sampling schedule. Afte 5 years, wonitoring will occur on an annual basis. Analytical cost Chemtech MNA (2008, inflated 3 For each sampling event, assumed: Work day consists of: Uppical Rental Rates - Includes G&A and 10% Profit Truck/SUV (2 to on simaller) Water Quality Analyzer Water Lovel Miter Submersible Pump	yn) 10 570.74 5159.00 531.80 511.59	20 3 20% \$81.86 \$207.62 \$50 hrs per day per day per day per day	wells hrs for travel added for QA per sample	per event /QC			2		event	385	Cost per hr	
	Sampling Long Term Monitoring Fint 5 years will be on a summanual sampling schedule. After 5 years, monitoring will occur on an annual basis. Analytical cost Chemtech MNA (2008, inflated 3 For each sampling event, assumed: Work day consists of: Typical Rental Rates - Includes G&A and 10% Profit Truck-SUV (12 on or maller) Water Quality Analyzer Water Quality Analyzer Water Quality Analyzer Water Lovel Meter Submershibe Pamp Generators: 220 Volt	yn) 10 570.74 5159.00 531.80 511.59	20 3 20% \$81.86 \$207.62 \$50 hrs per day per day per day per day	wells hrs for travel added for QA per sample	per event /QC			2		evant	585	Cost per hr	
A&M Operation and maintenance	Sampling Long Term Monitoring Fint 5 years will be on a similarmal sampling schedule. Afte 5 years will be on a similarmal sampling schedule. Afte 5 years will be on a similarmal sampling schedule. Chemicels VOC+-1 Chemicels MNA (2008, inflated 3 For each sampling event, assumed: Work day consists of: Typical Rental Rates - Includes G&A and 10% Profit TruckSUV (1/2 ton or similar) Water Lovel Mater Subamenble Fump Generators: 220 Volt Votes	yn) 10 570.74 5159.00 531.80 511.59	20 3 20% \$81.86 \$207.62 \$50 hrs per day per day per day per day	wells hrs for travel added for QA per sample	per event /QC					evant	585	Cost per hr	
	Sampling Long Term Monitoring Fint 5 years will be on a siminanal sampling schedule. Afte 5 years, monitoring will occur on an annual basis. Lvalytical cost Chemtech VOC%+ Chemtech MNA (2008, inflated 3 For each sampling event, assumed: Work day consists of: Typical Rental Rates - Includes G&A and 10% Profit TruckSUV (1/2 on or smaller) Water Lovel Meter Submersible Pump Genentor: 2:20 Volt Votes a och	yn) 10 570.74 5159.00 531.80 511.59	20 3 20% \$81.86 \$207.62 \$50 hrs per day per day per day per day	wells hrs for travel added for QA per sample	per event /QC			2		event	585	Cost per hr	
	Sampling Long Term Monitoring Fint 5 years will be on a siminanal sampling schedule. Afte 5 years, monitoring will occur on an annual basis. Lvalytical cost Chemtech VOC%+ Chemtech MNA (2008, inflated 3 For each sampling event, assumed: Work day consists of: Typical Rental Rates - Includes G&A and 10% Profit TruckSUV (1/2 on or smaller) Water Lovel Meter Submersible Pump Genentor: 2:20 Volt Votes a och	yn) 10 570.74 5159.00 531.80 511.59	20 3 20% \$81.86 \$207.62 \$50 hrs per day per day per day per day	wells hrs for travel added for QA per sample	per event /QC					event	585	Cost per hr	
	Sampling First System will be on a summinual sampling schedule. After System, somotioning will occur on an annual basis. Kulytical cost Chemstech MNA (2008, inflated 3 For each sampling event, assumed: Vork day consists of: System Acental Rates - Includes G&A and 10% Profit Truck/SUV (24 non smaller) Water (2will (24 non smaller) Water (2will Makyzer Submensible Pump Genenstor: 2:20 Volt Votes a och	yn) 10 570.74 5159.00 531.80 511.59	20 3 20% \$81.86 \$207.62 \$50 hrs per day per day per day per day	wells hrs for travel added for QA per sample	per event /QC			2		event	585	Cost per hr	

TECHNOLOGY			LOCATION MEDIA						E	stimate	d Cost to	Implen	nent	\$602,000			
	er Alternative 3			s Dryclear		2	Groun	lwater	1		Co	nstruction	n Time:		1	months	
In-Situ Enhanced Re	eductive Dechlorinat	tion	В	rewerton,	, NY							Operation				months	
					-	_			_		Post Remedi	ation Mor	utoring		10 abined Unit) years	
Description		Data Source		ntities	Mater	int I	Matarial	Labor	down	(if available		Emi			Costs	Onting	
Description		(Means ¹ or Other)	Quantity Amount	Quantity Unit	Mater Unit C		Material Total Cost	Unit Co	at 1	Labor Fotal Cost	Equipment Unit Cost		pment I Cost	ι	Jnit Cost	Option Total Cost	
REMEDIAL ACTION				CAPITAL				1	1.0	-	-	11	1	12.1		\$389,000	
			(totals ru	ounded to	nearest	thous		-		622.005		T.			610.01		
Site Preparation			1			_	\$30,257			\$33,995			\$2,199		\$12,21	0 \$262,53	
Utility Locator (based on recent bids)		recent quote	1	day	\$	-	s -	\$.	\$	•	s -	\$		s	2,475.0	\$2,47	
Pre-Implementation Samling Sampling for 1 event- includes collection	n of field parameters)		24	wells	s	170	\$ 4,080	S 1	70 S	4,080	\$ 93	2 5	2,199	s		\$10,35	
Mobilization/Demobilization of Field Sa		<i>a</i>	1	event	s	-	s -	s .	S	-	s -	s	-	s	2,040.0	\$2,04	
Analysis for MNA Parameters and VOC Drill Rig and Crew for Direct Push		Chemtech	24	ca	S	-	s -	s .	s		S	- S	•	-	\$289.4	\$6,94	
Mobilization/Demobilization		PEC	2	ca	s	_	s -	s .	-	•	s -	s	•	s	500.0		
Decontamination Pad Steam Generator		PEC PEC	25	ls day	\$ \$	-	s -	s . s .	s		s - s -	S S		S S	220.0		
Standby Time (Decontamination)		PEC	147	hr	s	-	s -		04 S	29,915	s -	s	-	s	-	\$29,91	
Drill Rig and Crew		PEC	25	day	S		s -	s .	s	-	s -	S	-	S	1,600.0		
Sand5 CY per bag Bentonite- 3 bags per point		PEC PEC	2,078 441	bag bag	S S		\$ 16,625 \$ 8,820	s .	s		s - s -	S	•	S S		\$16,62 \$8,82	
Quick Set Concretee- 1 bag per point		Home Depot	147		s		\$ 732	s .		-	s -	s	-	s	-	\$73	
3D Microemulsion 75 Product		Demensio	22.600	16	6	-		6		-				0	2.0	£107.53	
		Regenesis Engineer's	33,600		s		s -	s .			s -	s	•	S	3.2		
Shipment of product		Estimate ECHOS 33 32	1	ls	S	-	s -	s .	s		s -	S		\$	5,000.00	\$5,00	
Mixing Tank		0133	3	mo	s		s -	s .	s		s -	s		s	1,104.13	\$ \$3,31	
Chemical feed pump, 0.86 GPH, 700 PS	1	ECHOS 33 32 0123	2	ca	s		s -	s .	s	-	s -	s		s	2,758.9	\$5,51	
Labor			245	hr	S		s -		85 S	20,825	s -	s		s	-	\$20,82	
Contingency					-	-			-			-		-		\$39,37	
contingency	15% of Total Co	nstruction Activitie			1				+			1		-	\$262,53		
Professional/Technical Services	8% Project Mar	nagama-t							-			-			0010	\$86,63	
	8% Project Mar 15% Remedial D				1	+			+					-	\$262,53	0 \$21,00 \$39,37	
		on Management														\$26,25	
LONG TERM MONITORING											ANNUAL ANNUAL					\$64,000 \$16,000	
														COLUMN TO A			
			1. all		1	-	-				LIFETIM					\$212,800	
Marilania Canalia Tatia	d Analasia (Dan Fra						-								. Provent		
Monitoring, Sampling, Testing ar																	
Monitoring, Sampling, Testing ar	Site Monitoring Sampling for 1 event - in	neruoes concenton	24	wells	s		\$ 50	\$ 3	40 S	8,160		ELTM				\$15,97	
Monitoring, Sampling, Testing ar	Site Monitoring Samping for revent - in of field opposite Mobilization/Demobilization	neruoes concenton	24	wells	S					8,160	S 92	E LTM	(NPV)	s		\$15,97 \$10,40	
Monitoring, Sampling, Testing ar	Site Monitoring Sampling for 1 event - in	neruoes concenton	24		s s		s 50 s -	\$ 3 \$ -	40 S S	8,160	LIFETIM	ELTM	(NPV)		- 2,040.00	\$15,97 \$10,40	
Monitoring, Sampling, Testing ar	Site Monitoring Samphing for 1 event - in 6 field commenters Mobilization/Demobilization Sampling Crew Reporting	neruoes concenton	1		s s					8,160	S 92	E LTM	(NPV)	s		\$15,97 \$10,40	
Monitoring, Sampling, Testing ar	Site Monitoring Samping 107 I event - II of Edd most and the II of Edd most and the II Mobilization/Demobiliza Sampling Crew Reporting Laboratory analysis	ation of Field	1	event hour	\$ \$ \$	- \$85	\$ - \$ 1,360.00	s - s -	s s	8,160	LIFETIM S 92 S - S -	E LTM S S S	(NPV)	s s	2,040.00	\$15,97 \$10,40) \$2,04 \$1,36	
Monitoring, Sampling, Testing ar	Site Monitoring Sampling for 1 event - in of faid assaultion Of faid assaultion Mobilization/Demobilizi Sampling Crew Reporting Laboratory analysis VOCs (8260)	neruoes concenton	1	event hour	\$ \$ \$	- \$85	s -	s -	s	8,160	LIFETIM S 92 S -	E LTM 2 S S	(NPV)	s s		\$15,97 \$10,40) \$2,04 \$1,36	
	Site Monitoring Samping for Tevens - II Mobilization Demobilizi Sampling Crew Reporting Laboratory analysis VOCs (8260) (Net Present Value) 5 Years of Se	nenues concentor ation of Field <i>Chemtech</i> miannual Monitoria	1 16 24	event hour	\$ \$ \$ \$	- \$85	\$ - \$ 1,360.00	s - s -	s s	8,160	LIFETIM S 92 S - S -	E LTM S S S	(NPV)	s s	2,040.00	\$15,97 \$10,40) \$2,04 \$1,36	
	Site Monitoring Sampning or Leven - m - C fail Lansmaster Mobilization/Demobilizs Sampling Crew Reporting Laboratory analysis VOCs (8260) (Net Present Value) 5 Years of Se 4 Years of Ar	ation of Field Chemtech emiannual Monitorin	1 16 24 ng	event hour	\$ \$ \$	- \$85	\$ - \$ 1,360.00	s - s -	s s	8,160	LIFETIM S 92 S - S -	E LTM S S S	(NPV)	s s	2,040.00	\$15,97 \$10,40) \$2,04 \$1,36	
	Site Monitoring Sampning or Verm - II. Cf.di.d. assembler: Mobilization Demobiliz Sampling Crew Reporting Laboratory analysis VOCs (8260) (Net Present Value) S Years of A Years of Au 1 Year of Qu	nenues conection ation of Field <i>Chemtech</i> minanual Monitoring artedy Monitoring (1 16 24 ng final year)	event hour	\$ \$ \$ \$	- \$85	\$ - \$ 1,360.00	s - s -	s s	8,160	LIFETIM S 92 S - S -	E LTM S S S	(NPV)	s s	2,040.00	\$15,97 \$10,40) \$2,04 \$1,36	
Lifetime Long Term Monitoring	Site Monitoring Sampning or Yeem - III Cf Ald assessed Mobilization Demobilizy Sampling Crew Reporting Laboratory analysis VOCs (8260) (Net Present Value) 5 Years of Se 4 Years of Au 1 Year of Qu 5% Discount Fe	neruous concernon ation of Field Chemtech miannual Monitoring arterly Monitoring (actor (per NYSDEC	1 16 24 final year)	event hour ea	s s s		\$ - \$ 1,360.00 \$ -	s - s -	s s	8,160	LIFETIM S 92 S - S -	E LTM S S S	(NPV)	s s	2,040.00	\$15.97 \$10,40 \$2,04 \$1,36 \$ \$ \$ \$ \$	
Lifetime Long Term Monitoring TOTAL ESTIMATED NPV	Site Monitoring Sampning or Yeem - III Cf Ald assessed Mobilization Demobilizy Sampling Crew Reporting Laboratory analysis VOCs (8260) (Net Present Value) 5 Years of Se 4 Years of Au 1 Year of Qu 5% Discount Fe	neruous concernon ation of Field Chemtech miannual Monitoring arterly Monitoring (actor (per NYSDEC	1 16 24 final year)	event hour ea	s s s		\$ - \$ 1,360.00 \$ -	s - s -	s s	8,160	LIFETIM S 92 S - S -	E LTM S S S	(NPV)	s s	2,040.00	\$15,97 \$10,40) \$2,04 \$1,36	
Lifetime Long Term Monitoring	Sie Monitoring anipping 201 rovem - in cf fail assessments Mobilization Demobilizz Sampling Crew Reporting Laboratory analysis VOCs (8260) (Net Present Value) 5 Years of A 1 Years of A 1 Years of Qu 5% Discount Fa TECHNOLOGY Working condition is Sa	Actuales conection ation of Field Chemtech miannual Monitoring artedy Monitoring (actor (per NYSDEC COST (Cap fety Level:	1 16 24 ng (final year) 2) D	event hour ea Dost Reme	ductivity	- 1 585 - 1 1 1 Mo	s - s 1,360.00 s - nitoring) 82%	S - S -	S S S		LIFETIM S 92 S - S -	E LTM S S S	(NPV)	s s	2,040.00	\$15.97 \$10,40 \$2,04 \$1,36 \$ \$ \$ \$ \$	
Lifetime Long Term Monitoring TOTAL ESTIMATED NPV Assumptions:	Site Monitoring CEAL assumpting or 19 vers - u CEAL assumpting or 19 vers - u Mobilization Demobilizz Sampling Crew Reporting VOCs (8260) VOCs (8260) (Net Present Value) 5 Years of Se 4 Years of Au 1 Year of Que 5% Discount For TECHNOLOGY Working condition is Sa Working condition is Sa	Actuacy conection ation of Field Chemtech minanual Monitoring arterly Monitoring (actor (per NYSDEC COST (Cap fety Level: y cost index (Roch	1 16 24 18 19 19 19 10 10 10 10 10 10 10 10 10 10	event hour ea Dost Reme	ductivity	- 1 585 - 1 1 1 Mo	s - s 1,360.00 s -	S - S -	S S S		S 92 S - S -	E LTM S S S	(NPV)	s s	2,040.00	\$15.97 \$10,40 \$2,04 \$1,36 \$ \$ \$ \$ \$	
Lifetime Long Term Monitoring TOTAL ESTIMATED NPV Assumptions:	Sie Monitoring anipping 201 rovem - in cf fail assessments Mobilization Demobilizz Sampling Crew Reporting Laboratory analysis VOCs (8260) (Net Present Value) 5 Years of A 1 Years of A 1 Years of Qu 5% Discount Fa TECHNOLOGY Working condition is Sa	Actuacy conection ation of Field Chemtech minanual Monitoring arterly Monitoring (actor (per NYSDEC COST (Cap fety Level: y cost index (Roch	1 16 24 18 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	event hour ea Dost Reme	ductivity: able for c		s - s 1,360.00 s - nitoring) 82%	S - S - ; Equipme dor quote	S S S		S 92 S - S -	E LTM S S S	(NPV)	s s	2,040.00	\$15.97 \$10,40 \$2,04 \$1,36 \$ \$ \$ \$ \$	
Lifetime Long Term Monitoring TOTAL ESTIMATED NPV Assumptions:	Site Monitoring CEAL Learnable CEAL Learnable CEAL Learnable Sampling Orew Reporting Laboratory analysis VOCs (8260) (Net Present Value) S Years of So Years of So Years of So Years of A Years of Qu 5% Discount Fe TECHNOLOGY Working condition is Sa Working condition is Sa	Actuales conection ation of Field Chemtech emiannual Monitoring arterly Monitoring actor (per NYSDEC COST (Cap fety Level: ty cost index (Roche profit factor Consultant Bill	1 16 24 18 18 19 19 19 10 19 10 10 10 10 10 10 10 10 10 10 10 10 10	event hour ea Dost Reme (Labor pro (not applic. per year 12/15/201	ductivity: able for c	585 	\$ - \$ 1,360.00 \$ - nitoring) 82% rived from ve	S - S - S - ; Equipme ador quote flation	S S S		S 92 S - S -	E LTM S S S	(NPV)	s s	2,040.00	\$15.97 \$10,40 \$2,04 \$1,36 \$ \$ \$ \$ \$	
Lifetime Long Term Monitoring TOTAL ESTIMATED NPV Assumptions:	Site Monitoring Site Monitoring Samphing sort Poem - II Cfail assumation Mobilization:Demobiliz Sampling Crew Reporting Laboratory analysis VOCs (8260) (Net Present Value) 5 Years of Ac 1 Ye	Actuales conection ation of Field Chemtech miannual Monitoring arterly Monitoring (actor (per NYSDEC COST (Cap fety Level: y cost index (Roch profit factor Consultant Bill (/2 ton or smaller)	1 16 24 18 18 16 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	event hour ea ost Reme (Labor pro (not applic: per year f 12/15/201) per day	ductivity: able for c	585 	\$ - \$ 1,360.00 \$ - nitoring) 82% rived from ve	S - S - S - ; Equipme ador quote flation	S S S		S 92 S - S -	E LTM S S S	(NPV)	s s	2,040.00	\$15.97 \$10,40 \$2,04 \$1,36 \$ \$ \$ \$ \$	
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Croundrate	OLOGY		LOCATI		MED		Estimated	Cost to In			41,000
	r Alternative 4 ed Aquifer Air Sparging		c's Dryclea Brewerton		Ground	water			uction Time ration Time	: <u>6</u> : 10	months years
		-				12110			Monitoring	z 10 Combined Unit	
Description	Data Source	Quantity	Quantity	Material	Co Material	st Breakdown Labor	(if available) Labor	Equipment	Equipment	Costs	Option
	(Means ¹ or Oth	1 Dates	Unit	Unit Cost	Total Cost	Unit Cost	Total Cost	Unit Cost	Total Cost	Unit Cost	Total Cost
REMEDIAL ACTION			CAPITAL	COST nearest thousa	nd)		Theshirt	3146		-	\$1,087,000
Pump Test		1	l		\$800	1	\$48,449		\$1,827	\$2,887	\$734,204
Equipment Rental- pump, water level meter	generator, filters Pine	8	day	\$ 100	S 800	s -	s -	\$ 228	\$ 1,827		\$2,627
Filter bag housing rental Oversight/Engineering		400	mo hour	s - s -	s - s -	S - S 85	\$ - \$ 34,000	s - s -	s - s -	\$ 750.00 \$ -	\$750 \$34,000
Drill Rig and Crew for Air Sparge Wel Mobilization/Demobilization	Installation PEC	4	ca	s -	s -	s .	\$.	s .	s .	\$ 200.00	\$800
4 1/4" Hollow Stem Auger	PEC	100	lf	s -	s -	s -	\$.	s -	s -	\$ 13.20	\$1,320
Decontamination Pad Steam Generator	PEC PEC	2 36	ls day	s - s -	s - s -	s . s .	s . s .	s - s -	s - s -	\$ 220.00 \$ 82.50	\$440 \$2,929
Standby Time (Decontamination) Well Installation	PEC	71	hour	s .	s -	\$ 204	\$ 14,449	s -	s -	s -	\$14,449
Geoprobe Daily Rate - 8 hour day	PEC	36	day	s -	s .	s -	s .	s .	s .	\$ 1,210.00	\$42,955
Air Sparge Wells, Stainless Steel, 2" Monitoring Points- 2" PVC	Parratt Wolf Parratt Wolf	2,485 355	lf lf	s - s -	s . s .	s - s -	s - s -	s . s .	s - s -	\$ 60.00 \$ 51.00	\$149,100 \$18,105
Well covers	Engineer's Estimate	71	ca	s .	s -	s .	s .	s .	s .	\$ 300.00	\$21,300
Well head setup- stainless steel	Engineer's Estimate	71	ca	s .	s .	s -	s .	s -	s .	\$ 500.00	\$35,500
Site Preparation Utility Locator (based on recent bids)	recent quote	10	day	s -	s -	s .	\$.	s -	s .	\$ 2,475.00	\$24,750
Electrical Permit and Utility Connection to I	PCU TRS Group		day		s .	s .	s -	s -	s .	\$ 2,475.00 \$ 44,000.00	\$24,750 \$220,000
Treatment System	Engineer's	1	ls	s -	s -	s .	s -	s .	s .	\$ 100,000.00	
Treatment Construction Enclosure	Estimate ECHOS-33 13	1	ca		s - s 1,232	s .	s .	s -	s .	s 100,000.00	\$100,000
Air Compresser, 1-2' diameter, PVC Coating	Engineer's	1	ca	\$ 1,232.24 \$ -	s 1,232 s -	s .	s .		s .	s - s 50,000.00	\$1,232
Dzone equipment HDPE air lines	Estimate recent quote	25	ca 100 lf	s - s -	s - s -	s . s .	s - s -	s - s -	s . s .	\$ 50,000.00 \$ 63.00	\$50,000 \$1,575
Trenching- 4' deep, 3/8 CY excavator	31 23 16.13 0050	1,481	boy	s -	s -	\$ 4.44	s 6,576	\$ 2.46	\$ 3,644	s -	\$10,221
NYS Certified Clean Back Fill Material Contingency	Paragon	132	ley	\$ 16.34	\$ 2,151	s .	s -	s -	s .	s .	\$2,151 \$110,131
	of Total Construction Activities									\$734,204	\$110,131 \$110,131
Professional/Technical Services											\$242,287
8%	Project Management									\$734,204	\$58,736
10%	Remedial Design Construction Management										\$110,131 \$73,420
LONG TERM MONITORING		1014	18 8	5-21171	10000		1.15	ANNUAL I			\$64,000
								ANNUAL I LIFETIME		(YRS 3-10) V)	\$16,000 \$212,800
Manifester 0	Analysis (Dec. 7)	-						INE			
Monitoring, Sampling, Testing and . Site Monitor	Analysis (Per Event) ring or revent - menuaes										\$15,970
Nationalization	A Fachoomzadon or riera	24	well	s - s -	\$ 50 \$ -	\$ 340 \$.	\$ 8,160 \$	\$ 92 \$ •	\$ 2,199 \$ -	\$ - \$ 2,040.00	\$10,409 \$2,040
Sameling Reporting		16		\$.	s 1,360.00	s . s .	s - s -	s . s .	s - s -	\$ 2,040.00 \$ -	\$2,040 \$1,360
Laboratory Volatile Or	ganic Compounds (8260B) Chemtech	24	ca	s .	s -	s .	s -	s .	s -	\$ 90.05	\$2,161
Lifetime Long Term Monitoring (No	t Present Value) Years of Semiannual Monitoring						-				
4	Years of Annual Monitoring										
	Year of Quarterly Monitoring Discount Factor (per NYSDEC)										
ONG TERM OPERATIONS AND		1 100 3		San Sugar						ST (YRS 1-10)	\$96,000
and the second second second second	the second second second second	1	North and			And and		LIFETIME	LTOM (N	PV)	\$741,300
system Operations (per month)											\$7,850
Electricity General Od	NYSEG		kW-hr months		s - s -	\$ - \$ 5,000.00	s - s 5,000.00	s . s .	s - s -	\$ 0.10 \$ -	\$2,850 \$5,000
lifetime Operations and Maintenan	ce (Net Present Value)										45,000
10	Years of Operations and Maintenance Discount Factor (per NYSDEC)										
5%		+ Lifetin	ne O&M	+ Post Reme	ediation Mon	itoring)					\$2,041,000
				a de la							Bank Baran
FOTAL ESTIMATED NPV TI Assumptions:											
FOTAL ESTIMATED NPV TI Assumptions:	dition is Safety Level:	D	(Labor pro			; Equipment p	roductivity:	100%	þ		
TOTAL ESTIMATED NPV T Assumptions: Working con Weighted Av Costs are los		96.5% 10%	(not applica	able for costs deri	ved from vendor	quotes).	roductivity:	100%	þ		
FOTAL ESTIMATED NPV TI Assumptions: Working con Weighted Av Costs are los Infiliaion	dition is Safety Level: erage of eity cost index (Rochester, NY)	96.5% 10%		able for costs deri		quotes).	roductivity:	100%	þ		
TOTAL ESTIMATED NPV T Assumptions: Working con Weighted Av Costs are los	dition is Safety Level: erage of eity cost index (Rochester, NY)	96.5% 10% 3%	(not applica per year Hours work	the for costs deri	ved from vendor for 5 years of inflat np test	quotes). lion					
FOTAL ESTIMATED NPV TI Assumptions: Working con Weighted Av Costs are los Infiliaion	dition is Safety Level: erage of eity cost index (Rochester, NY)	96.5% 10% 3% 10 10 10	(not applica per year Hours work 15-60 minut Hours works	ted to set up pur es, every 10 minut ed (total) second as	ved from vendor for 5 years of inflat up test tes for 60-120 minu nd third day of pun	quotes). tion ttes, and every :	30 minutes for 12	20 minutes-10 k	ours	one more time befor	re the end of the test
FOTAL ESTIMATED NPV TI Assumptions: Working con Weighted Av Costs are los Infiliaion	dition is Safety Level: erage of eity cost index (Rochester, NY)	96.5% 10% 3% 10 10 10 10 2	(not applica per year Hours work 15-60 minut Hours work People work	ted to set up pur sed to set up pur s, every 10 minut	ved from vendor for 5 years of inflat up test tes for 60-120 minu nd third day of pun	quotes). tion ttes, and every :	30 minutes for 12	20 minutes-10 k	ours	one more time befor	re the end of the test
FOTAL ESTIMATED NPV TI Assumptions: Working con Weighted Av Costs are los Infiliaion	dition is Sufety Level: enge of eity cost indes (Rochester, NY) ded with a profit factor Consultant B i	96.5% 10% 3% 10 10 10 10 10 10	(not applica per year Hours work 15-60 minut Hours worka People work per day of 12/15/201	the for costs derived to set up pur- ted to set up pur- es, every 10 minuted (total) second at the during pump to	ved from vendor for 5 years of inflat up test tes for 60-120 minu nd third day of pun	quotes). tion ates, and every : ap test (measure	30 minutes for 12	20 minutes-10 k	ours	one more time befor	re the end of the test
FOTAL ESTIMATED NPV TI Assumptions: Working con Weighted Av Costs are los Infiliaion	dition is Safety Level: enge of eity cout index (Rochester, NY) led with a profit factor Consultant Bi Truck SUV (12 no or smaller Water Quality Analyze	96.5% 10% 3% 10 10 10 10 2 11 Rates (as 570.74	(not applica per year Hours work 15-60 minut Hours worka People work per day of 12/15/201 per day per day	the for costs derived to set up pur- ted to set up pur- es, every 10 minuted (total) second at the during pump to	ved from vendor for 5 years of inflat up test tes for 60-120 minu nd third day of pun est	quotes). tion ates, and every : ap test (measure	30 minutes for 12	20 minutes-10 k	ours	one more time befor	re the end of the test
FOTAL ESTIMATED NPV TI Assumptions: Working con Weighted Av Costs are los Infiliaion	dition is Safety Level: erage of eity cost index (Rochester, NY) led with a profit factor Consultant Bi Truck/SUV (1/2 on or smaller	96.5% 10% 3% 10 10 10 10 10 10 10 10 10 10 10 10 10	(not applica per year Hours work 15-60 minut Hours worke People work per day of 12/15/201 per day per day per day	the for costs derived to set up pur- ted to set up pur- es, every 10 minuted (total) second at the during pump to	ved from vendor for 5 years of inflat up test tes for 60-120 minu nd third day of pun est	quotes). tion ates, and every : ap test (measure	30 minutes for 12	20 minutes-10 k	ours	one more time befor	re the end of the test
FOTAL ESTIMATED NPV TI Assumptions: Working con Weighted Av Costs are los Infiliaion	dition is Safety Level: erage of eity cost index (Rochester, NY) led with a profit factor Consultant Bi Truck SUV (1/2 on or smaller Water (wality Analyse) Water Level Nete	96.5% 10% 3% 10 10 10 10 2 10 2 10 2 10 2 10 2 10 2	(not applica per year Hours work 15-60 minut Hours work People work per day of 12/15/201 per day per day per day	the for costs derived to set up pur- ted to set up pur- es, every 10 minuted (total) second at the during pump to	ved from vendor for 5 years of inflat up test tes for 60-120 minu nd third day of pun est	quotes). tion ates, and every : ap test (measure	30 minutes for 12	20 minutes-10 k	ours	one more time befor	re the end of the test
TOTAL ESTIMATED NPV TI Issumptions: Working con Weighted Ar Cots are Inflation Pump Test:	dition is Safety Level: enge of eity cost index (Rochester, NY) led with a profit factor Truet/SUV (1/2 non ermatler Water Quality Analyze Water Quality Analyze Water Lovel Mete Submershible Pum Generators: 220 Vol	96.5% 10% 3% 10 10 10 10 10 10 10 10 10 10	(not applica per year Hours work 15-60 minut Hours work People work per day per day per day per day per day per day	table for costs derf 16% (cost to set up pum set to set up pum set, every 10 minut ed (total) second at ing during pump t 10) - Includes Ge	ved from vendor for 5 years of inflat up test (es for 60-120 mint d third day of pun d third day of pun est &A and 10% Pr	quotes). tion ates, and every : ap test (measure	30 minutes for 12 ments taken eve	20 minutes-10 b ry 4 hours to 48	ours thours, then c		
FOTAL ESTIMATED NPV TI Assumptions: Working con Weighted Av Costs are los Infiliaion	dition is Safety Level: enge of eity cout index (Rochester, NY) led with a profit factor Consultant I B Truek/SUV (1/2 on or smaller Water Quality Analyze Water Level Miter Submershible Pum	96.5% 10% 3% 10 10 10 10 10 10 10 10 10 10	(not applica per year Hours work 15-60 minut Hours work People work per day of 12/15/201 per day per day per day per day per day wells will be	ted to set up pur sed to set up pur es, every 10 minut ed (total) second at ing during pump t 10) - Includes Ge	ved from vendor for 5 years of inflat up test (es for 60-120 mint d third day of pun d third day of pun est &A and 10% Pr	quotes). tion ates, and every : ap test (measure	30 minutes for 12 ements taken eve	20 minutes-10 h ry 4 hours to 49 ft in length (ner	ours hours, then c v wells)		re the end of the test Labor
TOTAL ESTIMATED NPV TI Issumptions: Working con Weighted Ar Cots are Inflation Pump Test:	dition is Safety Level: enge of eity cost index (Rochester, NY) led with a profit factor Truet/SUV (1/2 non ermatler Water Quality Analyze Water Quality Analyze Water Lovel Mete Submershible Pum Generators: 220 Vol	96.5% 10% 3% 10% 10% 10% 10 10 10 10 20 10 10 21 Rates (as 1) 570.74 5159.00 531.80 5113.91 5113.91 582.68 171 2	(not applica per year Hours work 15-60 minut Hours workd Perople work per day per day per day per day per day wells will be wells will be	ted to set up pur sed to set up pur es, every 10 minut ed (total) second at ing during pump t 10) - Includes Ge	ved from vendor for 5 years of inflat up test (es for 60-120 mint d third day of pun d third day of pun est &A and 10% Pr	quotes). tion ates, and every : ap test (measure	30 minutes for 12 ements taken eve	20 minutes-10 b ry 4 hours to 48	ours hours, then c v wells)		
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FOTAL ESTIMATED NPV TI Assumptions: Working con Weighted Ar Costs are loa Inflation hump Test: Sparge Wells Sampling Vell Development	dition is Safety Level: enge of eity cost index (Rochester, NY) led with a profit factor Truet/SUV (1/2 non ermatler Water Quality Analyze Water Quality Analyze Water Lovel Mete Submershible Pum Generators: 220 Vol	96,5% 10% 3% 10% 3% 10% 10% 10% 10% 10% 10% 10% 10% 10% 10	(not applies per year Hours work 15-60 minut Hours worke People work per day per day per day per day per day per day set day per day the pipe for a the pipe for a the pipe for a	ted to set up pur set to set up pur se, every 10 minut ing during purp t (0) - Includes G seinstalled 30 ft apo y r lines to wells	ved from vendor o for 5 years of inflat ip test ies for 60-120 mini d hird day of pun ent &A and 10% Pr ert Events per year (yr	quotes). ites, and every : ap test (measure offit	30 minutes for 12 ements taken eve 35 1 1	20 minutes-10 fb ry 4 hours to 48 ft in length (ner hour for well di	ours hours, then c v wells) vvelopment pr	er well	Labor
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rotal Estimated NPV ti ssumptions: Working con Weighted A Consoling Inflation hump Test: parge Wells sampling Vell Development analytical cost For each sum	dition is Safety Level: erage of eity cont index (Rochester, NY) led with a profit factor Consultant Bit Truck/SUV (1/2 on or smaller Water (2004) Water (2004) Water (2004) Submersible Pam Generators: 220 Vol Assume	96.5% 10% 3% 10% 3% 10% 10% 10% 10% 10% 10% 10% 10% 10% 10	(not applica per year Hours work 15-60 minut Hours work Per day per day per day per day per day per day mer day per day per day mer day per day per day per day per day mer day per da	ted to set up pur sed to set up pur se, every 10 minut ing during purp t (0) - Includes G (0) - Includes G (1) - Includes G (ved from vendor for 5 years of inflat up test iss for 60-120 mint of third day of pun est Mark and 10% Pr est Events per year (yr Events per year (yr	quotes). ites, and every : ap test (measure offit	30 minutes for 12 ements taken eve 35 1 1	20 minutes-10 h ry 4 hours to 48 ft in length (new hour for well do	ours hours, then c v wells) vvelopment pr	er well	Labor
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rotal Estimated NPV Ti Issumptions: Working con Weighted A Costs wan Inflation Jump Test: Sparge Wells sampling Vell Development unalytical cost For each sam Vork day comsists of:	dition is Safety Level: erage of eity cont index (Rochester, NY) led with a profit factor Consultant Bit Truck/SUV (1/2 on or smaller Water (2004) Water (2004) Water (2004) Submersible Pam Generators: 220 Vol Assume	96.5% 10% 3% 10% 3% 10% 10% 10% 10% 10% 10% 10% 10% 10% 10	(not applica per year Hours work 15-60 minut Hours work Per day per day per day per day per day per day mer day per day per day mer day per day per day per day per day mer day per da	ted to set up pur sed to set up pur se, every 10 minut ing during purp t (0) - Includes G (0) - Includes G (1) - Includes G (ved from vendor for 5 years of inflat up test iss for 60-120 mint of third day of pun est Mark and 10% Pr est Events per year (yr Events per year (yr	quotes). ites, and every : ap test (measure offit	30 minutes for 12 ements taken eve 35 1 1	20 minutes-10 h ry 4 hours to 48 ft in length (new hour for well do	ours hours, then c v wells) vvelopment pr	er well	Labor
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rotal Estimated NPV Ti Issumptions: Working con Weighted Ar Costs are infinion Aump Test: iparge Wells ampling Vell Development unalytical cost For each sam Vork day consists of: Nores Sequence yord y cubic yard	dition is Safety Level: enge of eity cost index (Rochester, NY) ked with a profit factor Consultant Bit TruckSUV (1/2 on or mailler Water Quality Analyze Water Level Meter Submersible Pum Generators: 220 Vol Assume pling event, assumed: 10 mo Is Mo Soft	95,55% 10% 10% 10% 10% 10% 10% 10% 10	out applied per year Hours word 15-60 minut People word People word per day per day met applied per day per da	to set up pun e, every 10 minut e, every 10 minut e, every 10 minut installed 40 ft apa installed 30	ved from vendor for 5 years of inflat up test iss for 60-120 mint of third day of pun est Mark and 10% Pr est Events per year (yr Events per year (yr	quotes). ites, and every : ap test (measure offit	30 minutes for 12 ements taken eve 35 1 1	20 minutes-10 h ry 4 hours to 48 ft in length (new hour for well do	ours hours, then c v wells) vvelopment pr	er well	Labor

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TECHNOLOGY			LOCATIO	1		EDIA	Estimated		1.57	\$1,400,000		
Groundwater Alternative 5 Groundwater Extraction and Treatme	nt		's Dryclean Brewerton,		Groundwater				truction Time: peration Time:		months years	
				-				ost Remediati		years		
Description	Data Source	Qua Quantity	Quantity	Material	Material	Cost Breakdo	Labor	Equipment	Equipment	Costs	Option	
	(Means ¹ or Other)	Amount	Unit	Unit Cost	Total Cost	Unit Cost	Total Cost	Unit Cost	Total Cost	Unit Cost	Total Cost	
EMEDIAL ACTION			APITAL C	OST arest thousar							\$479,0	
		(iotais to					\$20,738		\$6,137	\$4,256	\$323,	
ump Test				-	\$2,020					54,256		
Equipment Rental- pump, water level meter, generator, filters Filter bag housing rental		4	week	\$ 100 \$ -	\$ 400 \$ -	s -	s - s -	\$ 228 \$ -	\$ 914 \$ -	s - s 750.00	51	
Oversight/Engineering Drill Rig and Crew for Extraction Well Installation		200	hours	s -	s -	\$ 85	\$ 17,000	s -	s -	s -	\$17.	
Mobilization/Demobilization 4 1/4" Hollow Stem Auger	PEC PEC	2	ca If	s - s -	s - s -	s - s -	s . s .	s . s .	s - s -	\$ 1,650.00 \$ 13.20	\$3.	
Decontamination Pad Steam Generator	PEC		ls dav	s . s .	s . s .	s - s -	s . s .	s - s -	s - s -	\$ 220.00 \$ 82.50	5	
Standby Time (Decontamination) Vell Installation	PEC	10		s -	s .	\$ 204	\$ 2,035	s -	s -	s -	\$2	
Geoprobe Daily Rate - 8 hour day	PEC 33 21 13.10 8340	3	day	s -	s .	s -	s .	s -	s -	\$ 1,210.00	\$4.	
4" PVC Piping Monitoring Wells Installed Flush Mount Well Covers	PEC	10	ca	\$ 4.65 \$ -	\$ 1,626 \$ -	\$ 4.87 \$ -	\$ 1,703 \$ -	\$ 14.92 \$ -	\$ 5,223 \$ -	s - s 165.00	\$8 \$1	
Well Development Site Preparation	PEC	10	hr	s -	s -	s -	s -	s -	s -	\$ 165.00	\$1,	
Utility Locator (based on recent bids) Discharge Line	recent quote	1	day Is	· 2 5 ·	s . s .	s - s -	s . s .	s - s -	s - s -	\$ 2,475.00 \$ 15,000.00	\$2. \$15.	
Electrical Permit and Utility Connection to PCU reatment System	TRS Group	1	day	s -	s .	s -	s -	s .	s -	\$ 44,000.00	\$44,	
Treatment Construction Enclosure	Engineer's Estimate	1 500	ls	5.	s .	s .	s .	s .	s .	\$ 150,000.00	\$150, \$4,	
6" PVC pipe NYS Certified Clean Back Fill Material Borrow & CV much 20 mmb carls or sites	33 11 13.25 4530 Paragon	44	lcy	\$ 5.06 \$ 16.34	\$ 2,531 \$ 726	S 4.48 S -	\$ 2,241 \$ -	s - s -	s - s -	s .	54.	
Borrow, 8 CY truck, 30 mph, cycle 6 miles Trenching- 4' deep, 3/8 CY excavator	31 23 23.20 0052 31 23 16.13 0050	296	bcy	s .	s .	\$ 1.65 \$ 4.44	s - s 1,315	\$ 2.49 \$ 2.46	s - s 729	s .	\$2,	
Carbon System (see below for details)	Carbon Service Ace Hose & Rubber	1	ls 300 lf	s -	5 - 2	s .	s -	s .	s -	\$ 2,678.94	\$2	
Influent and effluent hoses- 2" diameter	Company Ace Hose & Rubber	2	ca	\$ 2,167.30	\$ 4,335	s .	5 -	<u>s</u> .	s -	5 .	\$4,	
Hose couplings Submersible Pumps	Company Pine Environmental	4	ca	\$ 12.64 \$ -	\$ 51 \$ -	s . s .	s - s -	s . s .	s - s -	s - s 4,400.00	\$44,	
Lift station before treatment Contingency	Engineer's Estimate	1	ca	s -	s .	s -	s -	s .	s -	\$ 12,000.00	\$12, \$48,5	
15% of Total Construction Activities							-			\$323,521	\$48,	
Professional/Technical Services Project Management				-						\$323,521	\$106, \$25,	
15% Remedial Design										3323,321	\$48,	
10% Construction Management ONG TERM MONITORING	and the providence	-	and the second	States and	and the second	and the second s		ANNUAL I	TM COST	(YRS 1-5)	\$32, \$28,00	
		1		-					LTM COST		\$14,00 \$275,80	
fonitoring, Sampling, Testing and Analysis (Per Event) Site Monitoring											\$13,	
Sampling for 1 event - Includes collection of field parameters		24		\$ 340	\$ 8,160	\$ 92	\$ 2,199	s .	\$ 100	s .	\$10,	
Mobilization/Demobilization of Field Sampling Crew Reporting		1 16	event hr	\$ - \$85	\$ 1,360.00	s - s -	s - s -	s . s .	s . s .	\$ 170.00 \$ -	S1,	
Laboratory analysis Volatile Organic Compounds (8260B)	Chemtech	24	ca	s .	s -	s -	s -	s .	s -	\$81.86	\$1,	
Lifetime Long Term Monitoring (Net Present Value) S Years of Semiannual Monitoring				-								
25 Years of Annual Monitoring 5% Discount Factor (per NYSDEC)		-										
ONG TERM OPERATIONS AND MAINTENANCE	1 Marshall			in the second		and the	1. 10 1	ANNUAL I	TOM COS	(YRS 1-30)	\$42,00 \$645,60	
								LIFETIME	LIOM (.4	•)		
ystem Operations (per 6 months) Electricity	NYSEG	36,000		s -	s -	s .	s -	s -	s -	\$ 0.10	\$21,- \$3,-	
General O&M Carbon changeout, service run, incl. labor, every 6 mo	Carbon Service	6	months ca	s - s -	s - s -	\$ 2,500.00 \$ -	\$ 15,000.00 \$ -	s - s -	s - s -	s - s 2,870.00	\$15,0	
Lifetime Operations and Maintenance (Net Present Value) 10 Years of Operations and Maintenance			-					_			_	
5% Discount Factor (per NYSDEC)				1								
TOTAL ESTIMATED NPV TECHNOLOGY COS	T (Capital + Lifetin	ne O&M +	Post Ren	nediation M	lonitoring)					\$1,400,000	
ssumptions: Working condition is Safety Level:		D	(Labor prod	uctivity:	82%	; Equipment p	oroductivity:	100%	b			
Weighted Average of city cost index (Rochester, NY) Costs are loaded with a profit factor		96.5%	(not applicat	ble for costs der			i canada i		P			
Inflation Sales Tax		3%	per year	23%	for 7 years of i	nflation						
ump Test:			9 1									
		10	15-60 minute	ed to set up pur s, every 10 minu		minutes, and eve	ery 30 minutes for	120 minutes-1	0 hours			
			test People worki	ng during pump	test							
	Consultant Bill Rate	s (as of 12/15	- /2010) - Inch	ides G&A and	10% Profit							
Tr	uck/SUV (1/2 ton or smaller) Water Ouality Analyzer	\$70.74	per day									
	Water Level Meter Submersible Pump		per day									
	Generators: 220 Volt	\$82.68	per day									
xtraction Well Installation			1								abor	
	Assumed	3	wells per day	installed 30 ft ap		in the second second	1 Nov. 1		evelopment per	well		
ampling			wells QA/QC	1 A	Events per year Event per year			hrs/sample		\$85	Cost per hr	
/ell Development		1	hrs for travel hrs per well	per event				workers per eve				
arbon Vessel		2,255	Cost of 3 AQ	100 HP adsorbe	rs each filled w	ith virgin liquid NY via commo	phase carbon, one on carrier truck wi	pre-filter, one	flow totalizer, ot including sal	interconnecting ho	ses,	
nalytical cost	XCs.	\$81.84	per sample	part				Dave, II				
				(gloves, noteboo	ks, etc.)							
Vo For each sampling event, assumed:	10	hrs										
For each sampling event, assumed:	10	hrs										
For each sampling event, assumed: 'ork day consists of: totes		hrs										
For each sampling event, assumed: 'ork day consists of: otes ssume NPDES or equivalent permit is used, no cost for water dischar y: bank cubic yard	rge O&M	Operation an	d maintenanc	re								
Ve For each sampling event, assumed: 'ork day consists of: otes ssume NPDES or equivalent permit is used, no cost for water dischar	rge											

about some