Phase II: Remedial Action Scope of Work
In-Situ Bioremediation of Groundwater Plume
Crystal Cleaners Site (No. 360053)

Village of Pelham
Westchester County, New York

Prepared for

New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau E
625 Broadway
Albany, New York 12233-7017

Prepared by

EA Engineering, P.C. and Its Affiliate
EA Science and Technology
269 W. Jefferson Street
Syracuse, New York 13020
(315) 431-4610

April 2022
Version: FINAL
EA Project No. 16025.11

This page intentionally left blank.

Phase II: Remedial Action Scope of Work
In-Situ Bioremediation of Groundwater Plume
Crystal Cleaners Site (No. 360053)

Village of Pelham
Westchester County, New York

Prepared for

New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau E
625 Broadway
Albany, New York 12233-7017

Prepared by

EA Engineering, P.C. and Its Affiliate
EA Science and Technology
269 W. Jefferson Street
Syracuse, New York 13020
(315) 431-4610

Donald Conan, P.E., P.G.
Vice President, EA Engineering, P.C.

Adam Etringer
Project Manager, EA Science and Technology

April 2022
Version: FINAL
EA Project No. 16025.11

This page intentionally left blank.

CERTIFICATION

I, Donald Conan, certify that I am currently a New York State Registered Professional Engineer (P.E.), and that this Remedial Action Scope of Work was prepared in accordance with all applicable statues and regulations in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Donald Conan, P.E., P.G.
New York State Professional Engineer No. 75666

April 27, 2022

Date

This page left intentionally blank.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

bgs	Below ground surface
CY	Cubic yard(s)
CAMP	Community Air Monitoring Plan
CFR	Code of Federal Regulations
COVID-19	Coronavirus-2019
DER	Division of Environmental Remediation
DPT	Department of Transportation
DPW	Department of Public Works
EA	EA Engineering, P.C. and its affiliate EA Science and Technology
EIT	Engineer-in-Training
ft	Foot (feet)
HASP	Health and Safety Plan
in.	Inch(es)
No.	Number
NYSDEC	New York State Department of Environmental Protection
NYSDOH	New York State Department of Transportation
OSHA	Occupational Safety and Health Administration
PCE	Tetrachloroethene
P.E.	Professional Engineer
P.G.	Professional Geologist
PDI	Pre-design investigation
RA	Remedial action
RD	Remedial design
ROD	Record of Decision
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus 2
SF	Square foot (feet)
Site	Crystal Cleaners Site
SOW	Scope of Work
SSDS	Sub-slab depressurization system
TBD	To be determined
VOC	Volatile organic compound

This page intentionally left blank

1. INTRODUCTION

EA Engineering, P.C. and its affiliate EA Science and Technology (EA) was tasked by the New York State Department of Environmental Conservation (NYSDEC) under Work Assignment Numbers (No.) D009806-11 to plan and oversee a pre-design investigation (PDI) and remedial design (RD) at the Crystal Cleaners Site (No. 360053) in the Village of Pelham, Westchester County, New York.

1.1 RECORD OF DECISION (MARCH 2016)

The overall remedial action (RA) is designed to address the elevated concentrations of contaminants of concern in soil west of the Site and facilitate remediation of the groundwater plume. The selected remedy includes six (6) elements:

1. Remedial Design
2. Excavation
3. Cover System
4. In-Situ Enhanced Bioremediation Using Activated Carbon Injection
5. Vapor Mitigation
6. Engineering and Institutional Controls

Element No. 2, excavation, was completed in July 2021 and included the removal of contaminated soils at the Pelham Department of Public Works property immediately west of the Site. The excavation work was performed as Phase I of EA's work assignment.

This scope of work addresses both Elements Nos. 1 and 4 and includes treatment of the contaminated groundwater in the DPW area, as well as the treatment of the contaminated groundwater plume that extends south to Manning Circle. The groundwater treatment activities are being performed as Phase II of EA's work assignment. This SOW supplements the *Phase I RA Scope of Work* (EA 2021).

1.2 RESPONSIBILITIES OF THE CONTRACTOR

The Contractor shall, in general, be responsible for the tasks and responsibilities outlined in Section 1.2 of the Phase I RA SOW (EA 2021) and the following additional supplemental items:

- Solicitation and procurement of a vendor for carbon product to be injected into subsurface to treat groundwater contamination.

- Injection of carbon product for in-situ bioremediation in locations shown on the Construction Drawings through DPT.

- Developing and implementing a Work Plan Addendum submitted and approved by EA and NYSDEC prior to mobilization. The Work Plan Addendum shall include but not be limited to:

  - Health and Safety Plan Addendum (HASP) – *revised to include Phase II Work Activities.*
  - Work Plan Addendum (that includes the following)
    - Injection Plan, including means and methods
    - Community Air Monitoring Plan (CAMP), per NYSDEC DER-10 (NYSDEC 2010) – *as an Appendix to the Work Plan revised to include Phase II Work*.
    - Erosion and Sediment Control Plan
    - Nuisance Control Plan

- The Contractor shall be required to obtain any work permits needed including building permits and street opening permits at the municipal level.

- Contractor shall solicit and procure products and services needed to complete the SOW if they cannot be provided in-house.

- Coordinating with NYSDEC, EA, the property owner(s), the Village of Pelham, as well as owners and/or operators of underground facilities, as necessary, to complete required work activities.

- Site restoration

- Management, characterization, and disposal of all generated wastes.

- Decontamination of all equipment and vehicles prior to leaving site.

2. REMEDIAL DESIGN

2.1 DESIGN RATIONALE AND ASSUMPTIONS

2.1.1 In-Situ Bioremediation

Per the ROD, areas of groundwater contamination exceeding 500 parts per billion will be treated by in-situ bioremediation and injection of carbon substrate. Additionally, injections will be performed in the vicinity of the excavation area completed in Phase I to prevent further migration of remaining contaminants from this area and assist in addressing any areas potentially not addressed through excavation due to restrictions based on surrounding structures.

Injection areas were determined based on historical groundwater concentrations and verified by groundwater sampling conducted as part of the PDI and Phase I RA work. The proposed injection areas are also limited by site constraints including the locations of surface structures and underground and overhead utilities.

The volume of water to be treated in the DPW and Manning Circle injection areas was estimated using the approximate surface area, 11,412 SF, and estimated "thickness" of groundwater in the treatment areas. Onsite at the DPW property, it was assumed that depth to water was 13.2 ft bgs based on historic gauging and that bedrock was located approximately 22 ft bgs based upon historic boring logs. Offsite at Manning Circle, depth to water was estimated at 8 ft bgs and bedrock was located at 20 ft bgs. Soil at the Site is generally fine to medium sand (based upon grain-size analysis and PDI soil boring logs); porosity of material was estimated at 30 percent, resulting in an estimated groundwater volume of 318,908 gallons (Appendix A) including a safety factor of 15%.

EA consulted with suppliers of injectable carbon substrates. Final volumes of product and injection spacing will be subject to input from the vendor selected by the Contractor. In accordance with the ROD, the injectable product is intended to reduce groundwater concentrations of contaminants of concern through anaerobic reductive dechlorination and be enhanced by the addition of activated carbon injections (NYSDEC 2016). The injectate selected by the Contractor shall not only be able to provide both sorption on the surface of the carbon, but also be supplemented with a product promoting degradation of PCE and other contaminants of concern. Contractor's selected product shall be approved by NYSDEC.

This page intentionally left blank

3. DESCRIPTION OF WORK TASKS

This section presents a task-by-task description of the Contractor's activities associated with the SOW to address the contaminated source area and implement in situ bioremediation at the Crystal Cleaners Site. Specifications and drawings are presented in Appendix B and C, respectively. The Contractor's activities will be implemented under the following general work tasks:

- Work Task 1 – Planning Documents and Mobilization/Demobilization
- Work Task 2 – In situ Bioremediation Injections/Product Application
- Work Task 3 – Site Restoration
- Work Task 4 – Site Survey.

A description of each of the anticipated work tasks is presented in the following sections.

3.1 WORK TASK 1 – PLANNING DOCUMENTS AND MOBILIZATION/DEMOBILIZATION

The Remedial Contractor will be responsible for conducting the following activities under this work task:

- Development, submittal, and revision (if needed) of a Work Plan Addendum that includes the following: an Injection Work Plan presenting means and methods and CAMP.
- Development, submittal, and revision (if needed) of a HASP Addendum
- Obtain any work permits needed including building permits, street opening permits, hydrant permits, etc. at the municipal level. The remedial contractor shall provide NYSDEC and EA copies of any permits obtained for the execution of the work.
- Attending project meetings as required.
- Mobilization/demobilization of all equipment, labor, and materials necessary to complete the SOW.
- Furnish and maintain temporary construction facilities to support remediation activities. Temporary construction facilities will include at a minimum sanitation facilities and necessary utilities.

Additional details for these activities are presented in the following sections.

3.1.1 Planning Documents

The Contractor shall submit appropriate planning documents to EA and NYSDEC for review. The Contractor shall finalize the documents submitted based on comments provided by EA and NYSDEC. Contractor shall not mobilize until all planning documents have been reviewed and approved by EA and NYSDEC.

The selected Contractor shall prepare a Work Plan Addendum including, but not limited to, the following:

- A full project schedule, including the length of time it will take for the Contractor to complete each individual work activity.

- Sequence of operations and proposed hours of operation. Normal working hours shall be defined during the pre-construction meeting, or if none are set forth, shall be defined as beginning no earlier than 8:00 a.m. and ending at no later than 6:00 p.m., unless otherwise stipulated by NYSDEC and/or the Village of Pelham.

- HASP Addendum:

  — The health and welfare of the Contractor's staff is the direct responsibility of the Contractor. The Contractor shall take all necessary precautions for the health and safety of all onsite Contractor employees in compliance with all applicable provisions of federal, state, and local health/safety laws; and provisions associated with the site-specific HASP. The Contractor shall designate a responsible representative at the site to act as the Site Health and Safety Officer whose duties include executing and ensuring compliance with the approved HASP.

  — As part of the HASP, the Contractor shall prepare a plan to manage and minimize the potential for transmission of the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) virus, which causes the Coronavirus Disease 2019 (COVID-19) in accordance with Section 01 35 33 – COVID-19 Risk Management (Appendix B).

- Permitting requirements/permits acquired.

- Subsurface utility identification, location, and termination.

- Proposed procedure(s) of decontamination for Contractor's small equipment and hand tools, waste material and personal protective equipment, and large equipment and vehicles included as a component of the Work Plan.

- Noise control measures and monitoring as required by local ordinances (Village of Pelham, Part II, Chapter 68, Article VII Noise Control).

- A CAMP will require real-time monitoring for particulates (i.e., dust) and VOCs, and shall be prepared in accordance with NYSDEC DER-10 and NYSDOH Generic Community Air Monitoring Plan:

  — The CAMP will be used to confirm that work activities do not spread contamination offsite through the air. The Contractor shall provide a daily data submittal from real-time monitoring.

— The CAMP will include proposed mitigation measures.

The Contractor shall revise the required submittals as necessary to address comments from EA and NYSDEC. The Contractor shall submit the revised and/or final submittals to EA and NYSDEC. EA and NYSDEC's review do not relieve the Contractor of any responsibility to comply with applicable laws, rules, regulations, or agreements.

3.1.2 Project Meetings

The Contractor shall be responsible for coordinating (as necessary) and attending project meetings including a pre-construction meeting (onsite or virtually); weekly project coordination meetings to discuss project status, schedule, and any implementation issues; daily health and safety meetings onsite; and final inspection meeting following completion of the SOW.

3.1.3 Permitting Plan/Permits

The Remedial Contractor will be required to obtain any work permits needed including building permits, street opening permits, hydrant permits, EPA Underground Injection Control approvals, etc. at the municipal, state, and federal level as necessary. The Contractor shall provide NYSDEC and EA copies of any permits obtained for the execution of the work.

3.1.4 Mobilization/Demobilization Activities

The Contractor shall be responsible, at a minimum, for the following mobilization tasks:

- Coordinating access to water and electrical service (if required). Onsite water could be supplied utilizing a hydrant adjacent to the DPW facility gate. Access to other various municipal structures (i.e., hydrants, valves, manholes, fire alarms, etc.) shall not be obstructed by the Contractor to prevent use by others. The Contractor shall secure any required permits from the local water authority and be responsible for installing a backflow preventer and water meter on the hydrant. The Contractor shall also be required to provide sanitary facilities for the duration of the site work.

- Verifying the existing site conditions and identifying and marking the location(s) of all aboveground and underground utilities, equipment, and structures, as necessary to implement the SOW:

  — Prior to commencing onsite activities, the Contractor shall contact Dig Safely New York to obtain utility clearances. A geophysical survey was conducted by EA. The surveyed and mapping of identified utilities are provided on the Drawings. The Contractor shall be responsible for verifying all utility locations and for coordinating with the applicable utility companies. The Contractor shall also obtain and pay for all necessary permits to complete the work.

— As stated above, the Contractor shall be responsible for calling Dig Safely New York prior to initiating the injection work. Soft-digging is subject to the discretion of the Contractor for injection locations in close proximity to marked utilities, or in areas of uncertainty.

— If the Contractor damages existing utilities, equipment, or structures, the Contractor is responsible for notifying the appropriate utility company, EA, and NYSDEC, and fully repairing all damages at no additional cost to NYSDEC. Repairs, if necessary, shall be completed in accordance with all requirements of the utility company and to the satisfaction of EA and NYSDEC.

- Mobilizing all manpower, equipment, and materials to the Site as necessary to implement the SOW. The Contractor shall be responsible for providing all labor, equipment, and materials needed to conduct decontamination activities (as necessary) of all personnel and equipment associated with the SOW.

- Completing site preparation activities included but not limited to:

  — Establishing a storage area with temporary construction fencing or barricades to prevent access by unauthorized personnel to be utilize to stage and store materials as needed to complete injection work.

  — Constructing additional support area(s) and decontamination area(s) in accordance with the provisions of the reviewed documentation and plans.

- Decontamination activities shall be conducted on a temporary decontamination pad constructed by the Contractor in an area approved by EA. Procedures shall include scraping equipment of residual debris with a shovel/brush and a hot-water pressure washing of equipment and vehicle tires, as needed. Decontamination fluids shall be containerized in an appropriate container for characterization and disposal offsite by the Contractor.

- Characterization and disposal of all waste generated by the Contractor in performance of this SOW.

- Demobilization activities to be conducted by the Contractor include, at a minimum, decontamination, dismantling and removal from the site of all equipment, additional materials not used by the Contractor, and other support services.

3.2 WORK TASK 2 – INSITU BIOREMEDIATION INJECTIONS/PRODUCT APPLICATION

To target areas of groundwater contamination, the Contractor shall inject an activated carbon product to the areas/locations shown on the Construction Drawings. Injection locations within the footprint of the excavation from the Phase I work shall be completed prior to final surface

completion with concrete and asphalt as specified in Work Task 6 of Phase I RA SOW (EA 2021). The material(s) will be procured and supplied by the Contractor.

The Contractor shall inject activated carbon into the areas shown on the Drawings through direct-push technology (DPT). Quantities and volumes of product will be determined through consultation with the selected carbon vendor, the Contractor, EA, and NYSDEC. Generally, EA anticipates that the Contractor (with assistance from the vendor) will install roughly 150 injection points in the targeted areas. EA solicited proposals from companies that provide carbon treatment products. As is typical with in-situ products, each company has proprietary formulated products, resulting in no two companies being able to provide identical products or injection methodology. Each company was given all the site data for their professionals to review and propose the most appropriate product to meet project requirements. Estimated injection quantities varied between vendor, depending on the product. Copies of EA's solicitation and vendor response are provided in Appendix D. Final volumes of product, injection spacing, and number of injection points will be subject to input from the vendor selected by the Contractor.

As noted in each vendor's proposal, the vendor can provide a DPT drilling contractor to perform injections of the in-situ product. It is expected that the vendor will work with the drilling contractor onsite to complete injections. The Contractor shall be responsible for soliciting vendor pricing, selecting appropriate vendor, and overseeing implementation of injections.

3.3 WORK TASK 3 – SITE RESTORATION

Site restoration of injection points will be dependent upon surrounding surfaces. Injection points installed at the southern end of the DPW property and on the Manning Circle roadway will be backfilled with hydrated bentonite to within 6-in of surrounding grade and then restored with cold patch to meet existing grades of surrounding asphalt. Injection points installed within the excavation area will be backfilled with hydrated bentonite to within 12-in of surrounding grade. The surface of the excavation area will be restored as specified in the Phase I RA SOW (EA 2021). Injection points installed in vegetated areas will be backfilled with hydrated bentonite to within 6-in of surrounding grade, backfilled with topsoil, and finished to match the existing/surrounding landscaping. Injection points within the Community Driveway shall be backfilled with hydrated bentonite to within 6-in of surrounding grade, with final surface completion of the Community Driveway as specified below. All completed injection points shall be surveyed prior to restoration of the Community Driveway (described below).

The Contractor shall cold mill and repave the community driveway located at 25 Manning Circle following completion of injections in that area. Approximately 1-inches of asphalt will be milled from the driveway surface and replaced with NYSDOT Type 6F Top Course. The surface shall be completed so that it maintains positive drainage away from the apartment buildings at 25 Manning Circle and there is a minimum asphalt thickness of 3-inches (or minimum thickness of existing driveway surface, whichever is greater). Further details and specifications are provided in the Drawings.

This page intentionally left blank

3.4 WORK TASK 4 – SITE SURVEY

The Contractor shall be responsible for procuring a New York State-licensed surveyor. The overall injection area footprint shall be surveyed and marked in the Manning Circle area to allow for efficient modification to injection locations, if needed due to subsurface utilities. A pre-construction 0.5-ft topographic survey of the Community Driveway shall also be performed. The pre-construction survey should capture edge of pavement (at a minimum every 10 linear feet), topography between edge of pavement and apartment building, and road and sidewalk tie ins at intersection with Manning Circle. Injection points shall be flagged/marked and surveyed by the licensed surveyor once all injections are complete, prior to repaving of the Community Driveway. A 0.5-ft topographic survey shall also be completed in the Community Driveway at 25 Manning Circle so that final grades can be included in the as-built drawings.

3.5 ROLES AND RESPONSIBILITIES

A description of the roles and responsibilities identified in the Phase I SOW (EA 2021) will be maintained in Phase II.

- Pre-construction surveys, injection point survey, and of final restoration surveys.
- Submit waste profiles for each sampled and identified waste stream to EA and indicate the proposed disposal facility the waste will be transported. Potential waste streams anticipated include drill cuttings from any test borings installed during injection mobilization and decontamination fluids
- Supply weight tickets for offsite disposal or recycling of any material and weight tickets of imported material used for site restoration.

This page intentionally left blank

4. PROJECT CONTACTS

The following personnel identified in **Table 1** have been identified for this project to fulfill requirements, roles, and responsibilities listed in Section 3.8.

Table 1 Project Roles and Contact Information

Name	Project Role	Company	Telephone	Email
John Miller, P.E.	Site Project Manager	NYSDEC-DER	Office: (518) 402-9589 Cell: (315) 269-5928	john.miller@dec.ny.gov
Joseph Senerchia	Superintendent of Department of Buildings and Public Works	Village of Pelham	Office: (914) 738-2258	buildingdept@pelhamgov.com
Chris Scelza	Village Administrator	Village of Pelham	Office: (914) 738-2015	chris.scelza@pelhamgov.com
TBD	Environmental and Exposure Evaluation	NYSDOH	Office: TBD	TBD
Donald Conan, P.E., P.G.	EA Program Manager	EA Engineering, P.C.	Office: (315) 565-6551 Cell: (315) 877-7403	dconan@eaest.com
Frank DeSantis, Jr.	EA Deputy Program Manager	EA Science and Technology	Office: (315) 565-6554 Cell: (315) 395-7689	fdesantis@eaest.com
Adam Etringer	EA Project Manager	EA Science and Technology	Office: (315) 565-6564 Cell: (518) 242-9773	aetringer@eaest.com
Emily Cummings, EIT	EA Project Engineer	EA Science and Technology	Office: (315) 565-6553 Cell: (860) 309-3837	ecummings@eaest.com
TBD	EA Construction Inspector	EA Science and Technology	TBD	TBD
Adam Atkinson	Construction Project Manager	Precision Environmental Services, Inc.	Office: (518) 885-4399 Cell: (518) 307-7163	aatkinson@pesnyinc.com

Notes:
EIT = Engineer-in-Training
P.E. = Professional Engineer
P.G. = Professional Geologist
TBD = To be determined

This page left intentionally blank

5. REFERENCES

EA. 2021. *Phase I: Remedial Action Scope of Work; Excavation and In-Situ Bioremediation at Village of Pelham Department of Public Works Property; Crystal Cleaners Site (no. 360053)*. July.

New York State Department of Environmental Protection (NYSDEC). 2010. *DER-10 Technical Guidance for Site Investigation and Remediation.* May.

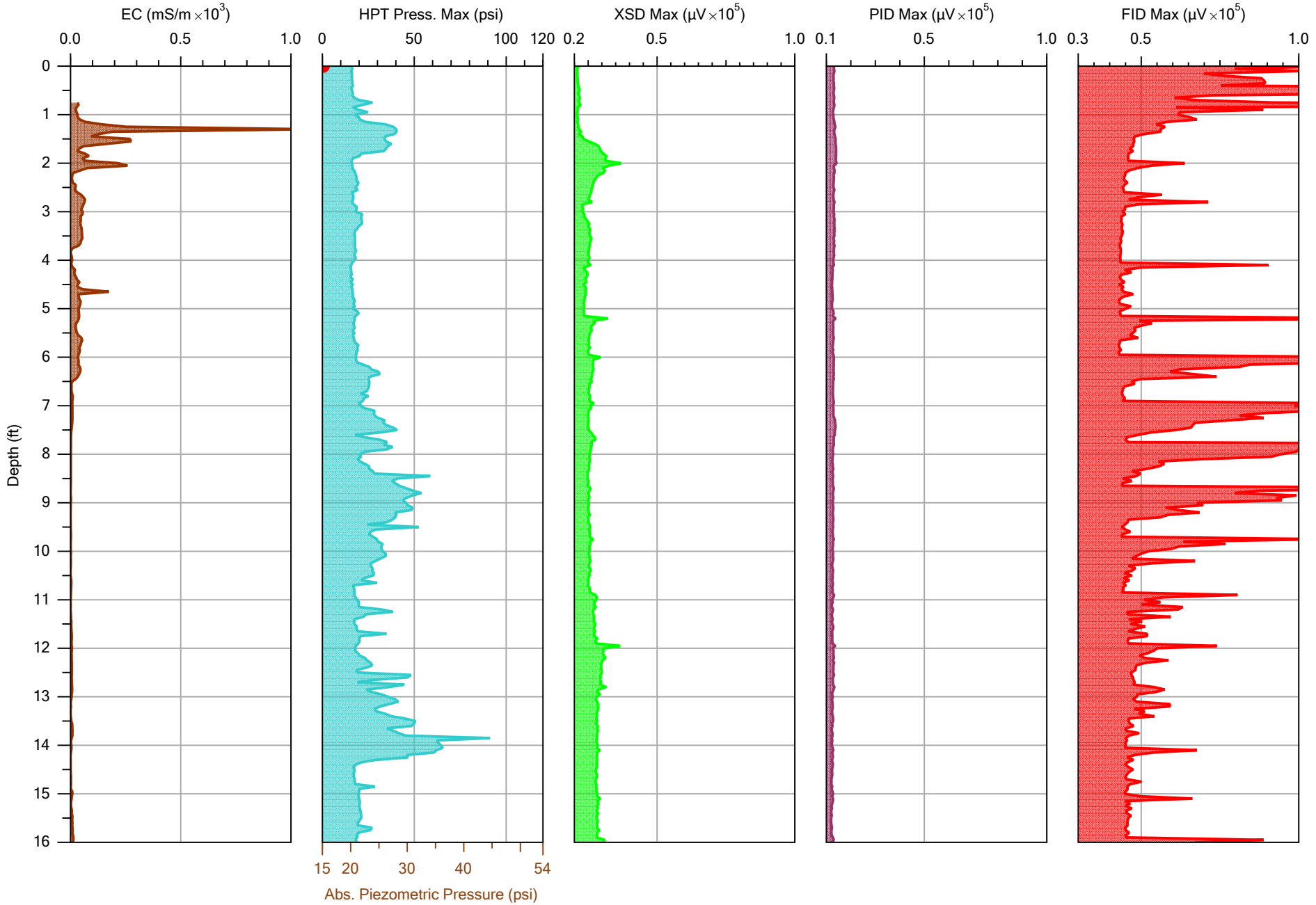
———. 2016. *Record of Decision, Crystal Cleaners, State Superfund Project, Pelham (V), Westchester County, Site No. 360053.* March.

This page left intentionally blank.

Appendix A

Relevant Site Data Documents

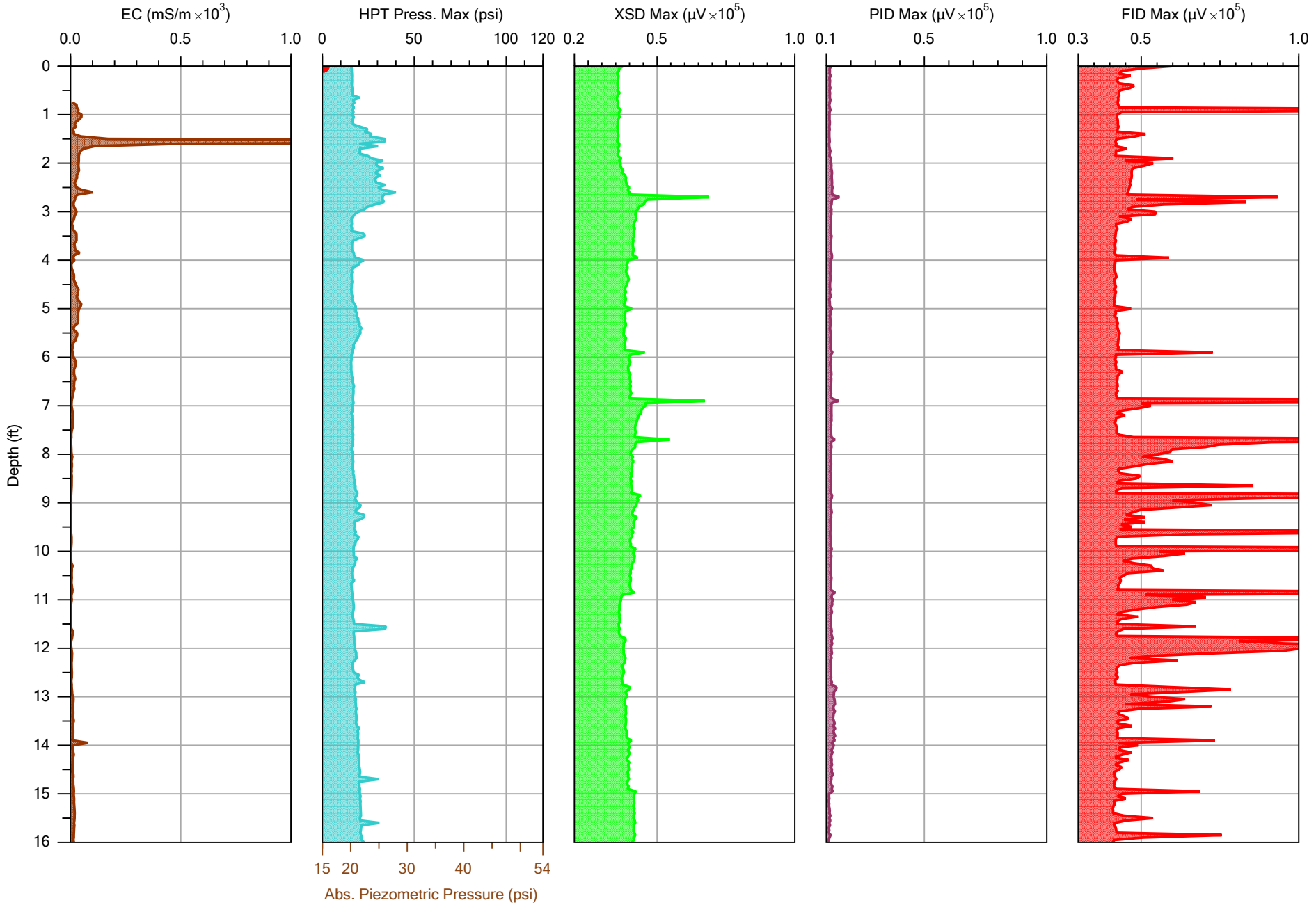
This page intentionally left blank



parratt wolff inc

DIRECT IMAGING

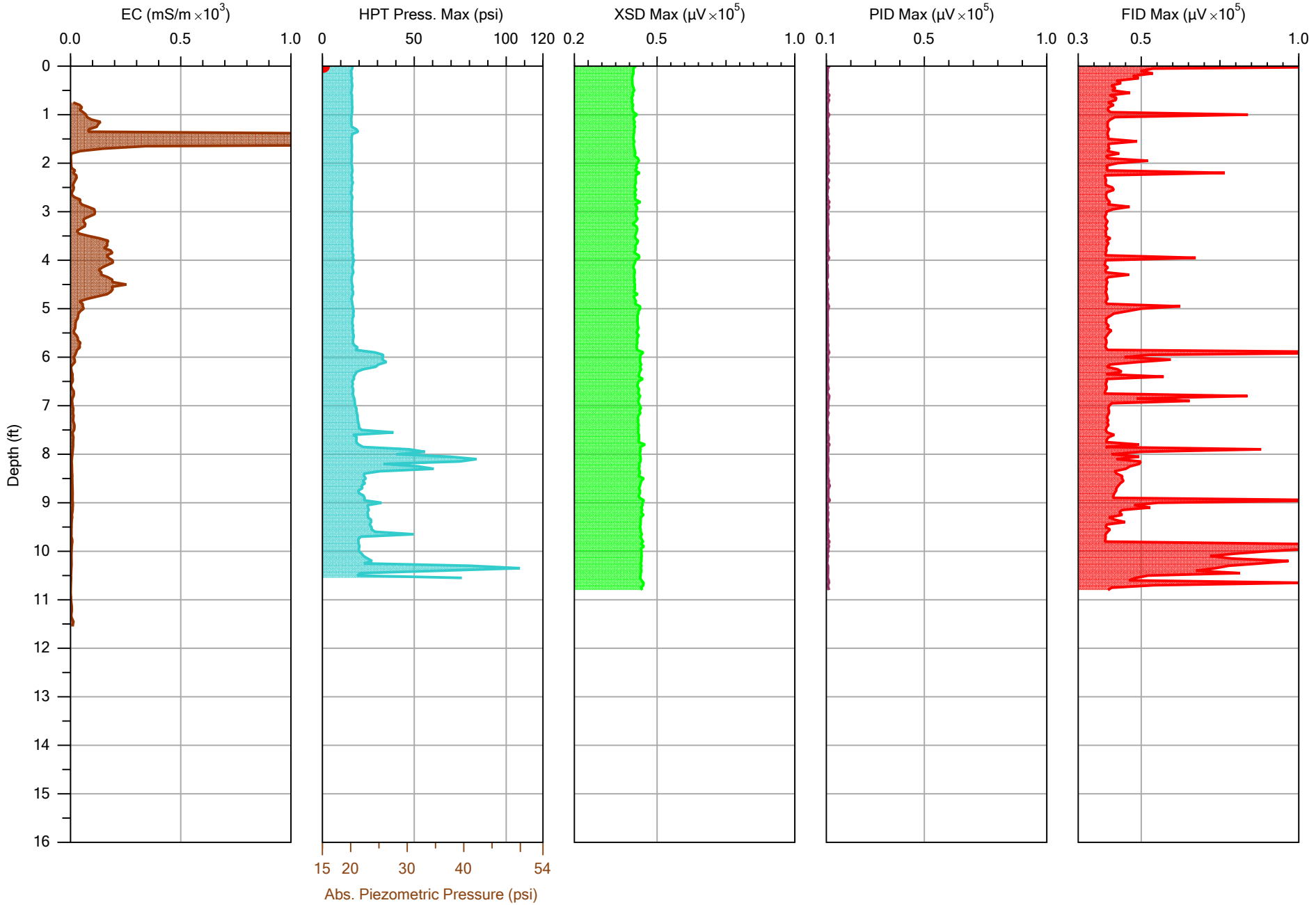
		File: MIHPT-001.MHP
Company: Parratt-Wolff	Operator: Wayne Nielson	Date: 7/7/2020
Project ID: 20083	Client: EA -	Location: Pelham N.Y.



parratt wolff inc

DIRECT IMAGING

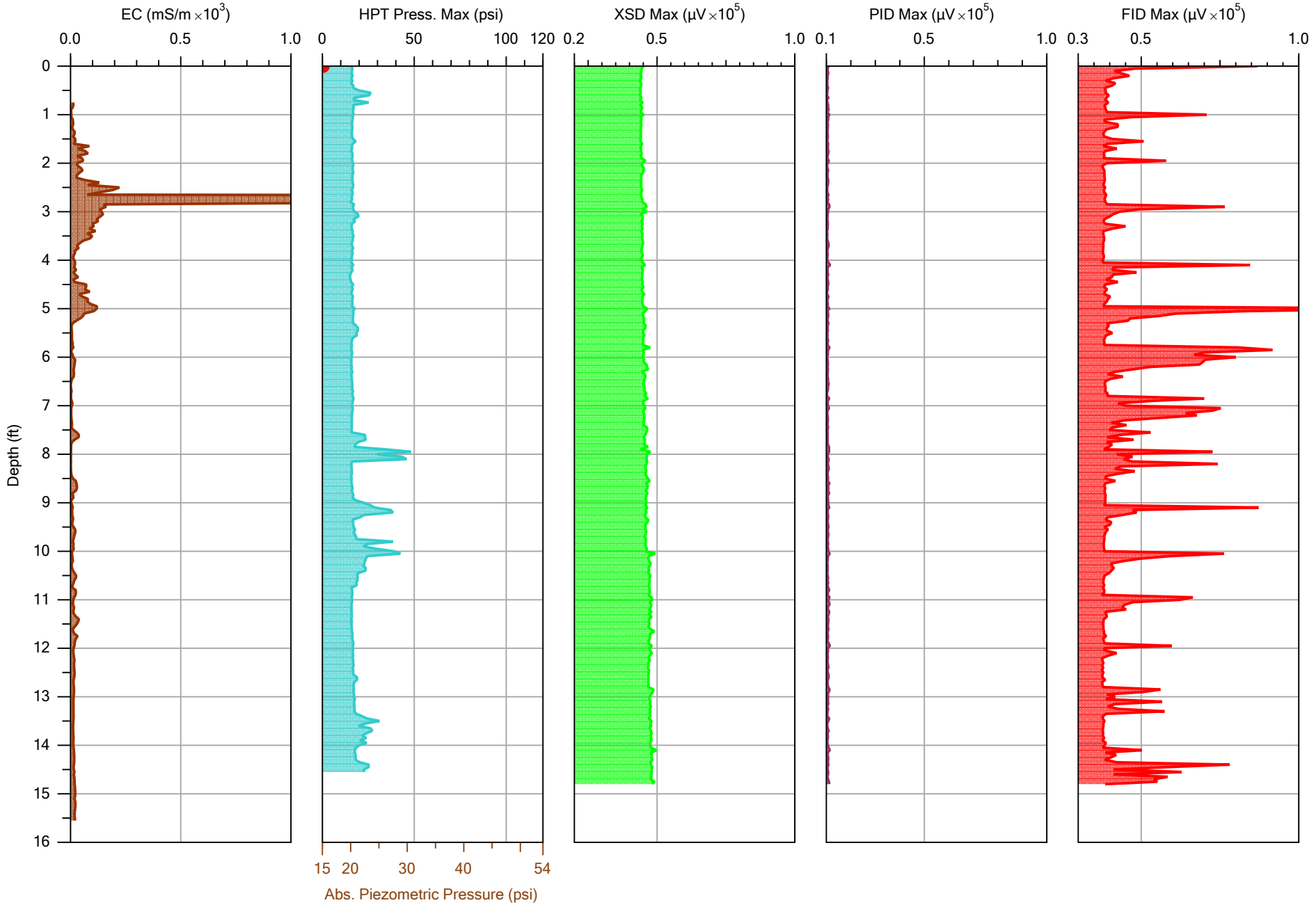
		File: MIHPT-002.MHP
Company: Parratt-Wolff	Operator: Wayne Nielson	Date: 7/7/2020
Project ID: 20083	Client: EA -	Location: Pelham N.Y.



parratt wolff inc

DIRECT IMAGING

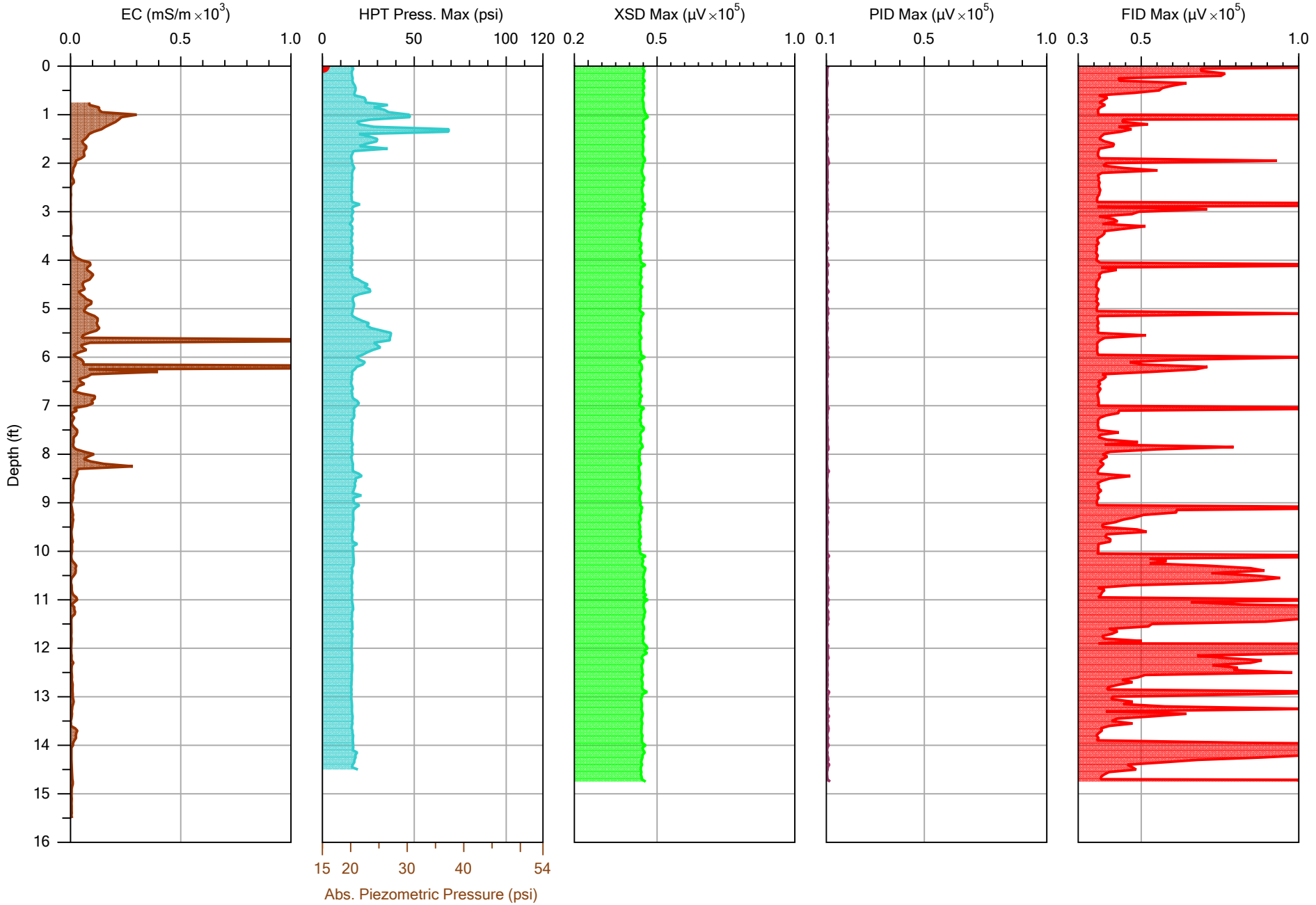
		File: MIHPT-003.MHP
Company: Parratt-Wolff	Operator: Wayne Nielson	Date: 7/7/2020
Project ID: 20083	Client: EA -	Location: Pelham N.Y.



parratt wolff inc

DIRECT IMAGING

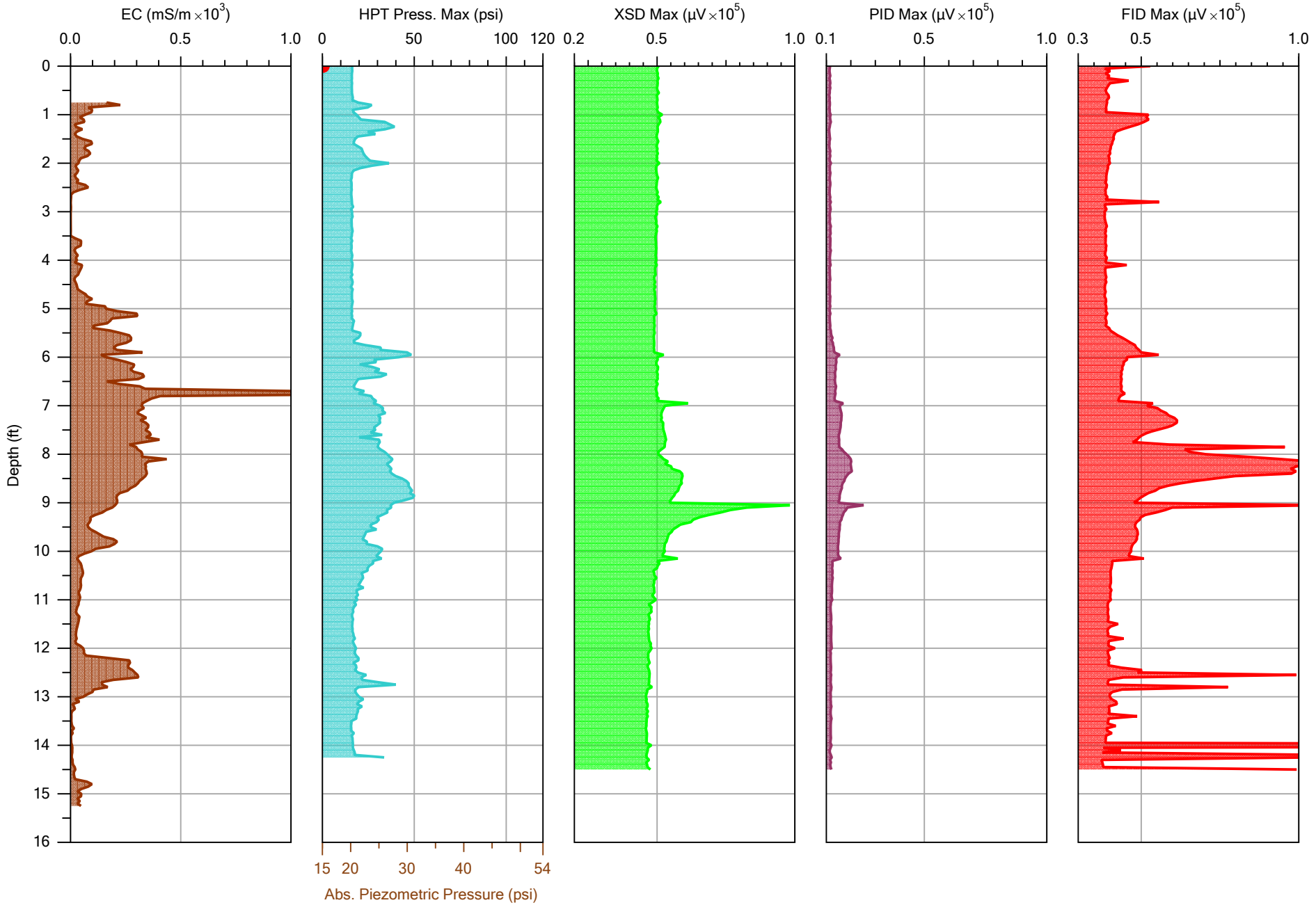
			File: MIHPT-004.MHP
Company: Parratt-Wolff		Operator: Wayne Nielson	Date: 7/7/2020
Project ID: 20083		Client: EA -	Location: Pelham N.Y.



parratt wolff inc

DIRECT IMAGING

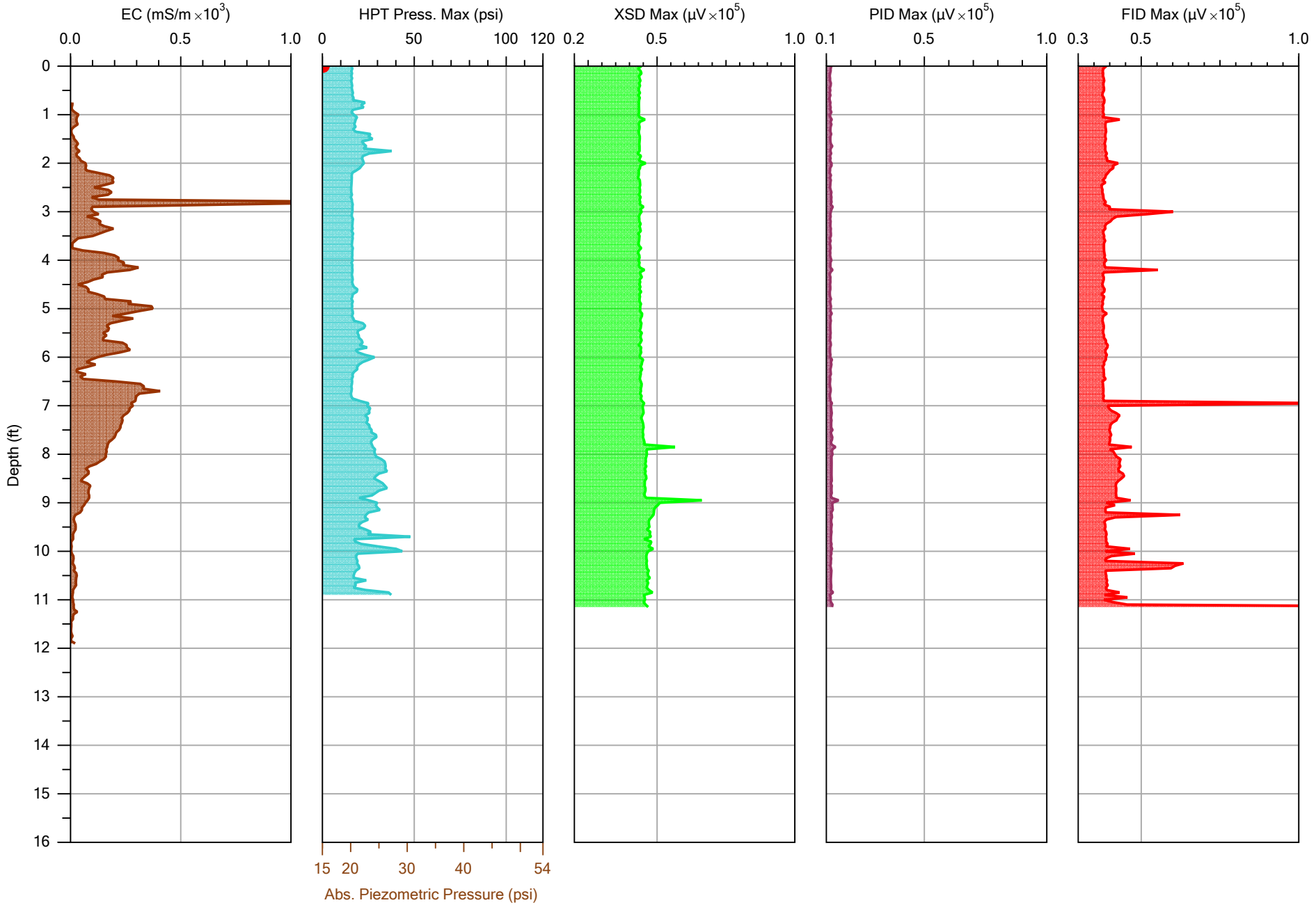
			File: MIHPT-005.MHP
Company: Parratt-Wolff		Operator: Wayne Nielson	Date: 7/7/2020
Project ID: 20083		Client: EA -	Location: Pelham N.Y.



parratt wolff inc

DIRECT IMAGING

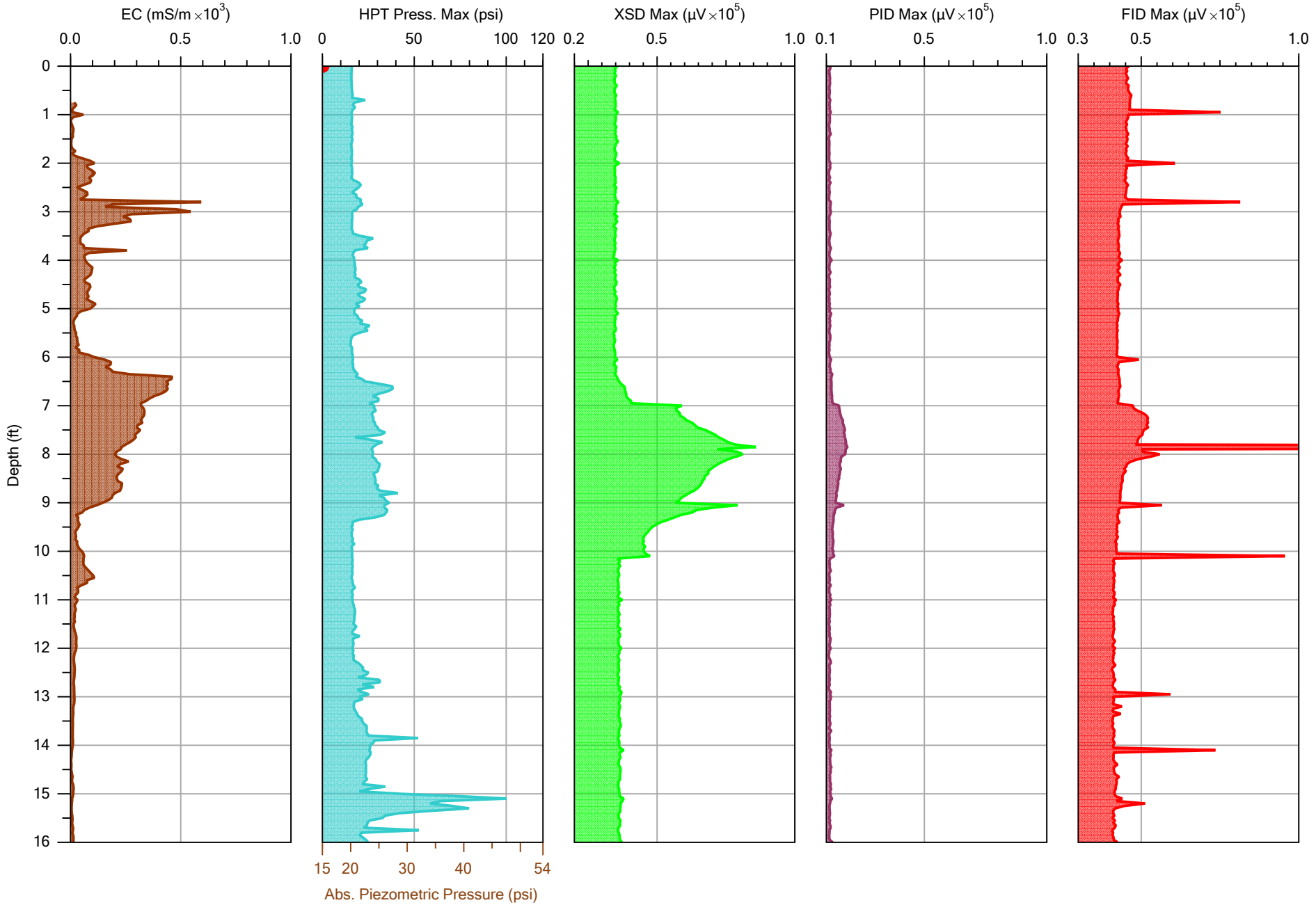
		File: MIHPT-006.MHP
Company: Parratt-Wolff	Operator: Wayne Nielson	Date: 7/7/2020
Project ID: 20083	Client: EA -	Location: Pelham N.Y.



parratt wolff inc

DIRECT IMAGING

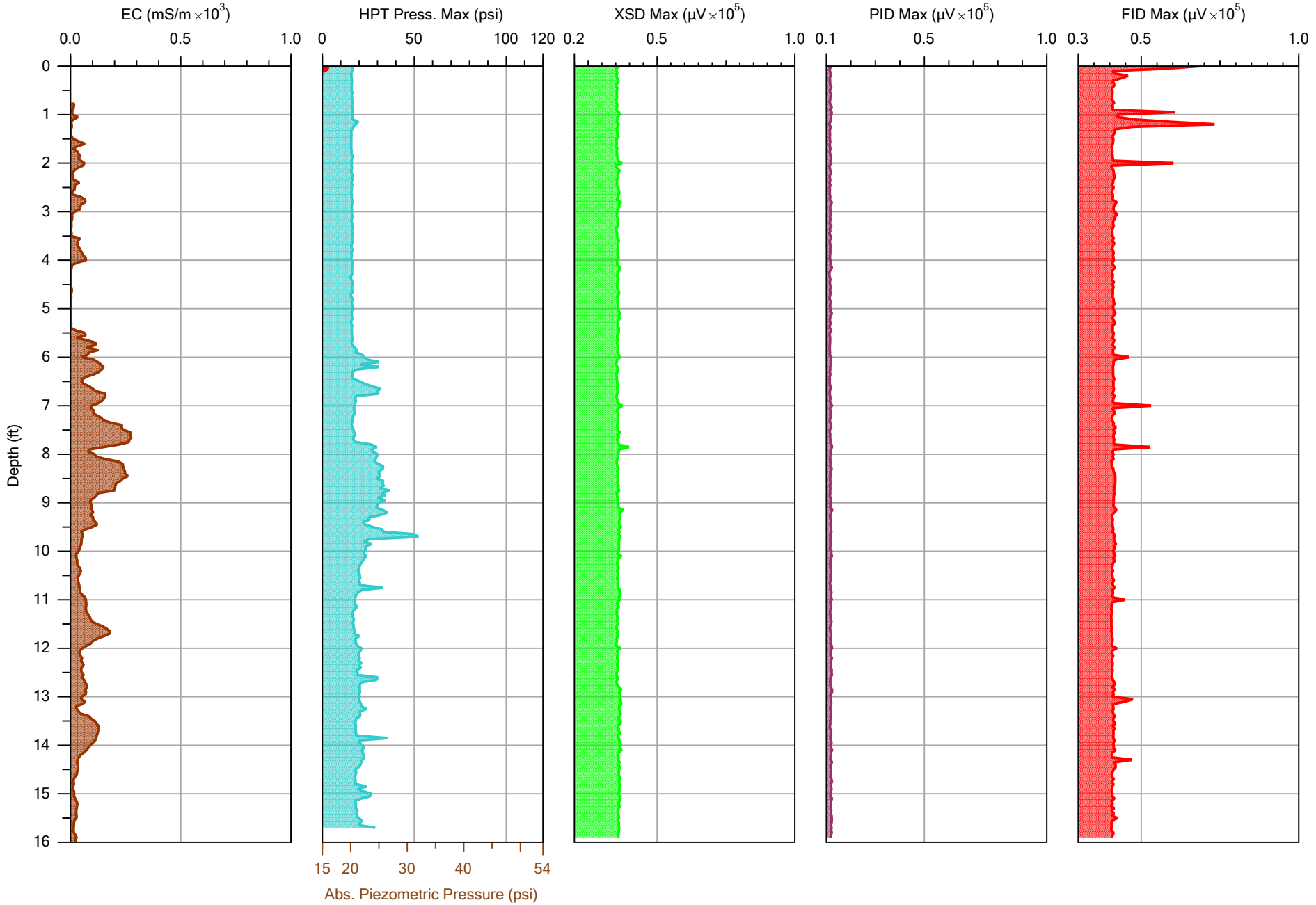
		File: MIHPT-007.MHP
Company: Parratt-Wolff	Operator: Wayne Nielson	Date: 7/7/2020
Project ID: 20083	Client: EA -	Location: Pelham N.Y.



parratt wolff inc

DIRECT IMAGING

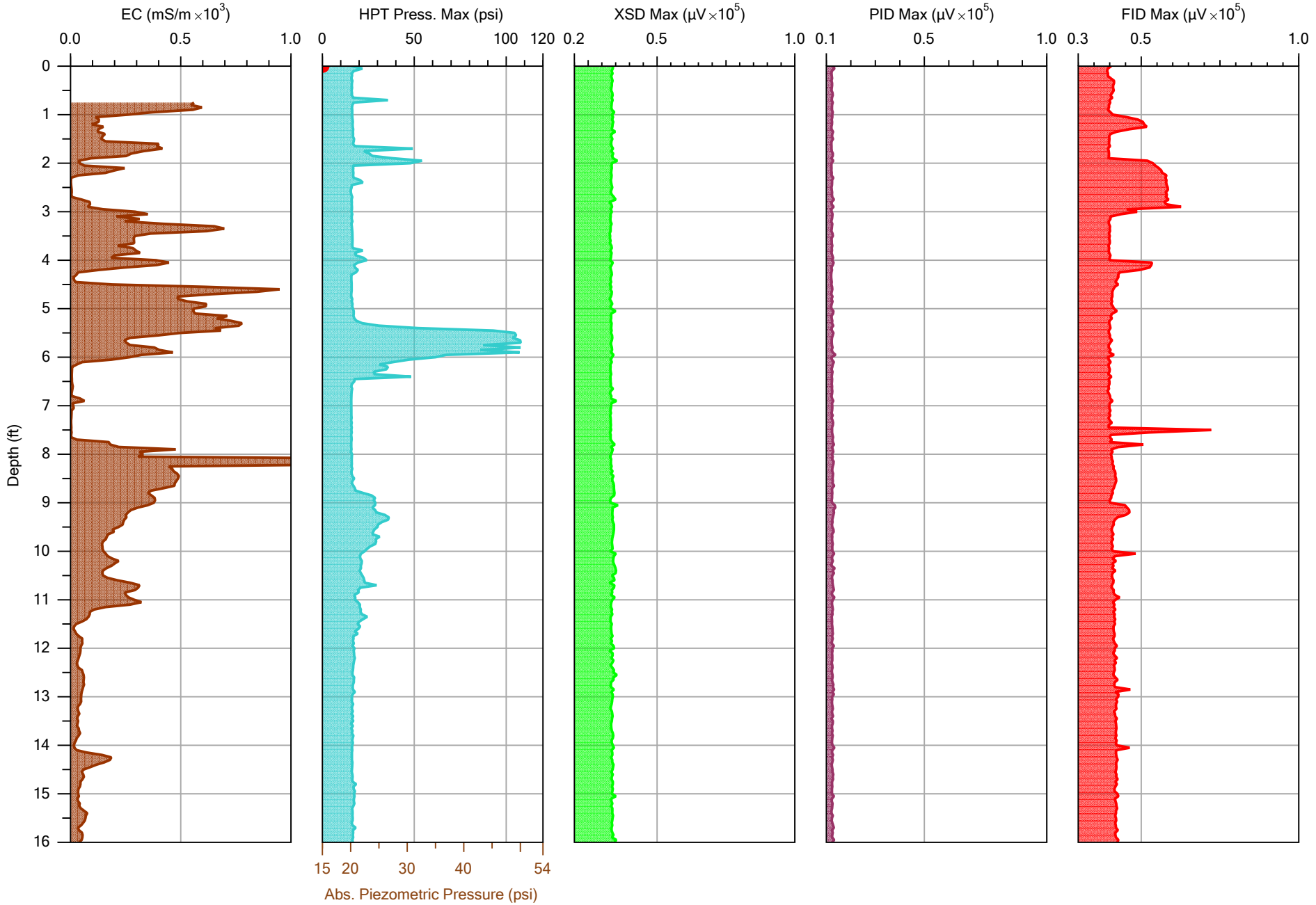
		File: MIHPT-008.MHP
Company: Parratt-Wolff	Operator: Wayne Nielson	Date: 7/8/2020
Project ID: 20083	Client: EA -	Location: Pelham N.Y.



parratt wolff inc

DIRECT IMAGING

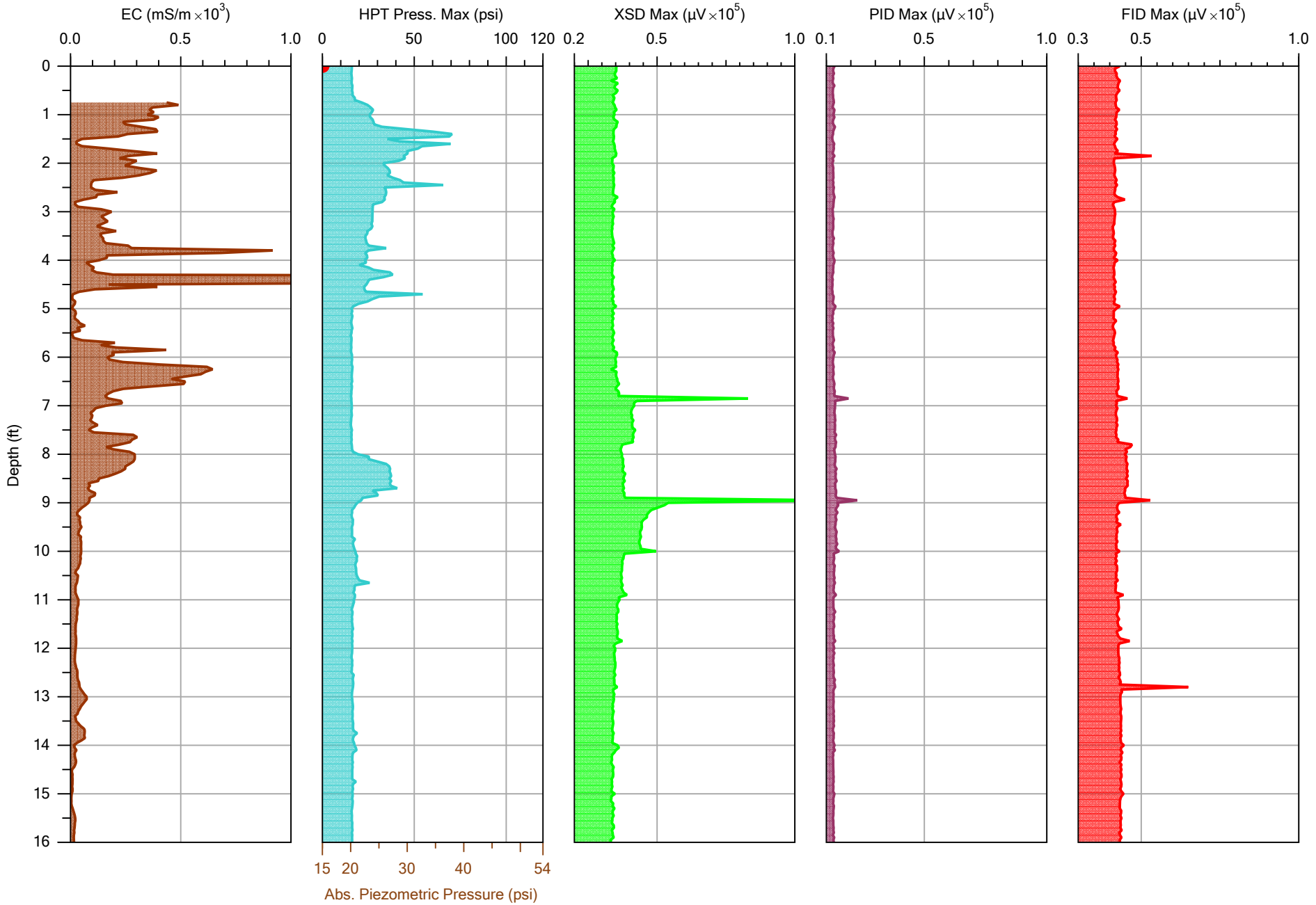
		File: MIHPT-009.MHP
Company: Parratt-Wolff	Operator: Wayne Nielson	Date: 7/8/2020
Project ID: 20083	Client: EA -	Location: Pelham N.Y.



parratt wolff inc

DIRECT IMAGING

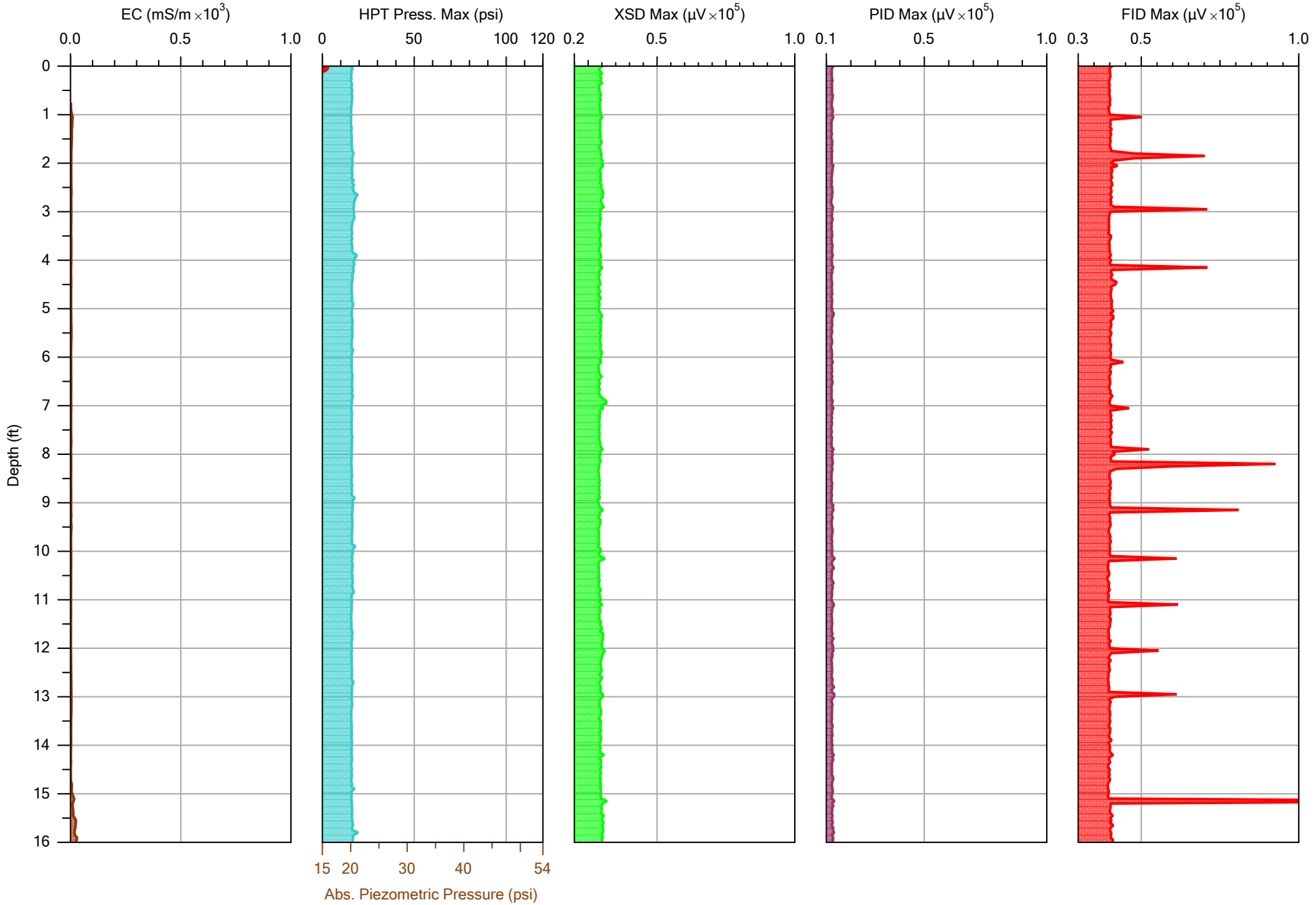
		File: MIHPT-010.MHP
Company: Parratt-Wolff	Operator: Wayne Nielson	Date: 7/8/2020
Project ID: 20083	Client: EA -	Location: Pelham N.Y.



parratt wolff inc

DIRECT IMAGING

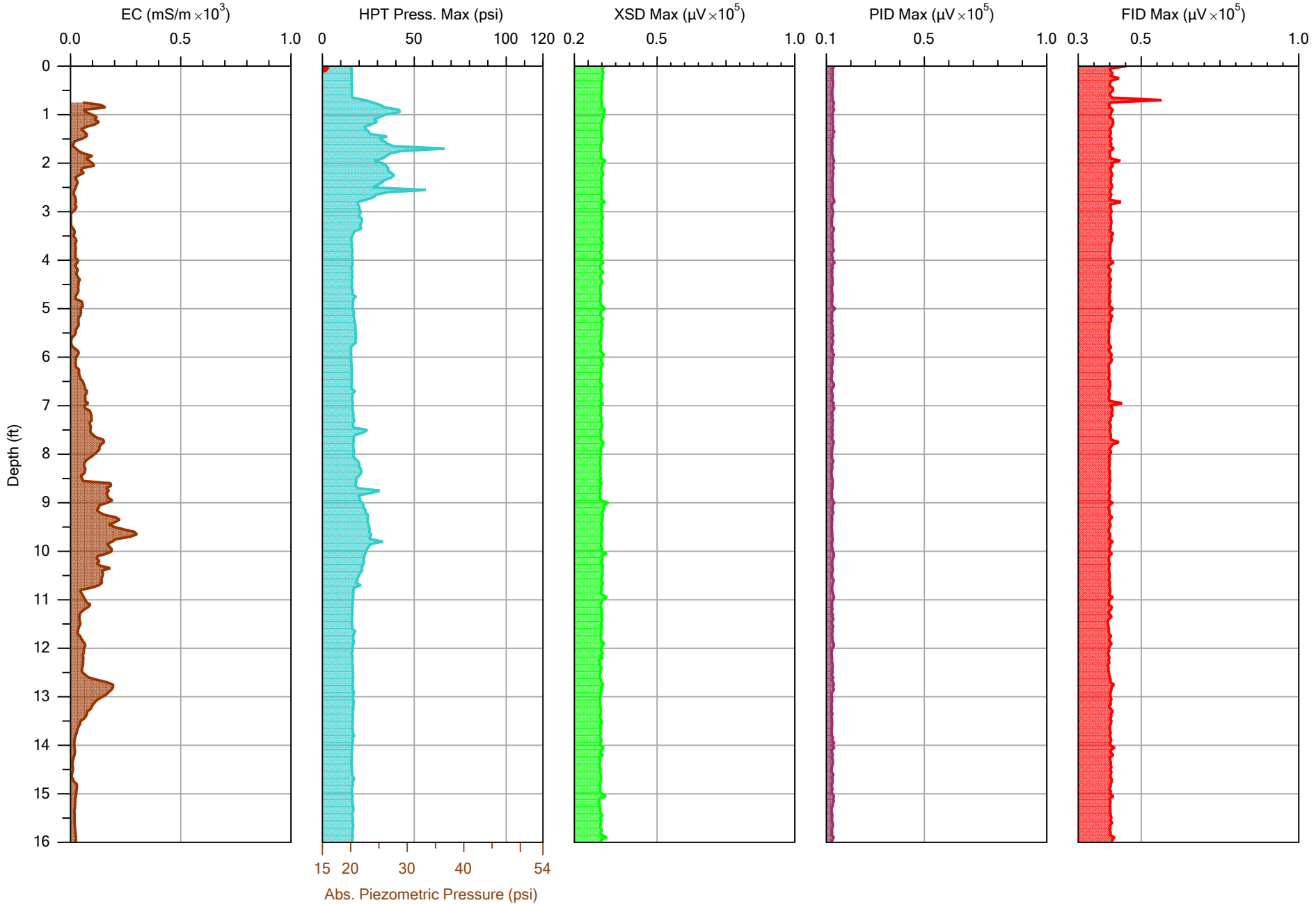
		File: MIHPT-011.MHP
Company: Parratt-Wolff	Operator: Wayne Nielson	Date: 7/8/2020
Project ID: 20083	Client: EA -	Location: Pelham N.Y.



parratt wolff inc

DIRECT IMAGING

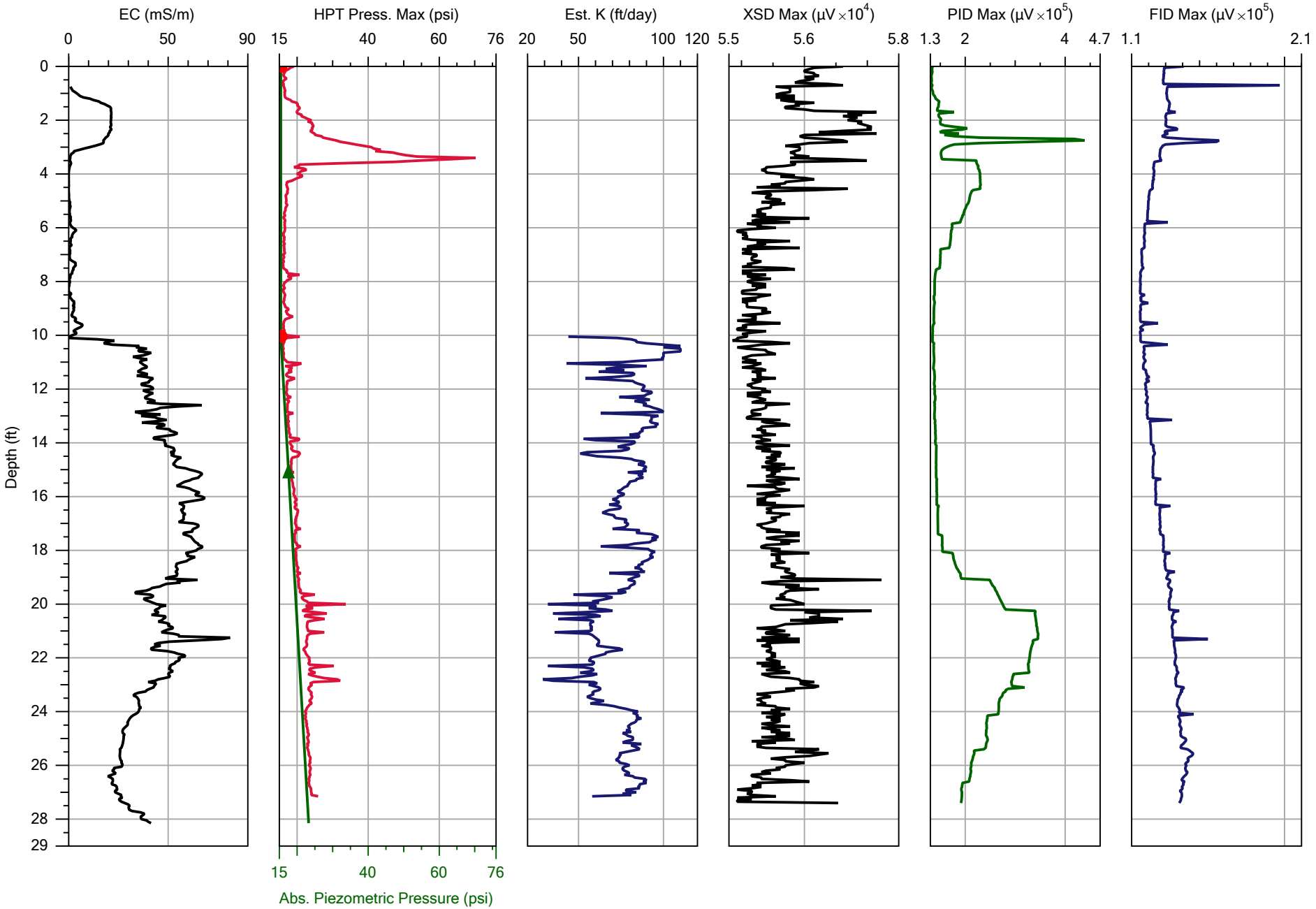
		File: MIHPT-012.MHP
Company: Parratt-Wolff	Operator: Wayne Nielson	Date: 7/8/2020
Project ID: 20083	Client: EA -	Location: Pelham N.Y.



parratt wolff inc

DIRECT IMAGING

		File: MIHPT-013.MHP
Company: Parratt-Wolff	Operator: Wayne Nielson	Date: 7/8/2020
Project ID: 20083	Client: EA -	Location: Pelham N.Y.



parratt wolff inc

DIRECT IMAGING

		File: MC-MIP-1.MHP
Company: Parratt-Wolff, Inc.	Operator: Danylo Kulczycky	Date: 11/19/2020
Project ID: Crystal Cleaners	Client: EA	Location: Pelham, NY

MC-MIP-1.zip

SITE INFORMATION -- DIRECT IMAGE MIP+HPT PROBE

Geoprobe DI Acquisition Software for Windows
Version: 3.3 Build: 19087

Pre-Log EC Load Tests

Test	Target (mS/m)	Actual (mS/m)	% Diff	P/F
Low	55.0	54.0	1.9	PASS
High	290.0	281.1	3.1	PASS

COMPANY: Parratt-Wolff, Inc.
OPERATOR: Danylo Kulczycky
PROJECT ID: Crystal Cleaners
CLIENT: EA
UNITS: ENGLISH
PROBE AND ARRAY: MH6530/6532 MiHPT Probe with Top Dipole
PROBE SERIAL NUMBER: 1O
LOCATION: Pelham, NY
100 INCH STRING POT USED
ROD LENGTH: 5 feet

MIP PRE-LOG RESPONSE TEST

FILENAME: MC-MIP-1.pre.tim
COMPOUND: TCE
CONCENTRATION: 15 ppm
FLOW: 40 mL/min
RESPONSE TEST START TIME: Thu Nov 19 2020 10:57:16

RESPONSE TEST ATTENUATION CHANGES

TIME	DET1	DET2	DET3	DET4
0	1	1	1	1
2	1	1	1	1

TRIP TIME: 45 sec
Gas Used: nitrogen

PRE-LOG HPT REFERENCE TEST VALUES

PRE TEST TIME: Thu Nov 19 2020 11:03:26

TEST	HPT PRESSURE (psi)	FLOW (mL/min)	HPT PRESSURE (kPa)
TOP with FLOW=0	15.817	0.0	109.050
TOP with FLOW>0	16.158	268.0	111.410
BOTTOM with FLOW=0	15.589	0.0	107.480
BOTTOM with FLOW>0	15.962	270.5	110.050

EXPECTED FLOW=0 HPT DIFF.: 0.22 psi (1.5 kPa) +/- 10%
ACTUAL FLOW=0 HPT DIFF.: 0.23 psi (1.6 kPa)

TRANSDUCER TEST PASSED

HPT IDEAL COEFFS: 2.2696e1,-2.2356
HPT SENSOR CAL NUMBERS: XD31329A,0.0000,0.0000,0.0000,0.0000,9.9540e-1,-1.3330

Temperature out of range (36.8 deg C) at 0.00 ft (0.000 m)

Temperature out of range (32.2 deg C) at 0.00 ft (0.000 m)

Temperature out of range (27.2 deg C) at 0.00 ft (0.000 m)

LOG START TIME: Thu Nov 19 2020 11:12:35

Temperature out of range (79.9 deg C) at 27.40 ft (8.352 m)

ATTENUATION CHANGES

DEPTH (ft)	DEPTH (m)	DET1	DET2	DET3	DET4
0.00	0.000	1	1	1	1

LOG END DEPTH: 27.40 ft (8.352 m)
LOG END TIME: Thu Nov 19 2020 12:05:10

LATITUDE: 0.000000000
LONGITUDE: 0.000000000
ELEVATION: 0.000 METERS 0.00 FEET
GPS Quality: None

MIP POST-LOG RESPONSE TEST

FILENAME: MC-MIP-1.post.tim
COMPOUND: TCE
CONCENTRATION: 15 ppm
FLOW: 40 mL/min
RESPONSE TEST START TIME: Thu Nov 19 2020 12:23:21

RESPONSE TEST ATTENUATION CHANGES

TIME	DET1	DET2	DET3	DET4
0	1	1	1	1
1	1	1	1	1

POST-LOG HPT REFERENCE TEST VALUES

POST TEST TIME: Thu Nov 19 2020 12:27:30

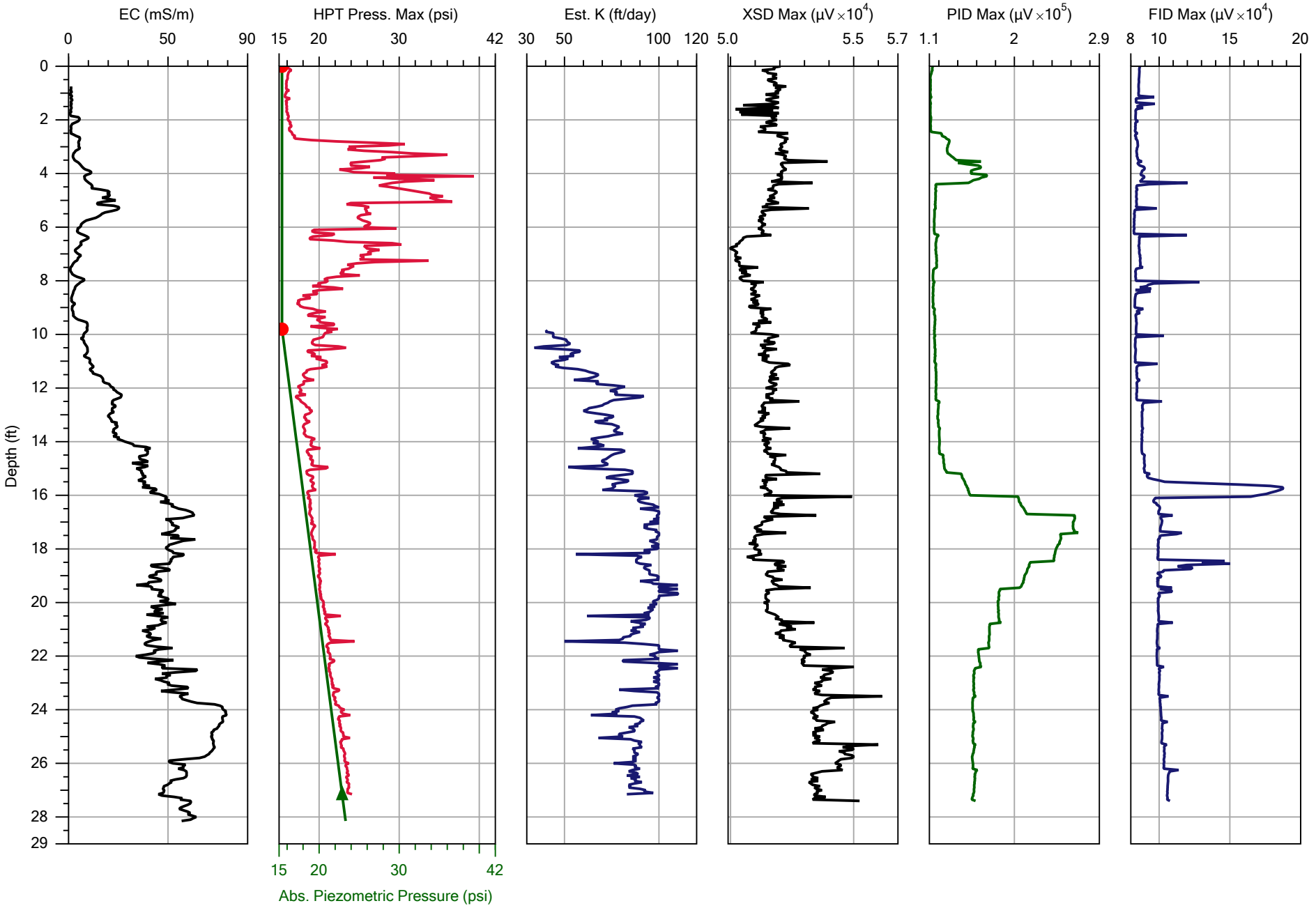
TEST	HPT PRESSURE (psi)	FLOW (mL/min)	HPT PRESSURE (kPa)
TOP with FLOW=0	15.769	0.0	108.720
TOP with FLOW>0	16.159	268.4	111.410
BOTTOM with FLOW=0	15.548	0.0	107.200
BOTTOM with FLOW>0	15.940	269.4	109.900

EXPECTED FLOW=0 HPT DIFF.: 0.22 psi (1.5 kPa) +/- 10%
ACTUAL FLOW=0 HPT DIFF.: 0.22 psi (1.5 kPa)

TRANSDUCER TEST PASSED

Post-Log EC Load Tests

Test	Target (mS/m)	Actual (mS/m)	% Diff	P/F
Low	55.0	54.9	0.2	PASS
High	290.0	274.9	5.2	PASS



parratt wolff inc

DIRECT IMAGING

		File: MC-MIP-2.MHP
Company: Parratt-Wolff, Inc.	Operator: Danylo Kulczycky	Date: 11/19/2020
Project ID: Crystal Cleaners	Client: EA	Location: Pelham, NY

MC-MIP-2.zip

SITE INFORMATION -- DIRECT IMAGE MIP+HPT PROBE

Geoprobe DI Acquisition Software for Windows
Version: 3.3 Build: 19087

Pre-Log EC Load Tests (Post-Log From MC-MIP-1.zip)

Test	Target (mS/m)	Actual (mS/m)	% Diff	P/F
Low	55.0	54.9	0.2	PASS
High	290.0	274.9	5.2	PASS

COMPANY: Parratt-Wolff, Inc.
OPERATOR: Danylo Kulczycky
PROJECT ID: Crystal Cleaners
CLIENT: EA
UNITS: ENGLISH
PROBE AND ARRAY: MH6530/6532 MiHPT Probe with Top Dipole
PROBE SERIAL NUMBER: 1O
LOCATION: Pelham, NY
100 INCH STRING POT USED
ROD LENGTH: 5 feet

MIP PRE-LOG RESPONSE TEST (Post-Log From MC-MIP-1.zip)

FILENAME: MC-MIP-2.pre.tim
COMPOUND: TCE
CONCENTRATION: 15 ppm
FLOW: 40 mL/min
RESPONSE TEST START TIME: Thu Nov 19 2020 12:23:21

RESPONSE TEST ATTENUATION CHANGES

TIME	DET1	DET2	DET3	DET4
0	1	1	1	1
1	1	1	1	1

TRIP TIME: 45 sec
Gas Used: nitrogen

PRE-LOG HPT REFERENCE TEST VALUES (Post-Log From MC-MIP-1.zip)

PRE TEST TIME: Thu Nov 19 2020 12:27:30

TEST	HPT PRESSURE (psi)	FLOW (mL/min)	HPT PRESSURE (kPa)
TOP with FLOW=0	15.769	0.0	108.720
TOP with FLOW>0	16.159	268.4	111.410
BOTTOM with FLOW=0	15.548	0.0	107.200
BOTTOM with FLOW>0	15.940	269.4	109.900

EXPECTED FLOW=0 HPT DIFF.: 0.22 psi (1.5 kPa) +/- 10%
ACTUAL FLOW=0 HPT DIFF.: 0.22 psi (1.5 kPa)

TRANSDUCER TEST PASSED

HPT IDEAL COEFFS: 2.2696e1,-2.2356
HPT SENSOR CAL NUMBERS: XD31329A,0.0000,0.0000,0.0000,0.0000,9.9540e-1,-1.3330

Temperature out of range (21.9 deg C) at 0.00 ft (0.000 m)

Temperature out of range (21.2 deg C) at 0.00 ft (0.000 m)

Temperature out of range (20.0 deg C) at 0.00 ft (0.000 m)

LOG START TIME: Thu Nov 19 2020 12:48:47

Temperature out of range (79.8 deg C) at 27.40 ft (8.352 m)

ATTENUATION CHANGES

DEPTH (ft)	DEPTH (m)	DET1	DET2	DET3	DET4
0.00	0.000	1	1	1	1

LOG END DEPTH: 27.40 ft (8.352 m)
LOG END TIME: Thu Nov 19 2020 13:43:22

LATITUDE: 0.000000000
LONGITUDE: 0.000000000
ELEVATION: 0.000 METERS 0.00 FEET
GPS Quality: None

MIP POST-LOG RESPONSE TEST

FILENAME: MC-MIP-2.post.tim
COMPOUND: TCE
CONCENTRATION: 15 ppm
FLOW: 40 mL/min
RESPONSE TEST START TIME: Thu Nov 19 2020 14:05:20

RESPONSE TEST ATTENUATION CHANGES

TIME	DET1	DET2	DET3	DET4
0	1	1	1	1
2	1	1	1	1

POST-LOG HPT REFERENCE TEST VALUES

POST TEST TIME: Thu Nov 19 2020 14:10:13

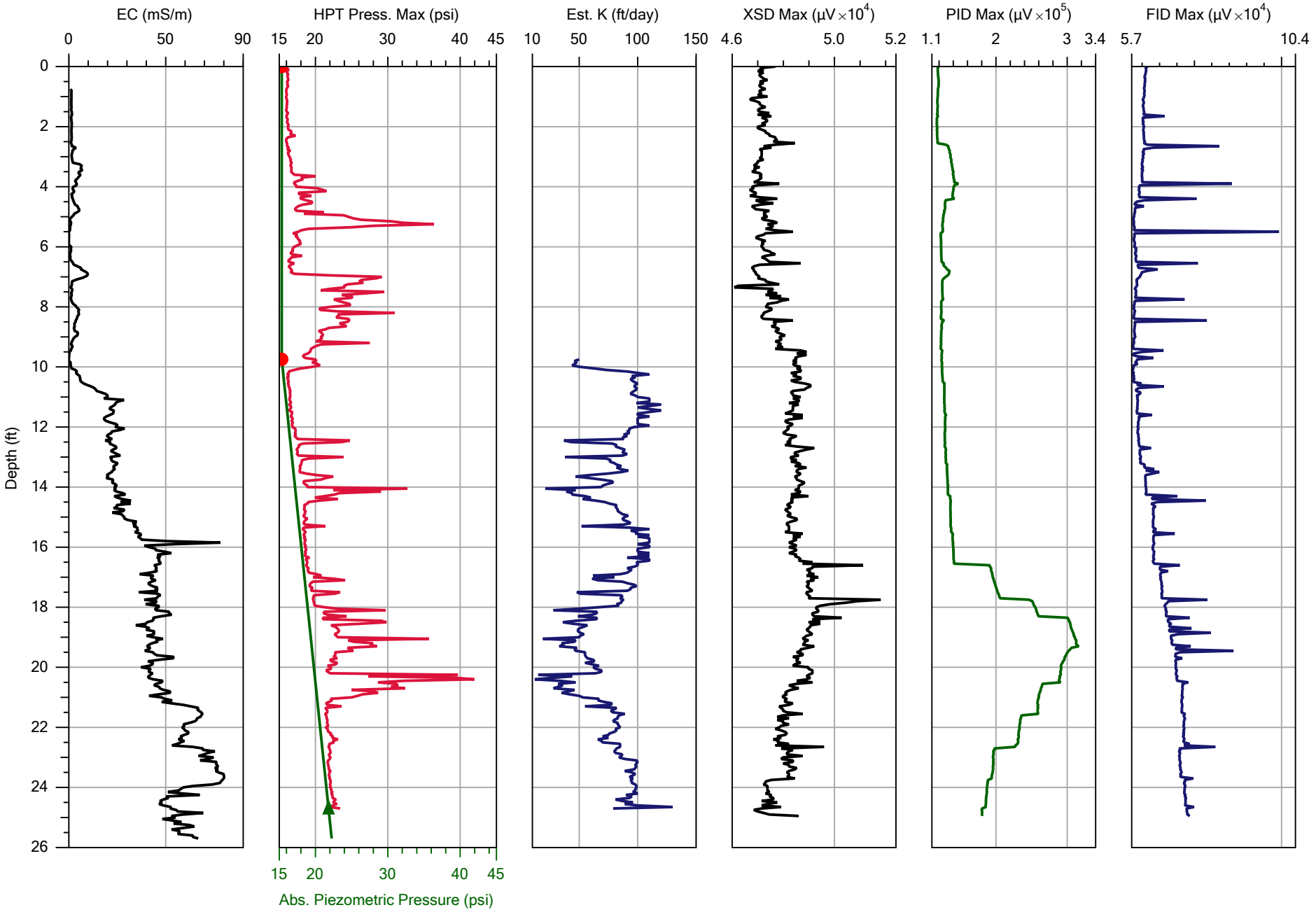
TEST	HPT PRESSURE (psi)	FLOW (mL/min)	HPT PRESSURE (kPa)
TOP with FLOW=0	15.752	0.0	108.600
TOP with FLOW>0	16.125	268.1	111.180
BOTTOM with FLOW=0	15.540	0.0	107.140
BOTTOM with FLOW>0	15.895	264.0	109.590

EXPECTED FLOW=0 HPT DIFF.: 0.22 psi (1.5 kPa) +/- 10%
ACTUAL FLOW=0 HPT DIFF.: 0.21 psi (1.5 kPa)

TRANSDUCER TEST PASSED

Post-Log EC Load Tests

Test	Target (mS/m)	Actual (mS/m)	% Diff	P/F
Low	55.0	54.1	1.6	PASS
High	290.0	281.5	2.9	PASS



parratt wolff inc

DIRECT IMAGING

		File: MC-MIP-3.MHP
Company: Parratt-Wolff, Inc.	Operator: Danylo Kulczycky	Date: 11/19/2020
Project ID: Crystal Cleaners	Client: EA	Location: Pelham, NY

MC-MIP-3.zip

SITE INFORMATION -- DIRECT IMAGE MIP+HPT PROBE

Geoprobe DI Acquisition Software for Windows
Version: 3.3 Build: 19087

Pre-Log EC Load Tests (Post-Log From MC-MIP-2.zip)

Test	Target (mS/m)	Actual (mS/m)	% Diff	P/F
Low	55.0	54.1	1.6	PASS
High	290.0	281.5	2.9	PASS

COMPANY: Parratt-Wolff, Inc.
OPERATOR: Danylo Kulczycky
PROJECT ID: Crystal Cleaners
CLIENT: EA
UNITS: ENGLISH
PROBE AND ARRAY: MH6530/6532 MiHPT Probe with Top Dipole
PROBE SERIAL NUMBER: 1O
LOCATION: Pelham, NY
100 INCH STRING POT USED
ROD LENGTH: 5 feet

MIP PRE-LOG RESPONSE TEST (Post-Log From MC-MIP-2.zip)

FILENAME: MC-MIP-3.pre.tim
COMPOUND: TCE
CONCENTRATION: 15 ppm
FLOW: 40 mL/min
RESPONSE TEST START TIME: Thu Nov 19 2020 14:05:20

RESPONSE TEST ATTENUATION CHANGES

TIME	DET1	DET2	DET3	DET4
0	1	1	1	1
2	1	1	1	1

TRIP TIME: 45 sec
Gas Used: nitrogen

PRE-LOG HPT REFERENCE TEST VALUES (Post-Log From MC-MIP-2.zip)

PRE TEST TIME: Thu Nov 19 2020 14:10:13

TEST	HPT PRESSURE (psi)	FLOW (mL/min)	HPT PRESSURE (kPa)
TOP with FLOW=0	15.752	0.0	108.600
TOP with FLOW>0	16.125	268.1	111.180
BOTTOM with FLOW=0	15.540	0.0	107.140
BOTTOM with FLOW>0	15.895	264.0	109.590

EXPECTED FLOW=0 HPT DIFF.: 0.22 psi (1.5 kPa) +/- 10%
ACTUAL FLOW=0 HPT DIFF.: 0.21 psi (1.5 kPa)

TRANSDUCER TEST PASSED

HPT IDEAL COEFFS: 2.2696e1,-2.2356
HPT SENSOR CAL NUMBERS: XD31329A,0.0000,0.0000,0.0000,0.0000,9.9540e-1,-1.3330

Temperature out of range (21.5 deg C) at 0.00 ft (0.000 m)

Temperature out of range (20.1 deg C) at 0.00 ft (0.000 m)

Temperature out of range (64.6 deg C) at 0.00 ft (0.000 m)

LOG START TIME: Thu Nov 19 2020 14:38:43

ATTENUATION CHANGES

DEPTH (ft)	DEPTH (m)	DET1	DET2	DET3	DET4
0.00	0.000	1	1	1	1

LOG END DEPTH: 24.95 ft (7.605 m)
LOG END TIME: Thu Nov 19 2020 15:19:33

LATITUDE: 0.000000000
LONGITUDE: 0.000000000
ELEVATION: 0.000 METERS 0.00 FEET
GPS Quality: None

MIP POST-LOG RESPONSE TEST

FILENAME: MC-MIP-3.post.tim
COMPOUND: TCE
CONCENTRATION: 15 ppm
FLOW: 40 mL/min
RESPONSE TEST START TIME: Thu Nov 19 2020 15:31:51

RESPONSE TEST ATTENUATION CHANGES

TIME	DET1	DET2	DET3	DET4
0	1	1	1	1
2	1	1	1	1

POST-LOG HPT REFERENCE TEST VALUES

POST TEST TIME: Thu Nov 19 2020 15:36:00

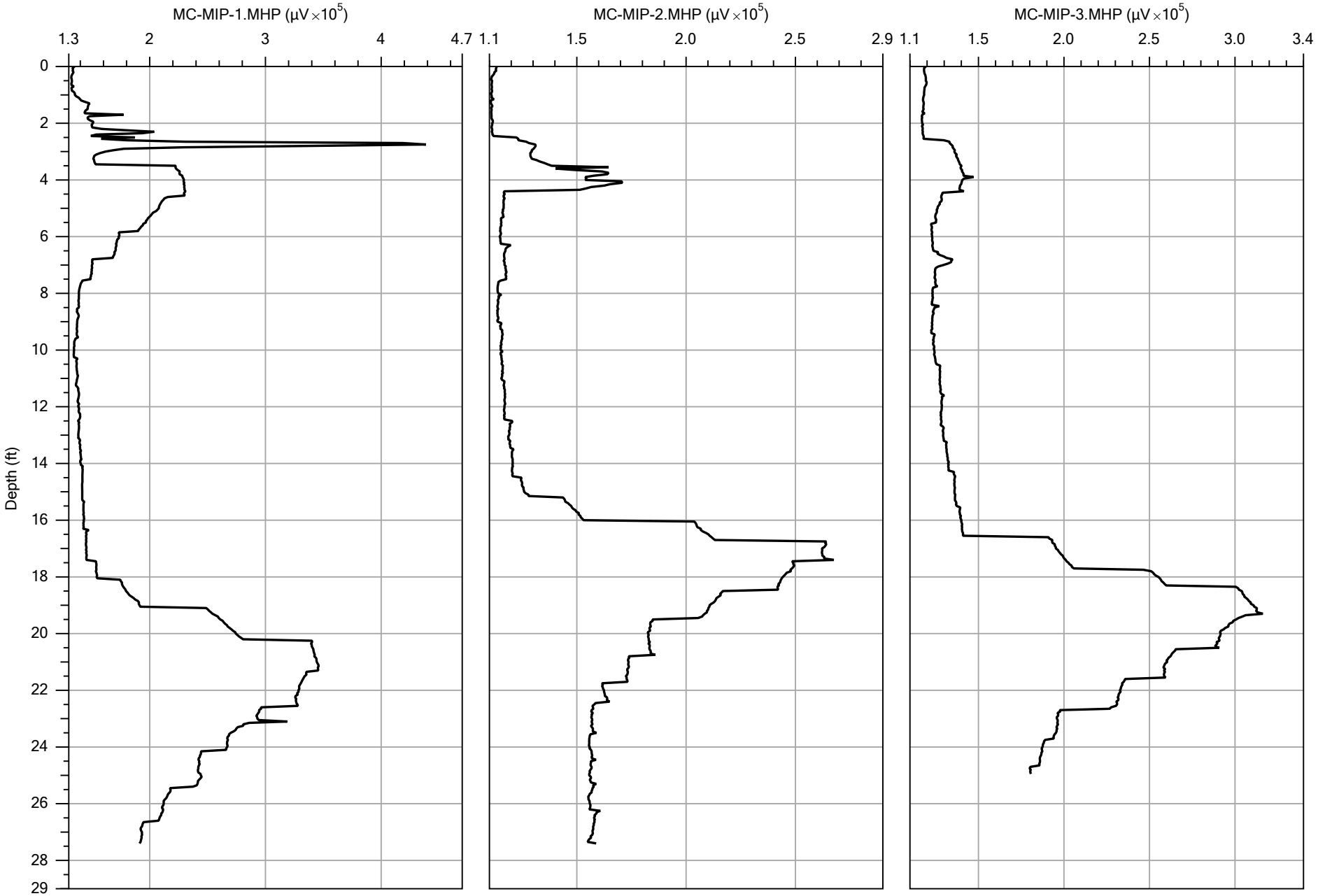
TEST	HPT PRESSURE (psi)	FLOW (mL/min)	HPT PRESSURE (kPa)
TOP with FLOW=0	15.730	0.0	108.450
TOP with FLOW>0	16.026	270.4	110.500
BOTTOM with FLOW=0	15.507	0.0	106.920
BOTTOM with FLOW>0	15.814	271.0	109.030

EXPECTED FLOW=0 HPT DIFF.: 0.22 psi (1.5 kPa) +/- 10%
ACTUAL FLOW=0 HPT DIFF.: 0.22 psi (1.5 kPa)

TRANSDUCER TEST PASSED

Post-Log EC Load Tests

Test	Target (mS/m)	Actual (mS/m)	% Diff	P/F
Low	55.0	55.0	0.1	PASS
High	290.0	294.6	1.6	PASS



parratt wolff inc

DIRECT IMAGING

PID Max

Company: Parratt-Wolff, Inc.	Operator: Danylo Kulczycky
Project ID: Crystal Cleaners	Client: EA

MC-MIP-1.MHP	11/19/2020
MC-MIP-2.MHP	11/19/2020
MC-MIP-3.MHP	11/19/2020

EA Engineering, P.C.
EA Science and Technology

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

GROUNDWATER SAMPLING PURGE FORM

Well I.D.:	EA Personnel:	Client:
MW-C12	Danny Kite	NYSDEC
Location:	**Well Condition:**	**Weather:**
Crystal Cleaners	Good	45 deg., partly cloudy
Sounding Method:	**Gauge Date:**	**Measurement Ref:**
WLI	20-Nov-20	TOC
Stick Up/Down (ft):	**Gauge Time:**	**Well Diameter (in):**
Down 3"	810	1"

Purge Date:	Purge Time:
20-Nov-20	840
Purge Method:	**Field Technician:**
Peristaltic pump	Danny Kite

Well Volume

A. Well Depth (ft):	D. Well Volume (ft):	Depth/Height of Top of PVC:
17.14	0.03	Down 3"
B. Depth to Water (ft):	**E. Well Volume (gal) C*D):**	**Pump Type:**
11.16	0.24	Peristaltic
C. Liquid Depth (ft) (A-B):	**F. Three Well Volumes (gal) (E3):**	**Pump Intake Depth:**
5.98	0.72	16.5'

Water Quality Parameters

Time (hrs)	Temperature (oC)	pH (pH units)	ORP (mV)	Conductivity (mS/m)	Turbidity (ntu)	DO (mg/L)	DTW (ft btoc)	Rate (Lpm)	Volume (liters)
845	16.02	6.4	175	1.94	>1000	4.98	10.58	0.50	-
848	16.32	6.23	186	1.97	>1000	1.41	10.58	0.50	0.5
851	16.34	6.22	188	1.97	958	1.09	10.58	0.50	1
854	16.32	6.21	192	1.96	564	0.75	10.58	0.50	1.5
857	16.31	6.21	194	1.96	358	0.55	10.58	0.50	2
900	16.31	6.21	195	1.95	282	0.54	10.58	0.50	2.5
903	16.3	6.22	196	1.93	166	0.5	10.58	0.50	3
906	16.29	6.22	197	1.93	126	0.5	10.58	0.50	3.5
909	16.29	6.22	198	1.92	93.3	0.51	10.58	0.50	4
912	16.28	6.22	198	1.92	93.6	0.51	10.58	0.50	4.5
915	16.29	6.22	198	1.93	93.4	0.5	10.58	0.50	5

Total Quantity of Water Removed (gal):	1.5	Sampling Time:	915
Samplers:	Danny Kite	Split Sample With:	NA
Sampling Date:	11/20/2020	Sample Type:	grab

COMMENTS AND OBSERVATIONS:

EA Engineering, P.C.
EA Science and Technology

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

GROUNDWATER SAMPLING PURGE FORM

Well I.D.: MW-C14	**EA Personnel:** Enock Bunyon	**Client:** NYSDEC
Location: Crystal Cleaners	**Well Condition:** Good	**Weather:** 80 deg, overcast
Sounding Method: WLI	**Gauge Date:** 9-Jul-20	**Measurement Ref:** TOC
Stick Up/Down (ft): Down 3"	**Gauge Time:** 1125	**Well Diameter (in):** 1"

Purge Date: 9-Jul-20	**Purge Time:** 1130
Purge Method: Peristaltic pump	**Field Technician:** Enock Bunyon

Well Volume

A. Well Depth (ft): 22	**D. Well Volume (ft):** 0.16	**Depth/Height of Top of PVC:**
B. Depth to Water (ft): 17.98	**E. Well Volume (gal) C*D):** 0.66	**Pump Type:** Peristaltic
C. Liquid Depth (ft) (A-B): 4.02	**F. Three Well Volumes (gal) (E3):** 2	**Pump Intake Depth:** 21

Water Quality Parameters

Time (hrs)	Temperature (oC)	pH (pH units)	ORP (mV)	Conductivity (mS/m)	Turbidity (ntu)	DO (mg/L)	DTW (ft btoc)	Rate (Lpm)	Volume (liters)
1130	17.98	7.13	186	1.85	13	0.76	11.66	0.50	-
1135	17.66	7.16	193	1.75	6.5	0.92	11.65	0.50	0.5
1140	17.37	6.97	201	1.74	4	0.9	11.65	0.50	1
1145	17.35	6.82	208	1.73	1.6	0.87	11.68	0.50	1.5
1150	17.30	6.79	212	1.73	1.1	0.84	11.67	0.50	2
1155	17.27	6.74	214	1.74	1.1	0.8	11.66	0.50	2.5
1200	17.2	6.71	216	1.73	1	0.8	11.65	0.50	3

Total Quantity of Water Removed (gal):	1.5	**Sampling Time:**	1200
Samplers:	Enock Bunyon	**Split Sample With:**	NA
Sampling Date:	7/7/2020	**Sample Type:**	grab

COMMENTS AND OBSERVATIONS:

EA Engineering, P.C.
EA Science and Technology

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

GROUNDWATER SAMPLING PURGE FORM

Well I.D.:	EA Personnel:	Client:
MW-C04	Danny Kite	NYSDEC
Location:	**Well Condition:**	**Weather:**
Crystal Cleaners	Good	65 deg, overcast
Sounding Method:	**Gauge Date:**	**Measurement Ref:**
WLI	10-Jul-20	TOC
Stick Up/Down (ft):	**Gauge Time:**	**Well Diameter (in):**
Down 3"	645	2"

Purge Date:	Purge Time:
10-Jul-20	655
Purge Method:	**Field Technician:**
Peristaltic pump	Danny Kite

Well Volume

A. Well Depth (ft):	D. Well Volume (ft):	Depth/Height of Top of PVC:
21.61	0.02	
B. Depth to Water (ft):	**E. Well Volume (gal) C*D):**	**Pump Type:**
13.2	1.37	Peristaltic
C. Liquid Depth (ft) (A-B):	**F. Three Well Volumes (gal) (E3):**	**Pump Intake Depth:**
8.41	4.11	21

Water Quality Parameters

Time (hrs)	Temperature (oC)	pH (pH units)	ORP (mV)	Conductivity (mS/m)	Turbidity (ntu)	DO (mg/L)	DTW (ft btoc)	Rate (Lpm)	Volume (liters)
655	20.88	7.4	14	2.69	808	3.98	13.2	0.50	-
658	20.43	7.4	6	2.7	313	3.85	13.27	0.50	0.5
701	20.19	7.44	-8	2.69	147	2.43	13.27	0.50	1
704	19.99	7.4	-12	2.68	99.7	2.71	13.28	0.50	1.5
707	19.92	7.36	-8	2.68	92.4	2.68	13.28	0.50	2
710	19.93	7.31	-9	2.68	66.1	2.66	13.28	0.50	2.5
713	19.93	7.33	-9	2.68	59.2	2.73	13.29	0.50	3
716	19.91	7.31	-8	2.68	59	2.73	13.29	0.50	3.5
719	19.91	7.31	-7	2.68	58	2.69	13.29	0.50	4
721	19.91	7.31	-8	2.68	56	2.67	13.29	0.50	4.5
724	19.91	7.3	-8	2.68	55	2.66	13.29	0.50	5

Total Quantity of Water Removed (gal):	1.4	Sampling Time:	730
Samplers:	Danny Kite	Split Sample With:	NA
Sampling Date:	7/10/2020	Sample Type:	grab

COMMENTS AND OBSERVATIONS:

EA Engineering, P.C.
EA Science and Technology

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

GROUNDWATER SAMPLING PURGE FORM

Well I.D.:	EA Personnel:	Client:
MW-C08	Danny Kite	NYSDEC
Location:	**Well Condition:**	**Weather:**
Crystal Cleaners	Good	80 deg, overcast
Sounding Method:	**Gauge Date:**	**Measurement Ref:**
WLI	9-Jul-20	TOC
Stick Up/Down (ft):	**Gauge Time:**	**Well Diameter (in):**
Down 3"	2010	1"

Purge Date:	Purge Time:
9-Jul-20	NA
Purge Method:	**Field Technician:**
Peristaltic pump	Danny Kite

Well Volume

A. Well Depth (ft):	D. Well Volume (ft):	Depth/Height of Top of PVC:
21.65	0.04	
B. Depth to Water (ft):	**E. Well Volume (gal) C*D):**	**Pump Type:**
19.92	0.07	Peristaltic
C. Liquid Depth (ft) (A-B):	**F. Three Well Volumes (gal) (E3):**	**Pump Intake Depth:**
1.73	0.21	21

Water Quality Parameters

Time (hrs)	Temperature (oC)	pH (pH units)	ORP (mV)	Conductivity (mS/m)	Turbidity (ntu)	DO (mg/L)	DTW (ft btoc)	Rate (Lpm)	Volume (liters)

Total Quantity of Water Removed (gal):	NA	Sampling Time:	2015
Samplers:	Danny Kite	Split Sample With:	NA
Sampling Date:	7/9/2020	Sample Type:	grab

COMMENTS AND OBSERVATIONS: Enock Bunyon (EA) reported well going dry immediately during sampling attempt on 7/7/2020, so sampled well immediately without purging on 7/9/2020

EA Engineering, P.C.
EA Science and Technology

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

GROUNDWATER SAMPLING PURGE FORM

Well I.D.: MW-C06	**EA Personnel:** Danny Kite	**Client:** NYSDEC
Location: Crystal Cleaners	**Well Condition:** Good	**Weather:** 80 deg, overcast
Sounding Method: WLI	**Gauge Date:** 9-Jul-20	**Measurement Ref:** TOC
Stick Up/Down (ft): Down 3"	**Gauge Time:** 1910	**Well Diameter (in):** 1"

Purge Date: 9-Jul-20	**Purge Time:** 1914
Purge Method: Peristaltic pump	**Field Technician:** Danny Kite

Well Volume

A. Well Depth (ft): 17.21	**D. Well Volume (ft):** 0.04	**Depth/Height of Top of PVC:**
B. Depth to Water (ft): 10.97	**E. Well Volume (gal) C*D):** 0.25	**Pump Type:** Peristaltic
C. Liquid Depth (ft) (A-B): 6.24	**F. Three Well Volumes (gal) (E3):** 0.75	**Pump Intake Depth:** 16.5'

Water Quality Parameters

Time (hrs)	Temperature (oC)	pH (pH units)	ORP (mV)	Conductivity (mS/m)	Turbidity (ntu)	DO (mg/L)	DTW (ft btoc)	Rate (Lpm)	Volume (liters)
1914	20.11	6.54	66	1.37	101	0.33	10.97	0.50	-
1917	20.01	6.6	61	0.98	42	0.12	10.91	0.50	0.5
1920	19.93	6.68	71	0.9	27.8	0.09	10.9	0.50	1
1923	19.94	6.69	76	0.88	27.8	0.08	10.92	0.50	1.5
1926	19.94	6.71	76	0.89	23.4	0.09	10.92	0.50	2
1929	19.94	6.71	76	0.91	24.1	0.09	10.92	0.50	2.5
1932	19.94	6.71	75	0.89	24.4	0.09	10.91	0.50	3

Total Quantity of Water Removed (gal):	0.8	**Sampling Time:**	1935
Samplers:	Danny Kite	**Split Sample With:**	NA
Sampling Date:	7/9/2020	**Sample Type:**	grab

COMMENTS AND OBSERVATIONS:

EA Engineering, P.C.
EA Science and Technology

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

GROUNDWATER SAMPLING PURGE FORM

Well I.D.:	EA Personnel:	Client:
MW-C12	Danny Kite	NYSDEC
Location:	**Well Condition:**	**Weather:**
Crystal Cleaners	Good	80 deg, overcast
Sounding Method:	**Gauge Date:**	**Measurement Ref:**
WLI	9-Jul-20	TOC
Stick Up/Down (ft):	**Gauge Time:**	**Well Diameter (in):**
Down 3"	1820	1"

Purge Date:	Purge Time:
9-Jul-20	1832
Purge Method:	**Field Technician:**
Peristaltic pump	Danny Kite

Well Volume

A. Well Depth (ft):	D. Well Volume (ft):	Depth/Height of Top of PVC:
17.12	0.03	
B. Depth to Water (ft):	**E. Well Volume (gal) C*D):**	**Pump Type:**
11.25	0.24	Peristaltic
C. Liquid Depth (ft) (A-B):	**F. Three Well Volumes (gal) (E3):**	**Pump Intake Depth:**
5.98	0.72	16.5'

Water Quality Parameters

Time (hrs)	Temperature (oC)	pH (pH units)	ORP (mV)	Conductivity (mS/m)	Turbidity (ntu)	DO (mg/L)	DTW (ft btoc)	Rate (Lpm)	Volume (liters)
1832	21.58	6.65	255	2.33	>1000	3.16	11.25	0.50	-
1835	20.93	6.65	267	2.31	611	0.88	11.29	0.50	0.5
1838	20.41	6.55	268	2.16	399	0.56	11.3	0.50	1
1841	19.57	6.47	248	2.19	213	0.41	11.3	0.50	1.5
1844	19.44	6.47	241	2.19	112	0.33	11.31	0.50	2
1847	19.43	6.47	240	2.21	80.1	0.33	11.3	0.50	2.5
1850	19.43	6.47	237	2.20	74.3	0.31	11.3	0.50	3
1853	19.42	6.46	238	2.20	72.8	0.3	11.3	0.50	3.5
1856	19.42	6.47	238	2.2	72.4	0.3	11.3	0.50	4

Total Quantity of Water Removed (gal):	1.5	Sampling Time:	1900
Samplers:	Danny Kite	Split Sample With:	NA
Sampling Date:	7/9/2020	Sample Type:	grab

COMMENTS AND OBSERVATIONS:

EA Engineering, P.C.
EA Science and Technology

GROUNDWATER SAMPLING PURGE FORM

Well I.D.: MW-MC-1	EA Personnel: M. Gilkey D. Kite ~~J. Marra, E. Thielman~~ E. Fenner	Client: NYSDEC
Location: Crystal Cleaners/Pelham NY ~~National Heatset Printing, Babylon, NY~~	Well Condition: Good	Weather: Sunny 70°F
Sounding Method: Heron Skinny Dipper WLI	Gauge Date: 10/21/2021 Gauge Time: 1130	Measurement Ref: Top of Casing (TOC)
Stick Up/Down (ft):	PID Headspace Reading:	Well Diameter (in): 2"

Purge Date: 10/21/2021	Purge Time: 1140
Purge Method: Low Flow via Peristaltic Pump	Field Technician: ~~J. Marra, E. Thielman~~ D. Kite/M. Gilkey

Well Volume

A. Well Depth (ft): 22.41	D. Well Volume (ft):	Depth/Height of Top of PVC:
B. Depth to Water (ft): 10.44	E. Well Volume (gal) (C*D):	Pump Type: Peristaltic Pump
C. Liquid Depth (ft) (A-B):	F. Three Well Volumes (gal) (E3):	Pump Intake Depth: NA

Water Quality Parameters

Time (hrs)	pH (pH units)	Conductivity (mS/cm)	Turbidity (ntu)	DO (mg/L)	Temperature (°C)	ORP (mV)	DTW (ft btoc)	Rate (Lpm)	Volume (liters)
1140	6.17	2.10	44.0	11.45	19.58	225	10.44	0.25	
1143	6.30	2.13	51.5	6.176	18.21	228	10.44		
1146	6.34	2.13	41.6	5.12	18.07	230	10.44		
1149	6.36	2.13	33.4	3.94	18.00	232	10.45		
1152	6.37	2.13	26.6	3.40	17.91	233	10.45		
1155	6.38	2.13	23.8	3.06	17.94	234	10.45		
1158	6.39	2.13	17.2	2.70	17.90	235	10.43		
1201	6.39	2.13	12.6	2.45	17.90	236			
1204	6.40	2.13	8.7	2.25	17.89	237			
1207	6.39	2.13	6.6	2.12	17.86	238			
1210	6.39	2.12	3.8	1.98	17.85	238			
1213	6.38	2.12	2.3	1.85	17.84	239			
1216	6.37	2.12	0.0	1.74	17.84	240			
1219	6.38	2.12	0.0	1.63	17.87	241			
1221	6.38	2.12	0.0	1.60	17.86	240			

Total Quantity of Water Removed (gal):		Sampling Time:	1221
Samplers:	M. Gilkey/D. Kite	Split Sample With:	
Sampling Date:	10/21/2021	Sample Type:	GW Grab

COMMENTS AND OBSERVATIONS:

EA Engineering, P.C.
EA Science and Technology

GROUNDWATER SAMPLING PURGE FORM

Well I.D.: MW-MC-2	EA Personnel: J. Marra, E. Thielman DK	Client: NYSDEC
Location: Crystal Cleaners ~~National Heatset Printing, Babylon, NY~~	Well Condition: Good, new	Weather: Sunny, warm
Sounding Method: Heron Skinny Dipper WLI	Gauge Date: 10/21/21	Measurement Ref: Top of Casing (TOC)
	Gauge Time: 1145	
Stick Up/Down (ft): Up 6"	PID Headspace Reading:	Well Diameter (in): 2"

Purge Date: 10/21/21	Purge Time: 1146
Purge Method: Low Flow via Peristaltic Pump	Field Technician: ~~J. Marra, E. Thielman~~ DK

Well Volume

A. Well Depth (ft): 16.82	D. Well Volume (ft):	Depth/Height of Top of PVC:
B. Depth to Water (ft): 7.93	E. Well Volume (gal) (C*D):	Pump Type: Peristaltic Pump
C. Liquid Depth (ft) (A-B):	F. Three Well Volumes (gal) (E3):	Pump Intake Depth: NA

Water Quality Parameters

Time (hrs)	pH (pH units)	Conductivity (mS/cm)	Turbidity (ntu)	DO (mg/L)	Temperature (°C)	ORP (mV)	DTW (ft btoc)	Rate (Lpm)	Volume (liters)
1146	6.00	1.91	817	4.76	18.13	211	7.94	0.35	
1153	6.30	1.99	49.2	3.27	16.68	211	7.98		
1156	6.24	2.04	45.8	2.52	16.39	227	7.98		
1159	6.23	2.04	44.1	2.20	16.30	233	7.98		
1202	6.24	2.07	41.3	2.06	16.27	240	7.98		
1205	6.23	2.03	39.6	1.97	16.28	241	7.99		
1208	6.23	2.02	37.8	1.94	16.31	242	7.99		
1211	6.23	2.02	37.5	1.96	16.33	242	7.99		
1214	6.23	2.02	37.8	1.95	16.34	242	8.00		

Clean meter

Total Quantity of Water Removed (gal):	Sampling Time: 1214
Samplers: DK	Split Sample With: DUP-10212021
Sampling Date: 10/21/21	Sample Type: GW Grab

COMMENTS AND OBSERVATIONS: Very sandy initially

EA Engineering, P.C.
EA Science and Technology

GROUNDWATER SAMPLING PURGE FORM

Well I.D.: MW-MC-3	EA Personnel: DK, ~~SBL~~, MG, ~~[illegible]~~ B.F	Client: NYSDEC
Location: Crystal Cleaners, Pelham NY ~~National Heat Printing, Babylon, NY~~	Well Condition: Good	Weather: Sunny 70°F
Sounding Method: Heron Skinny Dipper WLI	Gauge Date: 10/21/2021 Gauge Time: 1230	Measurement Ref: Top of Casing (TOC)
Stick Up/Down (ft):	PID Headspace Reading:	Well Diameter (in): 2"

Purge Date: 10/21/2021	Purge Time:
Purge Method: Low Flow via Peristaltic Pump	Field Technician: D.Kite / F.Fennow / M.Gilkey

Well Volume

A. Well Depth (ft): 16.44	D. Well Volume (ft):	Depth/Height of Top of PVC:
B. Depth to Water (ft): 11.09	E. Well Volume (gal) (C*D):	Pump Type: Peristaltic Pump
C. Liquid Depth (ft) (A-B):	F. Three Well Volumes (gal) (E3):	Pump Intake Depth: NA

Water Quality Parameters

Time (hrs)	pH (pH units)	Conductivity (mS/cm)	Turbidity (ntu)	DO (mg/L)	Temperature (°C)	ORP (mV)	DTW (ft btoc)	Rate (Lpm)	Volume (liters)
1240	7.16	0.835	628	4.04	20.17	199	11.09	0.30	
1243	6.86	0.854	667	3.90	20.16	211	11.09		
1246							11.09		
1249	6.70	0.810	101	3.54	20.80	195	11.10		
1252	6.68	0.860	95.0	3.40	20.92	199	11.12		
1255	6.66	0.902	82.8	3.31	21.06	202	11.12		
1258	6.65	0.911	79.5	3.26	21.17	204	11.12		
1301	6.64	0.918	77.2	3.22	21.27	204	11.12		
1304	6.63	0.916	72.4	3.22	21.34	204	11.12		
1307	6.63	0.921	72.7	3.18	21.44	204	11.12		
1310	6.64	0.920	70.0	3.13	21.55	202	11.12		

Total Quantity of Water Removed (gal):		Sampling Time:	1310
Samplers:	D.Kite / M.Gilkey	Split Sample With:	
Sampling Date:	10/21/2021	Sample Type:	GW Grab

COMMENTS AND OBSERVATIONS: Horiba issue @ 1245; turn pump off & clean Horiba

EA Engineering, P.C.
EA Science and Technology

LOG OF SOIL BORING

Coordinates: Northing _____ Easting: _____
Surface Elevation: _____
Casing Below Surface: _____
Reference Elevation: _____
Reference Description: _____

Job. No. | Client: DEC
Project: 160254

Drilling Method: DP

Sampling Method: Cont

Water Level: | Time: | Date:

Surface Conditions:
Weather:
Temperature:

Location: Crystal Cleaners

Soil Boring Number: PDI-SB-01

Sheet of

Drilling

Start	Finish
DATE 7/9/20	DATE
TIME 0810	TIME

Blow Counts (140-lb)	Ft. Driven/ Ft. Recvrd	Boring Diagram	PID (ppm)	Depth in Feet	USCS Log
	4/4		0.0		SP/GP
			0.0		
			0.0		
			0.0		
			0.0		
			0.0		
	4/4		0.0		SP/SC
			0.0		
			0.0		
			0.0		
	4/4		0.0		SP
			0.0		
			0.2		
			0.0		
			0.0		
			0.0		
			0.0		

Refusal @ 14'

0-3 Brown gravelly Fill, some med sand, loose, dry

3-4 Brown med. SAND, some fines/clay, moderate plast., soft, (little debris)

4-8.5 As above, ▽ @ 7.5'

s-m

8.5-13.5 Brown/tan SAND, loose, wet, trace to little subangular gravel locally (~11', 12')

13.5-14 Rock, unidentified.

Comments/Notes

Sample Information

PDI-SB-01-7-8

engineering, P.C.
EA Science and Technology

LOG OF SOIL BORING

Coordinates: Northing _____ Easting _____
Surface Elevation:
Casing Below Surface:
Reference Elevation:
Reference Description:

Job. No. | Client: | Project: Crystal Cleaners | Location:
Drilling Method:
Sampling Method:
Soil Boring Number: PDI-SB-02
Sheet 1 of 1

Water Level:	
Time:	
Date:	
Surface Conditions:	
Weather:	
Temperature:	

Drilling: Start DATE / TIME 0855 | Finish DATE / TIME 0930

Blow Counts (140-lb)	Ft. Driven/ Ft. Recvrd	Boring Diagram	PID (ppm)	Depth in Feet	USCS Log	
	4/4		0.3		GP	0-4 Brown/black gravelly fill, asphalt + brick debris, dry
			0.3			
			1.1			
			2.4			
	3/4				SP	4-8.5 Brown m-c SAND, moist at 7'
			2.1			
			3.7			
	4/4		2.0		SM	8.5-9.5 Brown fine SAND and SILT, little clay, soft, mod. plast., wet ▽@9'
			6.9			
			1.2			
			0.3		SP	9.5-10 tan/brown m. SAND, some gravel
			1.9			
			0.3			
			0.1		SP	10-11 brown med. SAND
			0.1		SP	11-12.5 brown m-c SAND, tr. gravel.
	Refusal 16'				SP	12.5-15 same as (10-11)
					GP	15-16 tan coarse sand and Gravel (granitic), ~~very coarse~~

Comments/Notes

Sample Information
PDI-SB-02-7.5-8.5
@ 0930

Logged by: _____ Date: _____
Drilling Contractor: _____ Driller: _____

EA Engineering, P.C.
EA Science and Technology

LOG OF SOIL BORING

Coordinates: Northing _____ Easting _____
Surface Elevation: _____
Casing Below Surface: _____
Reference Elevation: _____
Reference Description: _____

Job. No.	Client: / Project:	Location:
Drilling Method:		Soil Boring Number: PDI-SB-03
Sampling Method:		Sheet of
Water Level:		Drilling: Start / Finish
Time:		DATE / DATE
Date:		TIME 0935 / TIME 1000

Surface Conditions:
Weather:
Temperature:

Blow Counts (140-lb)	Ft. Driven/ Ft. Recvrd	Boring Diagram	PID (ppm)	Depth in Feet	USCS Log	
	3/4		0.1		GP	0 - 6.5 Grey gravelly fill, little fines
			0.1			
			0.3		SP/SM	6.5 - 10 Brown f-m SAND, little fines, @ 8', mod. plast, soft.
			0.5			
	3/4		0.6			
			0.6		SP	10 - 12.5 As above, no fines ⇒ no plast.
			0.7			
			0.4			12.5 - 13 Brown coarse SAND, tr. gravel, loose
			0.6			
			1.1			13 - 15 Brown f-m SAND, loose, wet.
			1.8			
			1.9			
			0.6			
			0.5			
	Refusal @ 15.5					

Comments/Notes

Sample Information
PDI-SB-03-12-13 +
PDI-SB-Duplicate
@ 1000

EA Science and Technology

LOG OF SOIL BORING

Coordinates: Northing _____ Easting: _____

Surface Elevation: _____

Casing Below Surface: _____

Reference Elevation: _____

Reference Description: _____

Project:

Location:

Drilling Method:

Soil Boring Number: PDI-SB-04

Sampling Method:

Sheet of

Water Level:				
Time:				
Date:				

Drilling

Start	Finish
DATE	DATE
TIME 1005	TIME 1030

Surface Conditions:

Weather:

Temperature:

Blow Counts (140-lb)	Ft. Driven/ Ft. Recvrd	Boring Diagram	PID (ppm)	Depth in Feet	USCS Log
	4/4		0.0		GP
			0.0		
			0.0		SM
			0.0		
			0.0		
			0.3		
	4/4		0.5		
			0.6		SM/ML
			0.3		
			0.7		SM
			~~0.1~~		
	4/4		1.7		SP
			1.6		
			6.5		
			0.1		
			0.1		
			0.0		
	Refusal @ 16'				

0-3.5 Gray gravelly fill, some diseed rock (large cobble?)

3.5-4.5 Black fine silty SAND

4.5-7 same as (0-3.5)

7-9 Dark brown/black f-m SAND and silt, tr. gravel, loose, moist, ~~wet at 9~~

9-10.5 Brown silty sand, little clay, med plast, soft, wet ~~@ 10.5~~

10.5-16 Brown med SAND, trace fines, little gravel, wet @ 11'

Comments/Notes

Sample Information

PD-SB-04-11-12

+ MS/MSD

1035

EA Engineering, P.C.
EA Science and Technology

LOG OF SOIL BORING

Coordinates: Northing _____ Easting _____
Surface Elevation: _____
Casing Below Surface: _____
Reference Elevation: _____
Reference Description: _____

Job. No.	Client: Project:	Location:
Drilling Method:		Soil Boring Number: PDI-SB-05
Sampling Method:		Sheet of
		Drilling: Start / Finish
Water Level:		DATE / DATE
Time:		TIME / TIME
Date:		
Surface Conditions:		
Weather:		
Temperature:		

Blow Counts (140-lb)	Ft. Driven/ Ft. Recvrd	Boring Diagram	PID (ppm)	Depth in Feet	USCS Log
			0.0		GT
			0.0		
			0.0		
			0.0		SM
			0.6		
			1.6		
			1.1		SP/GP
			0.9		
			0.6		
			0.8		
			0.7		
			0.7		
		Refusal @ 13.5'			

0-3 ~~Fill~~ Brown gravelly Fill, rock, brick etc.

3-8 Brown silty fine sand, little clay, soft, perched water @ 3.5', med plast, "coal-like" mat'l @ 7.5'

8-~~12~~ 13.5 Brown m-c SAND, tr. local gravel, wet @ 8.5', firm

Comments/Notes

Sample Information

PDI-SB-05-7-8

@ 1120

Logged by: _____ Date: _____
Driller: _____

EA Engineering, P.C.
EA Science and Technology

LOG OF SOIL BORING

Coordinates: Northing _____ Easting: _____
Surface Elevation: _____
Casing Below Surface: _____
Reference Elevation: _____
Reference Description: _____

Job. No.	Client: / Project:
Drilling Method:	Location:
Sampling Method:	Soil Boring Number: PDI-SB-06
	Sheet of

Water Level:				
Time:				
Date:				

Surface Conditions:
Weather:
Temperature:

Drilling	
Start	Finish
DATE	DATE
TIME	TIME

Blow Counts (140-lb)	Ft. Driven/ Ft. Recvrd	Boring Diagram	PID (ppm)	Depth in Feet	USCS Log
			0.0		SP
			0.0		
			0.1		SP
			0.2		
			0.0		
			0.6		
			0.8		
			0.4		
			0.3		
			0.3		
			0.3		
Refusal @ 11'					

0-1 Brown gravelly fill,

1-5' Brown m-SAND, tr. gravel, loose

5-11 Brown silty sand, little clay, mod. plast. local gravel @ 6.5', little gravel from 9.5-TD

Comments/Notes

Sample Information

PDI-SB-06-6-7

1140

Logged by: _____ Date: _____

Driller: _____

EA Engineering, P.C.
EA Science and Technology

LOG OF SOIL BORING

Coordinates: Northing _____ Easting: _____
Surface Elevation: _____
Casing Below Surface: _____
Reference Elevation: _____
Reference Description: _____

Job. No.: Client:
Project:
Drilling Method:
Sampling Method:

Location:
Soil Boring Number: PDI-SB-07
Sheet of

Water Level:					Drilling	
Time:					Start	Finish
Date:					DATE	DATE
					TIME	TIME

Surface Conditions:
Weather:
Temperature:

Blow Counts (140-lb)	Ft. Driven/ Ft. Recvrd	Boring Diagram	PID (ppm)	Depth in Feet	USCS Log
	4/4		0.0		SP
			0.1		
			0.4		
			0.4		
	4/4		0.2		
			0.6		
			0.6		
			0.7		
			0.4		
			0.1		
			0.1		
			0.3		
	Refusal @ 15'				

0-4 Dark brown/black m-c SAND, fr. grand, loose, dry

4-8 Brown silty-sand, fr. fines, mod. plast., soft, wet @ 7'

8-10 As Above

10-12 Brown m-SAND, fr. gravel, wet, stiff.

12-14 As above

14-15 Rock frag.

Comments/Notes

Sample Information

PDI-SB-07-4-6
L) TCLP
PDI-SB-07-7-8

Date: _____
Driller: _____

EA Engineering, P.C.
EA Science and Technology

LOG OF SOIL BORING

Coordinates: Northing _____ Easting: _____
Surface Elevation: _____
Casing Below Surface: _____
Reference Elevation: _____
Reference Description: _____

Job. No.	Client: Project:	Location:
Drilling Method:		Soil Boring Number: PDI-SB-08
Sampling Method:		Sheet of
Water Level:		Drilling
Time:		Start: DATE / TIME — Finish: DATE / TIME
Date:		

Surface Conditions:
Weather:
Temperature:

Blow Counts (140-lb)	Ft. Driven/ Ft. Recvrd	Boring Diagram	PID (ppm)	Depth in Feet	USCS Log	
	4/4		0.1		GP/FILL	0-4 Brown sand + gravel fill, bricks, glass, etc.
			0.3			
			0.1			
	3/4		0.1		SP	4-8 As above, wet @ 8'
			0.4			
			0.7			
			1.1		SP/FILL	8-11 As above, increased gravel
			1.3			
			1.8			
			1.0			
			0.3			
	Refusal @ 11					

Comments/Notes

Sample Information

PDI-SB-08-8-9
x2 (TCLP)

Logged by: _____ Date: _____
Drilling Contractor: _____ Driller: _____

EA Engineering, P.C.
EA Science and Technology

LOG OF SOIL BORING

Coordinates: Northing _____ Easting: _____
Surface Elevation: _____
Casing Below Surface: _____
Reference Elevation: _____
Reference Description: _____

Job. No.: Client:
Project:
Location:
Drilling Method:
Soil Boring Number: PDE-SB-09
Sampling Method:
Sheet of

Water Level:				
Time:				
Date:				

Drilling

Start	Finish
DATE	DATE
TIME 1600	TIME

Surface Conditions:
Weather:
Temperature:

Blow Counts (140-lb)	Ft. Driven/ Ft. Recvrd	Boring Diagram	PID (ppm)	Depth in Feet	USCS Log
	4/4		0.0		SP
			0.0		
			0.1		
			0.0		SP
	3/4		0.1		
			0.1		
			0.2		SP
			0.6		
			0.4		
			0.1		
			0.1		SC
			0.7		
			0.6		
			0.5		
			0.3		
			0.3		
			0.4		
			0.4		
			0.9		
			1.7		
			1.2		
			2.6		
			0.7		
			1		
	Refusal @ ~24'				

0-8 Brown/gray sandy Fill, bricks etc, dry, v. rocky from 6-8

8-14 Brown m. SAND, wet ~~moist~~ fr-fine, wet @ ~~8~~ 9.5'

14-20 As above, little course sand, fr. gravel, incr gravel w/ depth

20-24 As above

Comments/Notes

Sample Information

Collect grain size sample at 9.5'

Logged by: _____ Date: _____
Drilling Contractor: _____ Driller: _____

EA Engineering, P.C.
EA Science and Technology

LOG OF SOIL BORING

Coordinates: Northing _____ Easting _____
Surface Elevation:
Casing Below Surface:
Reference Elevation:
Reference Description:

Job. No.	Client: DEC Crystal Clean	Location: Fishkill, NY
	Project:	
Drilling Method: Probe		Soil Boring Number: SB-MC1
Sampling Method:		Sheet 1 of 1
		Drilling
Water Level:		Start / Finish
Time:		DATE 11/19/20 DATE
Date:		TIME TIME

Surface Conditions:
Weather:
Temperature:

Blow Counts (140-lb)	Ft. Driven/ Ft. Recvrd	Boring Diagram	PID (ppm)	Depth in Feet	USCS Log	
	4/3		0.0			0-6" TS
						6"-1' White angular gravel
			0.0			
	4/4					1'-5' Lt. brown fine SAND and Silt, some clay, soft, moist
			0.0			
			0.0			5'-11.5' Tan m-c SAND, tr gravel, loose, moist,
	4/4					▽ 11.5' (perched)
			0.0			
	4/4					11.5-12 Brown/Dark brown, silty SAND, l.the gravel (round), significant Mica, soft.
			0.0			
	4/4					
	4/4 @ ▽		0.6			
			0.6			12-24' Same as (5-11.5'), ▽ @ 14'
			0.0			Called hole @ 24'
			0.0			
			0.0			

Comments/Notes

Sample Information

Sample 13.5-14'
@ 1050

Logged by: DK
Drilling Contractor: RW

Date:
Driller:

EA Engineering, P.C.
EA Science and Technology

LOG OF SOIL BORING

Coordinates: Northing _____ Easting: _____
Surface Elevation:
Casing Below Surface:
Reference Elevation:
Reference Description:

Job. No.	Client: Crystal Project:	Location: Fulham NY
Drilling Method:		Soil Boring Number: SB-MC2
Sampling Method:		Sheet of
Water Level:		Drilling: Start DATE 11/19/20 TIME; Finish DATE TIME
Time:		
Date:		

Surface Conditions:
Weather:
Temperature:

Blow Counts (140-lb)	Ft. Driven/ Ft. Recvrd	Boring Diagram	PID (ppm)	Depth in Feet	USCS Log
			OVA		
			0.0		
			BZ		
			0.0		
			0.0		
			0.0		
			0.0		
			0.0		
			0.0		
			-		
			0.0		
			0.0		
			0.3		
			BZ		
1.1			0.9		
			0.0		
			0.0		

0-4' Hand clear; Brown gravel and sand, some cobbles, loose, moist.

4-8' ~~As~~ Brown f-m SAND, tr. clay locally, med. dense, moist.

8-10.5 As above

10.5-13 Tan m-C SAND, loose, wet, uniform non-cohesive. ▽ @ 13'

13-19 As above, m-c w/ little gravel

19' refusal

Comments/Notes

Sample Information

Sample 16-16.5
@ 1410

Logged by: DK
Drilling Contractor: PW

Date:
Driller:

EA Engineering, P.C.
EA Science and Technology

LOG OF SOIL BORING

Coordinates: Northing _____ Easting _____
Surface Elevation:
Casing Below Surface:
Reference Elevation:
Reference Description:

Job. No.	Client: Crystal Project:	Location: Pelham, NY
Drilling Method: Probe		Soil Boring Number: SB-MC3
Sampling Method:		Sheet of
		Drilling
Water Level:		Start / Finish
Time:		DATE 11/9/20 / DATE
Date:		TIME / TIME

Surface Conditions:
Weather:
Temperature:

Blow Counts (140-lb)	Ft. Driven/ Ft. Recvrd	Boring Diagram	PID (ppm)	Depth in Feet	USCS Log	
			0.0			0-4' Hand clear
			0.0			0-2.5 Dark brown silty-SAND, w/ organics, soft, moist
			0.0			2.5-3 White gravel
			0.0			3-7.5 Brown m SAND, fine rounded gravel, med-dense, moist
			0.0			7.5-8 Brown silty-sand, w/clay, soft, cohesive, moist.
			0.0			8- Brown coarse SAND, ~~fine~~ silt, little angular gravel, mod. cohesive, silt lens at 11-11.5' ▽ @ 12'
			0.0			
			0.0			
			0.0			Refusal @ @ 16'
						Sample at top of water

Comments/Notes

Sample Information

Sample 12-12.5
@ 1545

Logged by: DK/RW Date:
Drilling Contractor: Driller:

Calculation Worksheet

Client:	NYSDEC	Project Number:	1602511
	Crystal Cleaners - Site ID 360053		
Subject:	RA SOW Carbon Injections		
By:	EGC	Checked By DFC	Date: 2/21/2022

OBJECTIVE: The following calculations provide an estimate of the amount of groundwater needing to be treated by carbon injections

I. INPUTS

KEY
BLUE = Input Value
BOLD = Calculated Value

Parameter	Value	Units
Injection Area DPW (A)	4,455	SF
Depth to Water	13	FT BGS
Depth to Bedrock	22	FT BGS
Overburden Aquifer Thickness (T)	**9**	FT
Assumed Porosity (P)	30	%

Injection Area Manning Circle (A)	6,957	SF
Depth to Water	8	FT BGS
Depth to Bedrock	20	FT BGS
Overburden Aquifer Thickness (T)	**12**	FT
Assumed Porosity (P)	30	%

II. Calculate Pore Volume of Treatment Areas

PV = (A x T x P) x (7.48 gal/ cf)

PV DPW Injection Area =	**89,973**	GAL
PV Manning Circle Injection Area =	**187,338**	GAL
Two Areas Summed =	**277,311**	GAL Total
Safety Factor	15%	
Total Volume	**318,908**	**GAL Total**

Appendix B

Specification

This page left intentionally blank.

SECTION 01 35 33 – COVID-19 RISK MANAGEMENT

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes requirements for managing and minimizing the potential for transmission of the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) virus, which causes the Novel Coronavirus Disease 2019 (COVID-19). COVID-19 typically causes respiratory illness in people.

B. Transmission: SARS-CoV-2 is currently known to spread via respiratory droplets produced when a person infected with the virus coughs or sneezes, the same way flu and other respiratory illnesses spread. SARS-CoV-2 can also be transmitted if people touch surfaces and objects with the virus on it.

C. Symptoms: COVID-19 can cause mild to severe respiratory illness with symptoms of fever, cough, and difficulty breathing. Preliminary information suggests older adults and people with underlying health conditions or compromised immune systems may be at higher risk of severe illness from this virus. Center for Disease Control (CDC) believes that symptoms of COVID-19 begin between 2 and 14 days after exposure.

D. Best Practices to Prevent Infection: Currently the best way identified to prevent infection is to minimize the potential of exposure to SARS-CoV-2. CDC recommends everyday actions to help prevent the spread of any respiratory viruses

- Wash your hands often with soap and water for at least 20 seconds. If soap and water are not available, use an alcohol-based hand sanitizer, containing at least 60% alcohol.
- Avoid touching your eyes, nose, and mouth with unwashed hands.
- Avoid close contact with people who are sick.
- Stay home when you are sick.
- Cover your cough or sneeze with a tissue, then throw the tissue in the trash can and wash hands or use hand sanitizer.
- Clean and disinfect frequently touched objects and surfaces.
- Wear face masks
- Safe social distancing (e.g., maintain a distance of 6 feet between people, limited group meetings)

1.2 OBJECTIVE

A. The objective of this specification is to minimize transmission and subsequent infections of COVID-19 in project staff that may arise as a result of exposure to SARS-CoV-2 released into the environment during construction and renovation activities. Controlling the dispersal of airborne infectious agents is critical to achieving this objective.

1.3 PERFORMANCE REQUIREMENTS AND RESPONSIBILITIES

A. The intent of this Section is to document and formalize the Contractor's requirements for minimizing the risk of transmission of COVID-19 among site workers, project staff, and

the surrounding community during construction per the latest recommendations of federal, state and local health agencies. This includes developing a COVID-19 Management Plan, establishing procedures for conducting onsite work activities to prevent virus transmission, monitoring staff health, and reporting requirements.

B. The Contractor is expected to communicate the requirements described in this section to all site workers, subcontractors, and visitors to the site daily, during daily Health and Safety meetings as well as through site postings (see attachment).

C. Contractors and their subcontractors are required at all times to guard the safety and health of all persons on and in the vicinity of the work site.

D. Contractors and their subcontractors are required to comply with all applicable rules, regulations, codes, and bulletins of the New York State Department of Labor and the standards imposed under the Federal Occupational Safety and Health Act of 1970, as amended ("OSHA").

E. Contractors and their subcontractors must comply with all City or State of New York safety requirements for projects within the City or State of New York constructed in accordance with the applicable building code.

F. Contractors and their subcontractors shall stay current and immediately implement the most up-to-date government issued practices to protect the safety and health of your employees, clients, and the general public.

1.4 RELATED SECTIONS (Not Used).

1.5 REFERENCES

A. Occupational Safety and Health Administration (OSHA) Guidance on Preparing Workplaces for COVID-19

B. New York State Department of Health

C. Centers for Disease Control and Prevention (CDC)

D. National Institute for Occupational Safety and Health (NIOSH)

E. Health Insurance Portability and Accountability Act (HIPAA)

1.6 SUBMITTALS

A. The Contractor shall prepare a COVID-19 Management Plan which can be a Supplement, or Addendum, to the Contractor' Health and Safety Plan

B. The CONTRACTOR shall develop a one-page summary of site-specific practices for COVID-19 management and clearly display on site. Operating hours, delivery times, and extra considerations for works involving a high volume of personnel or potential for interaction with community members could also be included in the summary.

C. The Contractor's Daily Field Report shall include a Daily Health Checklist, with the following questions at a minimum:

DAILY HEALTH CHECKLIST

Is social distancing being practiced?	Yes ☐	No ☐
Is the tail gate safety meeting held outdoors?	Yes ☐	No ☐
Are remote/call-in job meetings being held in lieu of meeting in person where possible?	Yes ☐	No ☐
Were personal protective gloves, masks, and eye protection being used?	Yes ☐	No ☐
Are sanitizing wipes, wash stations or spray available?	Yes ☐	No ☐
Have any workers/visitors been excluded based on close contact with individuals diagnosed with COVID-19, have recently traveled to restricted areas or countries, or are symptomatic (fever, chills, cough/shortness of breath)?	Yes ☐	No ☐
Comments:		

1.7 COVID-19 MANAGEMENT PLAN

A. At a minimum, the COVID-19 Management Plan shall include:
   1. Identification of potential exposure pathways and exposure risks associated with work tasks, e.g. activity hazard analysis (AHA).
   2. Identification of local health department contact information and COVID-19 testing sites and procedures.
   3. Detailed written description of the onsite personnel protection measures that will be utilized and a detailed explanation of how they will be implemented, monitored, and communicated.
   4. Detailed written description of measures that will be taken to prevent transmission to or from the surrounding community and how they will be implemented and communicated.
   5. Procedures to be followed in the event a site worker is diagnosed with or is suspected of having COVID-19, including identification of all personnel potentially exposed and isolation requirements.
   6. Daily cleaning schedules and disinfection procedures per the most recent CDC guidelines.
   7. Cleaning and disinfection procedures in the event there is/are suspected COVID-19 case(s) among site personnel.
   8. Site access controls and entry/exit procedures.
   9. Plan view of points of egress and delivery locations.

B. The COVID-19 Management Plan must be updated following any issued change(s) in federal, state, or local health agency guidance.

1.8 PRECONSTRUCTION CONFERENCE

A. Pre-Construction Conference shall include a review of methods and procedures related to COVID-19 risk management including, but not limited to the following:
   1. Review of COVID-19 Management Plan
   2. Review infection control procedures
   3. Review staff monitoring and reporting requirements.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 RISK IDENTIFICATION

A. COVID-19 is a new disease; scientists and health agencies are continuously learning about how it spreads. The Contractor shall adjust site policies based on the most up to date government issued guidance regarding transmission.

B. Contractor shall confirm staff that have worked in locations where quarantine orders are in place, have met the minimum quarantine guidance and do not have symptoms prior to mobilizing to site.

C. Contractor shall monitor staff daily, including checking, and documenting, temperature with no contact infrared thermometer, to confirm onsite staff do not exhibit COVID-19 symptoms. Contractor shall provide daily reports of those tests upon NYSDEC's request.

3.2 RISK MINIMIZATION

A. Engineering Controls
   1. Increasing ventilation rates of interior workspaces.
   2. Access controls, including fences and locking gates.
   3. Maintain 6 feet distances, using distance markers where appropriate in the field.

B. Administrative Controls
   1. Continuous and effective communication of administrative controls/requirements to all site personnel and visitors, through the posting of site signage, preparation and distribution of site plans, presented during site meetings, and verbal warnings if necessary.
   2. Require that all employees exhibiting any COVID-19 symptom do not enter the site and provide sick leave policies to support this requirement.
   3. To minimize face-to-face interaction, the Site's Health & Safety Officer's (or other designated employee) phone number shall be prominently posted and disseminated to project staff to be called for the purpose of site sign in and sign out by all visitors to the site upon arrival and exit. The designated employee will receive entry and exit calls each day and will fill out the site entry/exit log for each site visitor to reduce traffic in site trailer and/or the number of individuals contacting the site access tracking log.
   4. Staffing: only those employees necessary to complete critical path task(s) shall be present on-site at any given time. Work shall be scheduled to minimize the density of personnel in any given area at any given time.
   5. Working Remotely; employees shall be encouraged to complete work remotely if possible.
   6. Face-to-face meetings shall be replaced with video or phone conferences when practicable.
   7. Social distancing shall be exercised for face-to-face meetings e.g. daily Health and Safety tailgate meeting. In addition, the Contractor shall plan to have multiple meetings (if necessary) to keep the number of participants to a threshold that allows for the practice of social distancing protocol. The Health and Safety

officer will keep a record of all present for each meeting on the Health and Safety log.

8. Quarantine staff that have been in contact with a anyone that tested positive and notify NYSDEC immediately.

C. Safe Work Practices

1. The Contractor shall employ social distancing protocol for all onsite activities when able.
2. The Contractor provide PPE and adequate hand washing stations and hand sanitizer (containing a minimum of 60% alcohol) to allow site personnel and visitors to practice good personal hygiene.
3. The Contractor shall provide tissues, paper towels, no-touch trash cans, and disinfectants to maintain site cleanliness.
4. Sharing of tools and heavy equipment shall be limited to the extent practicable; handles of shared tools and equipment shall be sanitized regularly.

D. Personal Protective Equipment

1. Employees shall be provided disposable personal protective equipment (PPE), including gloves, goggles, face shields, face masks, and respiratory protection, as appropriate based on work environment and current recommendations by OSHA and CDC.
2. All PPE must be selected based on hazard to the worker, properly fitted and periodically refitted, consistently and properly worn when required, regularly inspected, maintained, and replaced, as necessary, and properly removed, cleaned, and stored or disposed of, to avoid contamination of self, others, or the environment.
3. PPE worn to prevent transmission of COVID-19 is not to be confused with PPE for protection against site contaminants.
4. PPE must be worn, removed, and disposed of correctly in order to remain effective.
    a. Face masks should fit snugly but comfortable against the side of the face and over the nose and be secured with ties or ear loops; cloth masks must include multiple layers of fabric, allow for breathing without restriction, and be able to be laundered and machine dried without damage.
    b. Face masks should be worn consistently and removed without touching eyes, nose, and mouth. An individual should wash their hands after handling a used face mask.
    c. Cloth face coverings should be sterilized by machine washing between use; disposable face masks shall be disposed of properly after using.
    d. Gloves are only effective if changed and disposed of frequently, to avoid cross-contamination.

3.3 NOTIFICATION OF POTENTIAL OR CONFIRMED INFECTION

A. The Contractor shall notify the Department immediately upon identification of a suspected or confirmed infection of COVID-19. This notification shall comply with HIPAA regulations.

B. The Contractor shall remove an individual suspected to have COVID-19 from the site immediately (to the individuals' hotel or local place of residence if transport home is not

immediately feasible), as well as those who have worked in close contact with that individual for extended periods of time (an hour at a time or more) over the previous week. The individual with suspected infection shall contact their health care provider and/or follow local health department testing procedures and protocol.

C. While in the process of removing an employee exhibiting symptoms, steps should be taken to isolate the individual, place a surgical mask on the individual and inform the local health department and the NYSDEC.

D. In the event the individual with suspected infection cannot get home right away, they shall isolate in their hotel room (notifying hotel management of their symptoms), contact their health care provider, and/or follow local health department testing procedures and protocol.

E. In the absence of local health department information, the individual may call the New York State Hotline at 1-888-364-3065.

F. The Contractor shall maintain communication with potentially infected individual(s) and notify the Engineer upon receipt of COVID-19 test results.

G. Positively infected individuals may return to work at the site after 72 hours of being symptom-free and 7 days of isolation after the first symptoms appeared, or in accordance with the current federal, state, and local guidelines

H. OSHA recordkeeping requirements at 29 CFR Part 1904 mandate covered employers record certain work-related injuries and illnesses on their OSHA 300 log. COVID-19 can be a recordable illness if a worker is infected as a result of performing their work-related duties. However, employers are only responsible for recording cases of COVID-19 if all the following are met:

1. The case is a confirmed case of COVID-19 (see CDC information on persons under investigation and presumptive positive and laboratory-confirmed cases of COVID-19).

2. The case is work-related, as defined by 29 CFR 1904.5; and

3. The case involves one or more of the general recording criteria set forth in 29 CFR 1904.7 (e.g. medical treatment beyond first-aid, days away from work).

END OF SECTION

This page left intentionally blank

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Entry/Exit Log with COVID-19 Acknowledgement

Project Name: _____

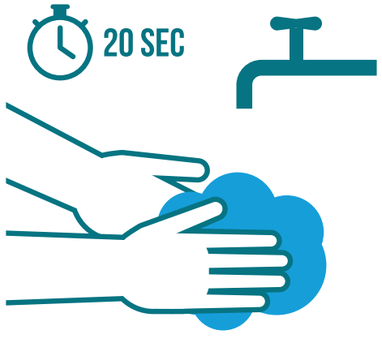
Project #: _____

New York State Department of Environmental Conservation's (DEC) objective is to provide a safe and healthy workplace. In response to COVID-19, DEC is prohibiting access to our work areas by those who pose an elevated risk of spreading COVID-19. By completing this site Entry/Exit log, you acknowledge your understanding of this policy and confirm that your health and travel history is NOT in one of the prohibited access groups listed below, and to the best of your knowledge, you do not pose an elevated risk of transmitting COVID-19 to others. Please leave the site immediately and follow recommendations from public health agencies and your healthcare provider if you fall into one of the prohibited access groups listed below:

- You are experiencing flu-like symptoms including but not limited to fever, chills, cough, sore throat, diarrhea, vomiting, runny/stuffy nose, muscle or body aches, headaches, fatigue.
- You have traveled to CDC-restricted destinations in the last 2 weeks including China, South Korea, Iran, United Kingdom & Ireland, all European Union countries, Switzerland and regions within the U.S. for which public health agencies have prohibited travel.
- You had direct contact with a person diagnosed with COVID-19 or suspected of having COVID-19 during the last 2 weeks.

Name	Initials	Affiliation	Date	Time In	Time Out

PREVENT INFECTION



Wash your hands and use hand sanitizer

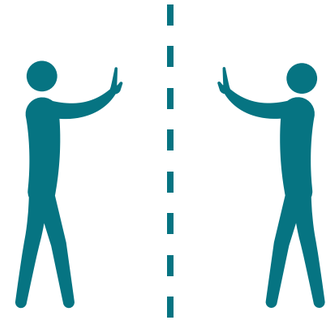
Wash your hands frequently and thoroughly, for a minimum of 20 seconds.

Use hand sanitizer, containing at least 60% alcohol when you are unable to wash you hands with soap and water.

Cover your cough or sneeze

Cover your mouth and nose when coughing or sneezing. Turn your head away from others, if possible, when sneezing.

Use a paper tissue or your sleeve and not your hand. Dispose of used tissues immediately.



Limit physical contact

Avoid handshakes, kisses and hugs.

Maintain at least 6 feet from all others persons when possible.

Keep clean

Regularly sanitize frequently touched and shared surfaces at home as well as at work.

Be considerate

Stay home whenever possible especially if you are experiencing symptoms.

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

SITE ACCESS RESTRICTIONS

SITE ACCESS IS PROHIBITED FOR THE FOLLOWING PERSONS DUE TO COVID-19 RISK

- **You are experiencing flu-like symptoms including but not limited to:**

  Fever or feeling feverish/chills, cough, sore throat, diarrhea, vomiting, runny or stuffy nose, muscle or body aches, headaches, fatigue (tiredness)

- **You have traveled to CDC-restricted destinations during the last 2 weeks:**

  China, South Korea, Iran, United Kingdom & Ireland, all European Union countries, Switzerland and regions within the U.S. for which public health agencies have prohibited travel

- **You had direct contact with a person diagnosed with COVID-19 or suspected of having COVID-19 during the last 2 weeks**

  Immediately notify NYSDEC site management.

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Appendix C

Construction Drawings

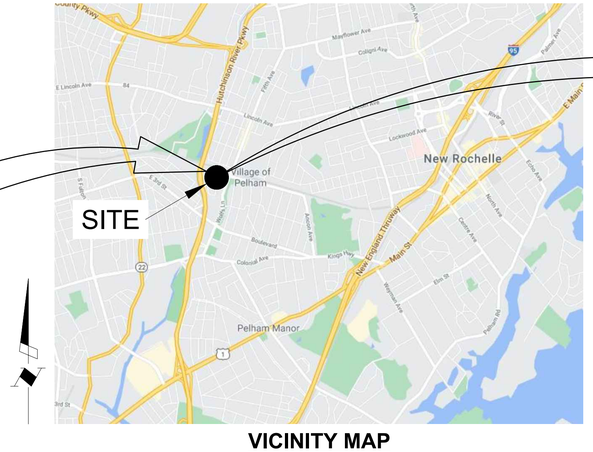
This page left intentionally blank.

CRYSTAL CLEANERS SITE
NYS REGISTRY NO. 360053
113 WOLFS LANE
PELHAM, NEW YORK
PHASE II - REMEDIAL ACTION PLAN

PREPARED FOR
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
ALBANY, NY

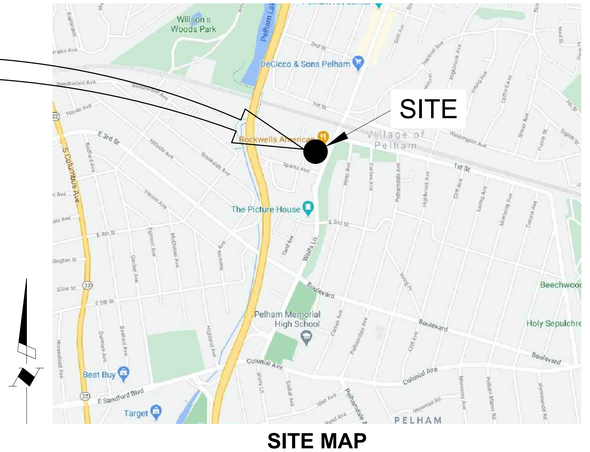
NEW YORK STATE MAP

NTS



VICINITY MAP

NTS



SITE MAP

NTS

SHEET LIST TABLE	
SHEET NUMBER	SHEET TITLE
1	TITLE SHEET
2	EXISTING CONDITIONS PLAN
3	GROUNDWATER PLUME & INJECTION LAYOUT
4	COMMUNITY DRIVEWAY RESTORATION PLAN

Department of Environmental Conservation
NEW YORK STATE OF OPPORTUNITY

NO.	DATE	REVISIONS
0	FEB 2021	FOR SCOPE OF WORK
1	JAN 2022	FOR CONSTRUCTION COMPLETION REPORT
2	MAR 2022	FOR PHASE II CONSTRUCTION

TITLE SHEET

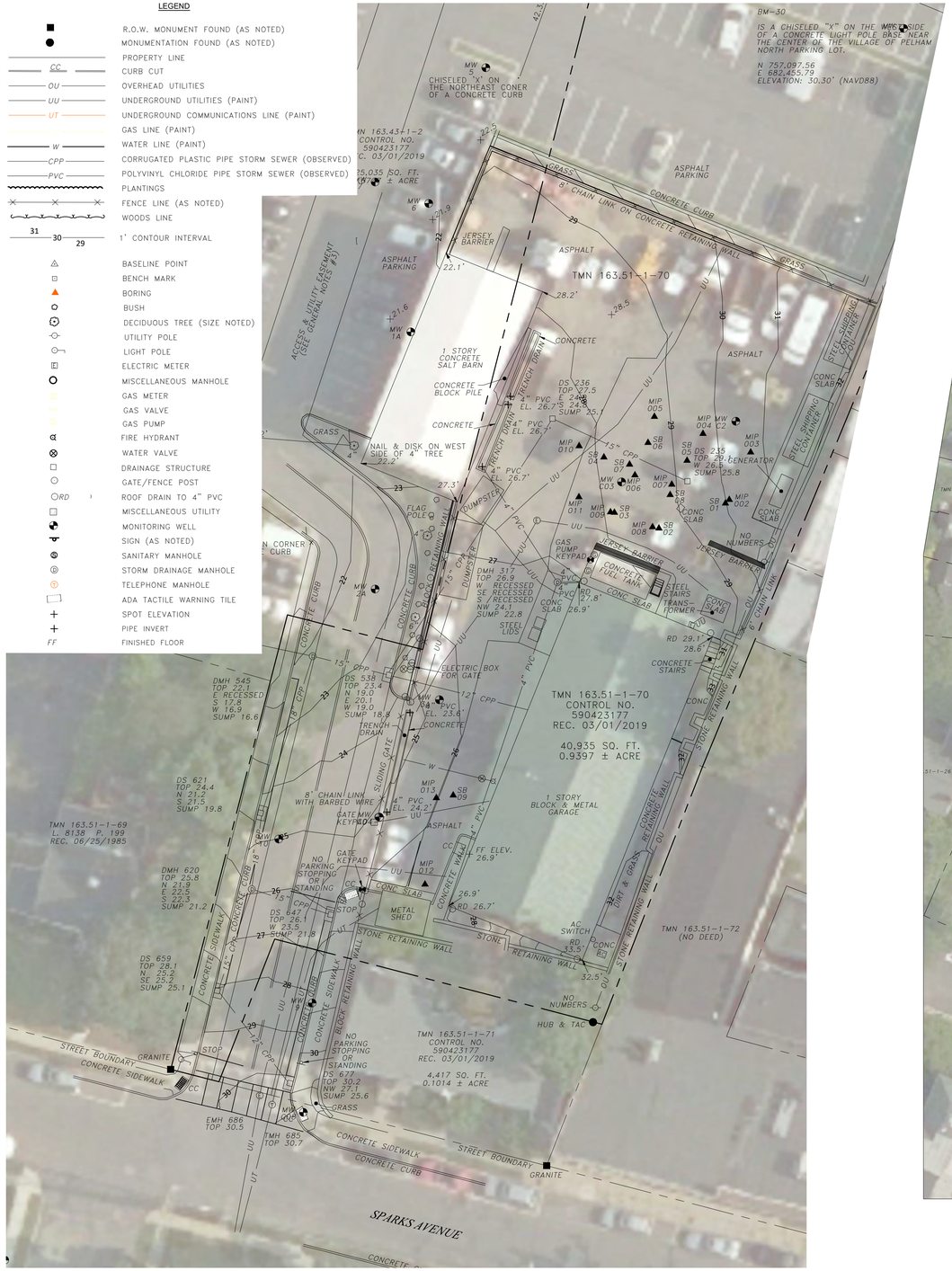
CRYSTAL CLEANERS SITE
NYS REGISTRY NO. 360053
113 WOLFS LANE
PELHAM, NEW YORK

PREPARED BY:
EA ENGINEERING, P.C.
AND ITS AFFILIATE
EA SCIENCE AND
TECHNOLOGY

EA #	16025.11
FILE	16025.11-Plnset.dwg
DRAWN BY	DPA
DATE	APRIL 2022
SCALE	AS SHOWN

SEAL

SHEET # 1



ON-SITE DPW PROPERTY EXISTING CONDITIONS

GRAPHIC SCALE IN FEET: 20 10 0 20 40

OFF-SITE MANNING CIRCLE RESIDENTIAL AREA EXISTING CONDITIONS

GRAPHIC SCALE IN FEET: 30 15 0 30 60

LEGAL NOTES

1. ONLY BOUNDARY SURVEY MAPS WITH THE SURVEYOR'S EMBOSSED SEAL ARE GENUINE TRUE AND CORRECT COPIES OF THE SURVEYOR'S ORIGINAL WORK AND OPINION.
2. THE CERTIFICATION IS LIMITED TO PERSONS FOR WHOM THE BOUNDARY SURVEY MAP IS PREPARED, TO THE TITLE COMPANY, AND TO THE OTHER INSTITUTIONS LISTED ON THIS BOUNDARY SURVEY MAP.
3. THE CERTIFICATIONS HEREON ARE NOT TRANSFERABLE.
4. THE LOCATION OF UNDERGROUND IMPROVEMENTS OR ENCROACHMENTS ARE NOT ALWAYS KNOWN AND OFTEN MUST BE ESTIMATED. UNDERGROUND IMPROVEMENTS OR ENCROACHMENTS ARE NOT COVERED BY THIS CERTIFICATE.
5. UNDERGROUND UTILITY LOCATIONS ARE NOT GUARANTEED, NOR IS THERE ANY GUARANTEE THAT ALL EXISTING UTILITIES WHETHER FUNCTIONAL OR ABANDONED WITHIN THE PROJECT AREA ARE SHOWN ON THIS DRAWING. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL UNDERGROUND UTILITIES BY CONTACTING DIG SAFELY, NEW YORK AT 1-800-962-7962, IN ACCORDANCE WITH 16 NYCRR PART 753, (ALSO CITED AS INDUSTRIAL CODE 53 OR CODE RULE 53) BEFORE STARTING WORK AND SHALL BE RESPONSIBLE FOR ALL DAMAGE RESULTING FROM HIS WORK.

GENERAL NOTES

1. CONTRACTOR PRIOR TO START OF WORK SHALL OBTAIN ANY AND ALL REQUIRED PERMITS FROM THE TOWN OF PELHAM BUILDING DEPARTMENT AND ANY OTHER AGENCIES THAT HAVE JURISDICTION. WHICH SHALL INCLUDE THE FOLLOWING WHERE APPLICABLE:
   A. BUILDING PERMIT
   B. SOLID AND HAZARDOUS WASTE TRANSPORTER PERMITS
   C. CONSTRUCTION FENCE PERMIT
   D. STREET RIGHT-OF-WAY PERMIT
   E. STREET OPENING PERMIT
2. WORK WILL REQUIRE A STREET OPENING PERMIT FROM THE VILLAGE OF PELHAM. CONTRACTOR SHALL BE RESPONSIBLE FOR MEETING ALL PERMIT CONDITIONS AND WORK WILL BE PERFORMED IN ACCORDANCE WITH THE VILLAGE OF PELHAM STREET OPENING INSTRUCTION SPECIFICATION PROVIDED IN THE SCOPE OF WORK.
3. THE CONTRACTOR SHALL PREPARE AND SUBMIT A WORK PLAN AS SPECIFIED IN THE CONTRACTOR SCOPE OF WORK FOR APPROVAL BY THE ENGINEER AND NYSDEC PRIOR TO COMMENCING WORK ONSITE. THE WORK PLAN WILL INCLUDE, AT A MINIMUM THE FOLLOWING:
   A. PROPOSED MEANS AND METHODS AND SEQUENCE OF TASKS
   B. HEALTH AND SAFETY PLAN
   C. EROSION AND SEDIMENT CONTROL PLAN
   D. DUST CONTROL PLAN
   E. CAMP
4. CONTRACTOR SHALL COMPLY WITH NYSDOT WORK ZONE TRAFFIC CONTROL MANUAL, WHERE APPLICABLE, AND ALWAYS MAINTAIN SAFE AND CLEAR ACCESS AROUND AND FROM THE SITE.
5. DURING AND THROUGHOUT ALL CONSTRUCTION ACTIVITIES, CONTRACTOR SHALL IMPLEMENT AIR MONITORING AND DUST CONTROL MEASURES.
6. THE CONTRACTOR SHALL IMPLEMENT ALL REQUIRED SITE LOGISTICS, TRUCK ROUTING, SAFETY ZONES, DECONTAMINATION PADS, ETC PRIOR TO START OF CONSTRUCTION.
7. ESTABLISHED SURVEY CONTROL POINTS ARE AVAILABLE FOR CONSTRUCTION PURPOSES. THE CONTRACTOR SHALL VERIFY LOCATIONS OF SURVEY CONTROL POINTS STARTING TO WORK, SAFEGUARD ALL SURVEY CONTROL POINTS DURING WORK, AND REPLACE ANY CONTROL POINTS DAMAGED OR DESTROYED DURING EXECUTION OF THE REMEDIAL ACTION.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LAYOUT OF THE SITE, CONSTRUCTION AND ANY ADDITIONAL SURVEY CONTROL POINTS, LINES, GRADES, AND LEVELS NECESSARY FOR PROPER EXECUTION OF THE WORK. SURVEY CONTROL SHALL INCLUDE, BUT IS NOT LIMITED TO, MAINTAINING APPROPRIATE SLOPES, SPECIFIED THICKNESSES, SPECIFIED ELEVATIONS, AND CONSTRUCTED LOCATIONS AS SHOWN ON THE DRAWINGS.
9. THE CONTRACTOR SHALL EMPLOY A LAND SURVEYOR LICENSED IN THE STATE OF NEW YORK AND IS RESPONSIBLE FOR SCHEDULING SURVEYS TO COINCIDE WITH CONSTRUCTION ACTIVITIES. SURVEY DOCUMENTATION INCLUDES, BUT MAY NOT BE LIMITED TO:
   A. PRE-INJECTION POINT LAYOUT/MARKOUT, AND PRE-CONSTRUCTION SURVEY OF COMMUNITY DRIVEWAY INCLUDING SHOTS OF THE EDGE OF PAVEMENT EVERY 10 LINEAR FEET, AND BETWEEN APARTMENT BUILDING AND DRIVEWAY. PRE-CONSTRUCTION SURVEY OF THE COMMUNITY DRIVEWAY SHALL ALSO INCLUDE SURVEY OF EXISTING TIE-IN TO MANNING CIRCLE ROADWAY AND SIDEWALK SURFACES.
   B. LOCATION OF FINAL INJECTION POINTS FOR INCLUSION ON AS-BUILT DRAWINGS
   C. FINAL GRADING OF COMMUNITY DRIVEWAY TO BE REPAVED FOLLOWING INJECTIONS

ON-SITE GENERAL NOTES

1. ABSTRACT OF TITLE - NOT PROVIDED AT THE TIME OF SURVEY AND MAY CONTAIN SPECIFIC TITLE INFORMATION. 2. CERTIFICATE OF TITLE - NOT PROVIDED AT THE TIME OF SURVEY AND MAY CONTAIN SPECIFIC TITLE INFORMATION.
2. "CONSTRUCTION, ACCESS AND UTILITY EASEMENT AGREEMENT" BETWEEN THE VILLAGE OF PELHAM AND PELPARK, LLC, RECORDED 03/01/2019 IN THE OFFICE OF THE WESTCHESTER COUNTY CLERK, DIVISION OF LAND RECORDS, DOCUMENT CONTROL NUMBER 590423177.
3. NYSGIS 2016 ORTHOIMAGERY WAS USED AS THE BASIS FOR SHOWING THE LOCATION OF CERTAIN FEATURES (EXCLUDING BOUNDARIES) WHERE GROUND MEASUREMENTS ARE NOT OTHERWISE NECESSARY TO LOCATE THOSE FEATURES TO AN APPROPRIATE AND ACCEPTABLE ACCURACY RELATIVE TO A NEARBY BOUNDARY.
4. POTENTIAL ENCROACHMENT - ONE STORY CONCRETE BUILDING FROM TMN 163.44-1-2.1 ONTO TMN 163.51-1-70 NEAR THE NORTHEAST CORNER, AS SHOWN.

ON-SITE REFERENCE DATA

1. TAX MAP - TOWN OF PELHAM, VILLAGE OF PELHAM, WESTCHESTER COUNTY, NEW YORK, MAP 163.43, DATE OF MAP 03/26/1990, LAST REVISED 01/19/2016.
2. TAX MAP- TOWN OF PELHAM, VILLAGE OF PELHAM, WESTCHESTER COUNTY, NEW YORK, MAP 163.51, DATE OF MAP 03/26/1990, LAST REVISED 01/19/2016.
3. "101 WOLFS LANE, SECTION NO. 163.44, BLOCK NO. 01, LOT NO. 2.1, VILLAGE OF PELHAM, WESTCHESTER, NEW YORK, ACCESS & UTILITY EASEMENT PLAN", PREPARED BY LANGAN ENGINEERING, ENVIRONMENTAL, SURVEYING, LANDSCAPE ARCHITECTURE AND GEOLOGY, D.P.C., DATED 10/23/2018, LAST REVISED 01/14/2019.
4. "MAP OF PELHAMVILLE, WESTCHESTER COUNTY, NEW YORK", SURVEYED BY WILLIAM BRYSON, ARCHITECT & CIVIL ENGINEER, NEW ROCHELLE, SURVEY COMPLETED 08/04/1857, FILED MAP NO. 205.

OFF-SITE REFERENCE DATA

1. TAX MAP- TOWN OF PELHAM, VILLAGE OF PELHAM, WESTCHESTER COUNTY, NEW YORK, MAP 163.51, DATE OF MAP 03/26/1990, LAST REVISED 01/19/2016.
2. "RESUBDIVISION OF LOTS 3,4,5,6,7,8,9,10,11,12,13,14, REVISED MAP OF MANNING TERRACE, PELHAM, N.Y.", PREPARED BY JOHN F. FAIRCHILD, C.E., DATED 03/24/1931, FILED IN THE OFFICE OF THE REGISTER OF WESTCHESTER COUNTY ON 01/14/1932, MAP NO. 3842.
3. "REVISED MAP OF MANNING TERRACE, PELHAM, N.Y.", PREPARED BY JOHN F. FAIRCHILD, C.E., DATED 05/02/1930, FILED IN THE OFFICE OF THE REGISTER OF WESTCHESTER COUNTY ON 05/09/1930, MAP NO. 3601.
4. "MAP OF MANNING TERRACE, PELHAM, N.Y.", PREPARED BY JOHN F. FAIRCHILD, C.E., DATED 03/17/1924, FILED IN THE OFFICE OF THE REGISTER OF WESTCHESTER COUNTY ON 03/31/1924 MAP NO. 2594.
5. "SUBDIVISION OF PROPERTY BELONGING TO THE WOLFS LANE IMPROVEMENT CO. INC., PELHAM, N.Y.", PREPARED BY JOHN F. FAIRCHILD, C.E., DATED 03/08/1923, FILED IN THE OFFICE OF THE REGISTER OF WESTCHESTER COUNTY ON 04/12/1923, MAP NO. 2495.
6. "MAP OF PELHAMVILLE, WESTCHESTER COUNTY, NEW YORK", SURVEYED BY WILLIAM BRYSON, ARCHITECT & CIVIL ENGINEER, NEW ROCHELLE, SURVEY COMPLETED 08/04/1857, FILED MAP NO. 205.

OFF-SITE GENERAL NOTES

1. ABSTRACT OF TITLE - NOT PROVIDED AT THE TIME OF SURVEY AND MAY CONTAIN SPECIFIC TITLE INFORMATION.
2. CERTIFICATE OF TITLE - NOT PROVIDED AT THE TIME OF SURVEY AND MAY CONTAIN SPECIFIC TITLE INFORMATION.
3. NYSGIS 2016 ORTHOIMAGERY WAS USED AS THE BASIS FOR SHOWING THE LOCATION OF CERTAIN FEATURES (EXCLUDING BOUNDARIES) WHERE GROUND MEASUREMENTS ARE NOT OTHERWISE NECESSARY TO LOCATE THOSE FEATURES TO AN APPROPRIATE AND ACCEPTABLE ACCURACY RELATIVE TO A NEARBY BOUNDARY.
4. POTENTIAL ENCROACHMENT - SOUTHEAST CORNER OF PLAYGROUND ON TMN 163.51-1-41 ONTO TMN 163.51-1-34 ALONG THE NORTH LINE BY UP TO 0.4 FEET.

Department of Environmental Conservation

NEW YORK STATE OF OPPORTUNITY

EXISTING CONDITIONS PLAN

CRYSTAL CLEANERS SITE
NYS REGISTRY NO. 360053
113 WOLFS LANE
PELHAM, NEW YORK

NO.	DATE	DESCRIPTION
0	FEB 2021	FOR SCOPE OF WORK
1	JAN 2022	FOR CONSTRUCTION COMPLETION REPORT
2	MAR 2022	FOR PHASE II CONSTRUCTION

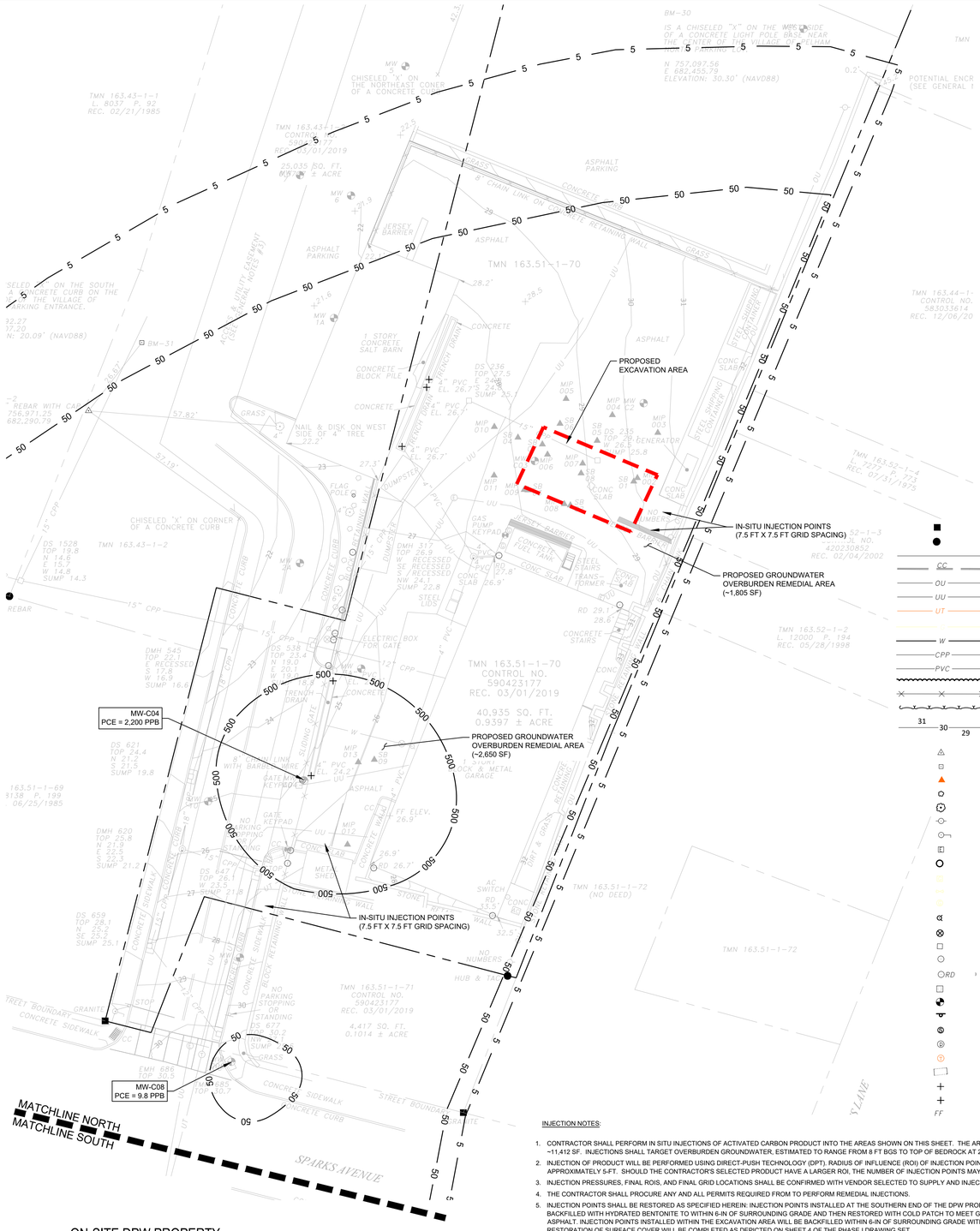
REVISIONS

PREPARED BY:
EA ENGINEERING, P.C.
AND ITS AFFILIATE
EA SCIENCE AND TECHNOLOGY

EA #	16025.11
FILE	16025.11–Planset.dwg
DRAWN BY	DPA
DATE	APRIL 2022
SCALE	AS SHOWN

SEAL

SHEET # 2



ON-SITE DPW PROPERTY GROUNDWATER PLUME & INJECTION LAYOUT

20 10 0 20 40
GRAPHIC SCALE IN FEET

OFF-SITE GROUNDWATER PLUME AND INJECTION AREA

40 20 0 40 80
GRAPHIC SCALE IN FEET

LEGEND

- R.O.W. MONUMENT FOUND (AS NOTED)
- MONUMENTATION FOUND (AS NOTED)
- PROPERTY LINE
- CC — CURB CUT
- OU — OVERHEAD UTILITIES
- UU — UNDERGROUND UTILITIES (PAINT)
- UT — UNDERGROUND COMMUNICATIONS LINE (PAINT)
- GAS LINE (PAINT)
- W — WATER LINE (PAINT)
- CPP — CORRUGATED PLASTIC PIPE STORM SEWER (OBSERVED)
- PVC — POLYVINYL CHLORIDE PIPE STORM SEWER (OBSERVED)
- PLANTINGS
- FENCE LINE (AS NOTED)
- WOODS LINE
- 31 / 30 / 29 — 1' CONTOUR INTERVAL
- BASELINE POINT
- BENCH MARK
- BORING
- BUSH
- DECIDUOUS TREE (SIZE NOTED)
- UTILITY POLE
- LIGHT POLE
- ELECTRIC METER
- MISCELLANEOUS MANHOLE
- GAS METER
- GAS VALVE
- GAS PUMP
- FIRE HYDRANT
- WATER VALVE
- DRAINAGE STRUCTURE
- GATE/FENCE POST
- RD — ROOF DRAIN TO 4" PVC
- MISCELLANEOUS UTILITY
- MONITORING WELL
- SIGN (AS NOTED)
- SANITARY MANHOLE
- STORM DRAINAGE MANHOLE
- TELEPHONE MANHOLE
- ADA TACTILE WARNING TILE
- SPOT ELEVATION
- PIPE INVERT
- FF — FINISHED FLOOR

PLUME & INJECTION LEGEND

- 5 — 5 µg/L PCE CONCENTRATION CONTOUR
- 50 — 50 µg/L PCE CONCENTRATION CONTOUR
- 500 — 500 µg/L PCE CONCENTRATION CONTOUR
- OVERBURDEN GROUNDWATER REMEDIAL AREA
- IN-SITU INJECTION POINT
- MONITORING WELL LOCATION

INJECTION NOTES:

1. CONTRACTOR SHALL PERFORM IN SITU INJECTIONS OF ACTIVATED CARBON PRODUCT INTO THE AREAS SHOWN ON THIS SHEET. THE AREAS SHOWN TOTAL ~11,412 SF. INJECTIONS SHALL TARGET OVERBURDEN GROUNDWATER, ESTIMATED TO RANGE FROM 8 FT BGS TO TOP OF BEDROCK AT 20 FT BGS.
2. INJECTION OF PRODUCT WILL BE PERFORMED USING DIRECT-PUSH TECHNOLOGY (DPT). RADIUS OF INFLUENCE (ROI) OF INJECTION POINTS SHALL BE APPROXIMATELY 5-FT. SHOULD THE CONTRACTOR'S SELECTED PRODUCT HAVE A LARGER ROI, THE NUMBER OF INJECTION POINTS MAY BE REDUCED.
3. INJECTION PRESSURES, FINAL ROIS, AND FINAL GRID LOCATIONS SHALL BE CONFIRMED WITH VENDOR SELECTED TO SUPPLY AND INJECT CARBON PRODUCT.
4. THE CONTRACTOR SHALL PROCURE ANY AND ALL PERMITS REQUIRED FROM TO PERFORM REMEDIAL INJECTIONS.
5. INJECTION POINTS SHALL BE RESTORED AS SPECIFIED HEREIN: INJECTION POINTS INSTALLED AT THE SOUTHERN END OF THE DPW PROPERTY WILL BE BACKFILLED WITH HYDRATED BENTONITE TO WITHIN 6-IN OF SURROUNDING GRADE AND THEN RESTORED WITH COLD PATCH TO MEET GRADE OF SURROUNDING ASPHALT. INJECTION POINTS INSTALLED WITHIN THE EXCAVATION AREA WILL BE BACKFILLED WITHIN 6-IN OF SURROUNDING GRADE WITH HYDRATED BENTONITE. RESTORATION OF SURFACE COVER WILL BE COMPLETED AS DEPICTED ON SHEET 4 OF THE PHASE I DRAWING SET.
6. INJECTION POINTS INSTALLED IN THE OFFSITE AREAS OF MANNING CIRCLE WILL BE BACKFILLED WITH HYDRATED BENTONITE TO WITHIN 6-IN OF SURROUNDING GRADE. INJECTION POINTS COMPLETED ON THE SIDEWALK SHALL BE RESTORED WITH CONCRETE TO MEET SURROUNDING GRADE. POINTS COMPLETED IN VEGETATED SURFACE WILL BE BACKFILLED WITH TOPSOIL TO GRADE AND SEEDED. POINTS COMPLETED IN MANNING CIRCLE WILL BE RESTORED WITH COLD PATCH TO MEET SURROUNDING GRADE. THE LAST 6-IN OF POINTS INSTALLED IN THE DRIVEWAY OF THE COMMUNITY DRIVE WAY WILL BE COMPLETED WHEN DRIVEWAY IS REPAVED.
7. INJECTION POINTS WILL LIKELY BE ADJUSTED TO SUIT FIELD CONDITIONS, E.G., PROVIDING ENOUGH CLEARANCE FROM UNDERGROUND AND OVERHEAD UTILITIES.
8. PCE CONCENTRATIONS PRESENTED ON THIS SHEET ARE FROM GROUNDWATER SAMPLES COLLECTED AS PART OF PDI INVESTIGATIONS AND RA PHASE I IN JULY 2020 AND OCTOBER 2021, RESPECTIVELY.

Department of Environmental Conservation
NEW YORK STATE OF OPPORTUNITY

NO.	DATE	REVISIONS
0	FEB 2021	FOR SCOPE OF WORK
1	JAN 2022	FOR CONSTRUCTION COMPLETION REPORT
2	MAR 2022	FOR PHASE II CONSTRUCTION

GROUNDWATER PLUME & INJECTION LAYOUT

CRYSTAL CLEANERS SITE
NYS REGISTRY NO. 360053
113 WOLFS LANE
PELHAM, NEW YORK

PREPARED BY:
EA ENGINEERING, P.C. AND ITS AFFILIATE EA SCIENCE AND TECHNOLOGY

EA #	16025.11
FILE	16025.11–Planset.dwg
DRAWN BY	DPA
DATE	APRIL 2022
SCALE	AS SHOWN

SEAL

SHEET # 3

GENERAL NOTES

1. FOLLOWING COMPLETION OF REMEDIAL SUBSTRATE INJECTIONS, THE CONTRACTOR SHALL MILL AND REPAVE THE COMMUNITY DRIVEWAY LOCATED AT APPROXIMATELY 25 MANNING CIRCLE, VILLAGE OF PELHAM, NEW YORK.
2. THE COMMUNITY DRIVEWAY SHALL BE PARTIALLY COLD MILLED TO A DEPTH OF 1 INCH OF EXISTING BITUMINOUS PAVEMENT IN CONFORMITY WITH THE EXISTING GRADE LINES. MILLING EQUIPMENT SHALL COMPLY WITH NYSDOT STANDARD SPECIFICATION SECTION 490-2.01.
3. VACUUMING TRUCKS, POWER BROOMS, HAND TOOLS, ETC. SHALL BE USED TO CLEAN THE MILLED SURFACE.
4. CONSTRUCTION SHALL CONFORM WITH NYSDOT STANDARD SPECIFICATIONS SECTION 490-3.
5. MILLING SHALL NOT BE PERFORMED IN SNOW OR ICE ON THE PAVEMENT SURFACE.
6. FINAL MILLED SURFACE SHALL ACHIEVE POSITIVE DRAINAGE AWAY FROM ADJACENT APARTMENT BUILDING.
7. MANHOLES, CATCH BASINS, VALVE BOXES, UTILITY LINES, OR OTHER STRUCTURES TO REMAIN IF DAMAGED DUE TO MILLING OPERATIONS SHALL BE REPAIRED AND REPLACED.
8. MILLED SURFACES SHALL BE CONTINUALLY CLEANED OF LOSE MATERIAL AND DUST. IMMEDIATELY BEFORE PLACEMENT OF TACK COAT, THE MILLED SURFACE SHALL BE CLEANED TO A CONDITION FREE OF LOOSE MATERIAL, DUST, AND FOREIGN MATTER.
9. TYING INTO EXISTING PAVEMENT AT LIMITS OF WORK ARE SHOWN ON DRAWINGS (I.E., MANNING CIRCLE). JOINTS SHALL BE SAW CUT AND EXISTING ASPHALT REMOVED TO FACILITATE TIE IN OF NEW ASPHALT OVERLAY.
10. MILLING SPOILS SHALL BE TRANSPORTED OFFSITE FOR RECYCLING / DISPOSAL BY THE CONTRACTOR.

PAVING NOTES

1. THE CONTRACTOR SHALL SUBMIT CERTIFICATION INDICATING THAT THE ASPHALT PLANT TO BE USED IS CURRENTLY APPROVED BY THE NEW YORK STATE DEPARTMENT OF TRANSPORTATION AND THAT ALL MATERIALS AND APPLICATION METHODS USED ARE IN CONFORMANCE WITH THE NYSDOT STANDARD SPECIFICATIONS.
2. PAVING SHALL NOT TAKE PLACE WHEN PROBABILITY OF PRECIPITATION WITHIN THREE HOURS OF THE START OF OPERATIONS EQUALS OR EXCEEDS 50 PERCENT. ASPHALT SHALL NOT BE LAID WHEN SURFACE TEMPERATURES ARE BELOW 45°F.
3. THE CONTRACTOR SHALL TAKE SURFACE TEMPERATURE READINGS AT 3 LOCATIONS IN THE AREA BEING PAVED. THE CONTROLLING TEMPERATURE SHALL BE THE AVERAGE OF THE THREE READINGS.
4. ASPHALT SURFACE LAYER SHALL HAVE A MINIMUM THICKNESS OF 1" OF NYSDOT TYPE 6F TOP COURSE. 1" FINAL THICKNESS OF DRIVEWAY SURFACE SHALL BE AT LEAST EQUAL TO THE PRE-CONSTRUCTION THICKNESS (ASSUMED 3"). TACK COAT WILL BE REQUIRED PRIOR TO PLACEMENT OF 6F TOP COURSE.
5. PLACEMENT SHALL BE IN 2" MAXIMUM LIFTS AND ROLLED WITH A TWO DRUM, STEEL WHEEL ROLLER. PLATE TAMPERS SHALL NOT BE USED FOR COMPACTION UNLESS THE ARE IS SUCH THAT SMALL, TWO DRUM ROLLERS DO NOT FIT BETWEEN OBSTRUCTIONS.
6. HOT MIX ASPHALT ARRIVING ONSITE SHALL HAVE MINIMUM TEMPERATURE OF 300F THAT WILL BE VERIFIED BY THE CONTRACTOR BEFORE UNLOADING.

OFF-SITE MANNING CIRCLE RESIDENTIAL AREA
COMMUNITY DRIVEWAY RESTORATION PLAN

20 10 0 20 40
GRAPHIC SCALE IN FEET

Department of Environmental Conservation
NEW YORK STATE OF OPPORTUNITY

NO.	DATE	DESCRIPTION
0	FEB 2021	FOR SCOPE OF WORK
1	JAN 2022	FOR CONSTRUCTION COMPLETION REPORT
2	MAR 2022	FOR PHASE II CONSTRUCTION

REVISIONS

COMMUNITY DRIVEWAY RESTORATION

CRYSTAL CLEANERS SITE
NYS REGISTRY NO. 360053
113 WOLFS LANE
PELHAM, NEW YORK

PREPARED BY:
EA ENGINEERING, P.C.
AND ITS AFFILIATE
EA SCIENCE AND
TECHNOLOGY

EA #	16025.11
FILE	16025.11-Planset.dwg
DRAWN BY	DPA
DATE	APRIL 2022
SCALE	AS SHOWN

SEAL

SHEET # 4

Appendix D

Carbon Vendor Proposal Packages

This page left intentionally blank.

PROPOSAL FOR IN-SITU TREATMENT SERVICES & PRODUCTS

CRYSTAL CLEANERS SITE
NYSDEC SITE NO. 36005
WOLFS LANE VICINITY
PELHAM, NY

FEBRUARY 23, 2021

PREPARED FOR

EA SCIENCE AND TECHNOLOGY
269 W. JEFFERSON STREET
SYRACUSE, NEW YORK 13202

ON BEHALF OF

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

ISOTEC PROPOSAL NO. 802850

In-Situ Oxidative Technologies, Inc.
11 Princess Road, Suite A
Lawrenceville, New Jersey 08648
Phone: (609) 275-8500, Fax: (609) 275-9608
www.ISOTEC-INC.com

SBA Certified Small Business

*****

This In-Situ Oxidative Technologies, Inc. (ISOTEC) document includes proprietary data that shall not be duplicated, used, or disclosed outside EA Science and Technology (EA) and New York State Department of Environmental Conservation (NYSDEC) for any purpose other than to evaluate this document. This restriction does not limit right to use information contained in this document if it is obtained from another source without restriction.

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1.0 PROPOSAL OVERVIEW

In-Situ Oxidative Technologies, Inc., (ISOTEC) is pleased to offer this proposal to EA Science and Technology (EA) on behalf of the New York State Department of Environmental Conservation (NYSDEC) under Work Assignment Number (No.) D009806-11 for In-Situ Treatment Services & Products at the Crystal Cleaners Site (No. 360053) located in the Village of Pelham, Westchester County, New York.

The Record of Decision (ROD) for the site calls for in-situ enhanced biodegradation to be employed to treat contaminants in groundwater near the source and at downgradient locations. The biological breakdown of contaminants through anaerobic reductive dechlorination will be enhanced by the addition of colloidal activated carbon (or equivalent products) injections which adsorb the contamination and promote the growth of bacteria to further stimulate biological breakdown of contaminants. Primary contaminants of concern (COCs) consist of chlorinated compounds identified as tetrachloroethene (PCE) and three associated daughter products: trichloroethene (TCE), cis-1,2-dichloroethene (DCE) and vinyl chloride (VC).

EA is requesting remedial treatment estimates that fit within the ROD established for the site with amendments to be applied to the bottom of the source area excavation prior to backfilling to aid in the remediation of residual source area groundwater contamination, and also injected into two target areas with overburden groundwater PCE impacts greater than 500 parts per billion (ppb).

EA provided to ISOTEC preliminary design details regarding the estimated size and depth of the source area excavation and overburden groundwater treatment areas as well as historical and most recent soil and groundwater data available for each area. Upon reviewing the provided data, ISOTEC developed an approach that conforms to the ROD and recommended treatment consisting of an equivalent activated carbon technology for the target areas referred to as BOS 100®. The recommended approach will provide comprehensive groundwater treatment based on demonstrated results with the selected technology.

Some key aspects of the BOS 100® approach that will increase treatment effectiveness in the overburden groundwater impacted areas are listed below.

- Unique to BOS 100® is the reactive iron impregnated into the activated carbon which destroys CVOCs that sorb to carbon replenishing sorption sites for continuous “trap and treat” of CVOCs. Additional details are provided in Section 3.0.
- Use of activated carbon slurry that will not migrate upon emplacement will establish a stable target area treatment that will have much longer persistence compared to liquid carbon.
- The recommended “trap and treat” BOS 100® dosage loading is designed to have an active treatment lifetime over multiple years and possibly significantly longer for extended groundwater treatment. Incorporating more injection locations with closer spacing in our design will guarantee better contact in-situ between impacted groundwater and the injected carbon for an overall robust treatment.
- Removal of impacted source area soils in the on-site target area will also significantly reduce the potential for CVOCs migrating off-site over time.

- The in-situ remedial approach will be effective for the range of CVOC concentrations in groundwater, for site groundwater pH conditions, and for treatment of the selected areas.
- BOS 100® has been utilized to target select hot-spot treatment areas similar to the Crystal Cleaners site as well as targeting large groundwater plumes via installation of permeable reactive barriers (PRBs) to reduce CVOC concentrations to below federal Maximum Contaminant Levels (MCLs).

Additional details are provided within the proposal in sections below.

1.1.1 Site Setting

The Crystal Cleaners site is a single story commercial building located on Wolfs Lane in the Village of Pelham, New York. The site has been used as a dry cleaner for several decades. The source area and on-site portion of proposed groundwater treatment reside within the immediate property boundaries on land currently being utilized by the Village's Department of Public Works (DPW). The off-site target treatment area resides in between a residential home and apartment building off of Manning Circle.

CVOCs have been documented in the unsaturated overburden, overburden groundwater and underlying bedrock groundwater. Contamination has also been observed in soil vapor at concentrations which exceed standards, criteria or guidance (SCGs). The plume originates in the vicinity of the dry cleaner building and flows to the southwest away from the site. PCE, TCE, DCE and VC have been detected at maximum concentrations of 2,200 parts per billion (ppb), 620 ppb, 1,900 ppb and 170 ppb, respectively, during historical and more recent sampling events conducted in the on-site target area from monitoring well location MW-C04. Historical samples from other wells (MW-3A and MW-9) in that area have indicated PCE concentrations greater than 500 ppb. Concentrations from temporary well points (TWPs) located in the off-site target area (TWP-1 and TWP-7) have also indicated PCE concentrations greater than 500 ppb in samples collected back in 2012 and 2013. No recent samples have been collected in this area. In the proposed target excavation source area, soil impacts within the estimated 600 square foot (ft^2) area were recently detected as high as 18-45 milligrams per kilogram (mg/kg) for PCE from location PDI-SB-01 at a depth between 7-8 feet (ft) below ground surface (bgs). Historical soil sample location SB-03 also indicated elevated PCE impacts of 17 mg/kg at a depth between 5.0-5.3 ft bgs. CVOC impacts are also noted in the underlying bedrock but are not proposed for treatment under the current RFP issued for the site.

General subsurface lithology at the site consists of a mixture of fill, sands, silts, some clays and gravels in the overburden underlain by bedrock (schist). Depth to bedrock and groundwater varies across the site based on the elevation changes noted. In the target source excavation area, the depth to water (DTW) measured from nearby monitoring well MW-C03 is between ~14.8-14.9 ft bgs; in the on-site target groundwater treatment area the DTW was referenced as ~13.2 ft bgs with depth to bedrock at ~22.0 ft bgs; and in the off-site target groundwater treatment area the DTW was referenced as ~13.0 ft bgs with depth to bedrock at ~19.0 ft bgs.

2.0 WHY ISOTEC?

Founded in 1995, ISOTEC has over 26 years of environmental remediation experience and is among the first firms to pioneer the transformation of ISCO from a laboratory technology to field-scale applications. ISOTEC's team of engineers, geologists, and scientists offer a full suite of in-situ remediation technologies and have demonstrated successful applications using bioremediation, soil mixing reagent delivery, thermal remediation, metals remediation, and offers laboratory services to enhance projects and achieve successful outcomes. ISOTEC does not advocate any single technology or amendment line and can offer the optimal technologies/amendments to match site setting, contaminants and concentrations, objectives, and timelines. ISOTEC specializes in the combined or sequential application of various remediation technologies and amendments to achieve optimal treatment results.

- ISOTEC has experience implementing more than 1,000 field scale applications and over 500 bench scale studies with a broad suite of treatment amendments, including liquids, slurries, chemical oxidants, amendments to enhance biodegradation, including numerous large volume injections (see example projects in **Table 1**).
- ISOTEC has significant experience with target area treatment applications and permeable reactive barrier (PRB) approaches using electron donors, activated carbon amendments, chemical oxidants in a wide range of hydrogeologic environments (see **Table 1** and case studies in **Appendix A**).
- The off-site area is located within a residential neighborhood. ISOTEC has significant experience implementing remediation at active sites, including in the parking lot and drive-through lane of a fast-food restaurant, installing a PRB pilot test in a school parking lot while school was in session, in-situ chemical oxidation injection in a busy downtown area north of Boston, numerous active construction sites, and in residential neighborhoods.
- ISOTEC is committed to maintaining the highest-level health and safety protocols. ISOTEC has 26 years of performing chemical injections with zero accidents/OSHA reportable incidents safety record. ISOTEC has a Grade A rating with ISNetworld.
- The ISOTEC team for this project (including Technical Director Prasad Kakarla, Senior Remediation Engineer Paul Dombrowski, Senior Project Manager Mike Temple, Senior Scientist Scott Pittenger) will have more than 75 years of combined experience designing and implementing in-situ remediation. Our field staff will be comprised of injection specialists, including a site supervisor who has more than 10 years of focused injection experience with ISOTEC.
- ISOTEC's team of engineers, geologists, scientists, and field service technicians offer a full suite of implementation, design assistance, and data evaluation tools to projects. The team routinely supports clients in making adjustments during a remedial program based on field observations.
- One of ISOTEC's partners operates a laboratory, and through this partnership ISOTEC can offer laboratory analyses at no cost for Remedial Design Characterization and performance evaluation. This value-added service is vital to optimize remedial dosage and assess performance. ISOTEC would utilize this service for analyzing soil samples and groundwater samples from monitoring wells and injection wells before, during, and after injections. This

effort would support assessment and attainment of remedial performance and goals and help optimize the injection program.

Table 1: Relevant Project List

Site	Description
Former Manufacturing Facility, NJ	ISOTEC implemented a series of PRBs for treatment of a large, dilute plume using BOS 100®, injectable activated carbon with reactive metallic iron, for dechlorination of PCE and TCE (10 to 120 ug/L). Groundwater treatment was performed for two separate plumes with low pH groundwater using 8 permeable reactive barriers. Two years after injection PCE and TCE concentrations were reduced to EPA MCL concentrations.
Active Warehouse, Dighton, MA	ISOTEC designed and implemented a remediation approach utilizing Trap and Treat injectable activated carbon (BOS 100®) for source mass reduction of tetrachloroethene (PCE). Injections were performed inside and outside an active warehouse. ISOTEC completed a grid treatment with 175 injections points over a 19-day injection period. Three months after injection, monitoring wells within the treatment areas were all below the PCE goal with 88% to greater than 99% reduction in PCE concentrations.
Active Gasoline Service Station, Northern, NJ	ISOTEC implemented a BOS 200® Trap and Treat remediation program at an active gasoline station targeting BTEX impacts in soil and groundwater. Three separate areas totaling ~1,200 ft^2 were targeted based on a remedial design characterization (RDC) used to finalize treatment extents. Approximately 4,250 lbs. of BOS200 (along with additional gypsum) injected within 1,940 gallons or reagent slurry into a network of 48 temporary DPT locations.
NJ Department of Transportation Facility, Central, NJ	ISOTEC implemented a Trap and Treat® pilot test at a state transportation facility to address impacts of petroleum compounds and chlorinated solvents including tertiary butyl alcohol (TBA), benzene, PCE, TCE, and vinyl chloride. The pilot test reagents consist of three technologies to trap contaminant via carbon adsorption, abiotic degradation of CVOCs within BOS100®, and enhanced bioremediation.
Active Warehouse, Manchester, CT	BOS 200® source area treatment combined with 150 linear foot downgradient PRB for petroleum hydrocarbon treatment. Combined extensive remediation design characterization with design of source treatment and plume capture. A fifteen-day field program resulted in BOS 200® being installed in 38 points in the source area and 96 points in the deep barrier wall. Most of the work was completed inside an active warehouse without disruption.
Former MGP Site. Ithaca MGP Site, NY	ISOTEC injected MFR and BASP in an active roadway in an urban, residential neighborhood for treatment of petroleum hydrocarbons and LNAPL. Oxidants and dosages selected based on bench-scale studies managed by ISOTEC's Senior Remediation Engineer. ISOTEC actively collaborated with client/consultant in optimization efforts to improve performance and safety during the three rounds of injection. Three injection events were conducted over a 16-month time period within a very sensitive site setting.
Town of Orleans, MA	ISOTEC installed a Denitrification PRB demonstration test to quantify nitrate removal. PRB length was ~110 ft targeting the ~36-68 ft bgs interval. A specially designed, blend of EVO for use in high flow aquifers was injected into an active school parking lot located between the building and athletic fields while school was in session. An initial injection event installed the denitrification PRB, and a second injection extended the PRB.

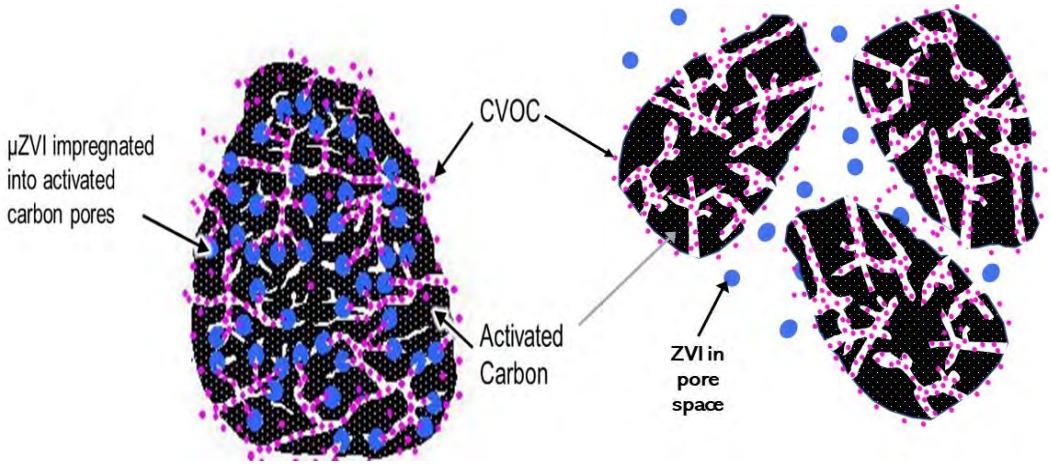
3.0 TECHNICAL APPROACH AND METHODOLOGY

The proposed remediation approach for the Crystal Cleaners site involves injectable activated carbon with abiotic dechlorination. ISOTEC's treatment approach will use a robust Trap & Treat® injectable carbon and reactive metallic iron reagent that are co-located and designed for long-term capture and management of dilute chlorinated solvents and as prevention from migrating past the installed target area barriers.

3.1 Injectable Activated Carbon & Abiotic Reductive Dechlorination

BOS 100® is an effective remediation amendment that provides many benefits compared to other in-situ remediation technologies as well as other injectable activated carbon products.

- BOS 100® combines injectable granular activated carbon and reactive, metallic iron in a single product. The food grade carbon is impregnated with metallic iron formed under reducing conditions at a temperature of ~850^{o}C, when the iron partially dissolves into the carbon forming a new and unique material with properties of both the carbon and iron.
- BOS 100® can achieve rapid reductions in parent chlorinated VOC (PCE & TCE) concentrations (days to months).
- The co-located metallic iron treats the sorbed CVOCs through abiotic dechlorination (Trap & Treat®) that does not generate partially dechlorinated daughter products (e.g., vinyl chloride).
- BOS 100® is a slurry and will not migrate from its emplacement location after injection, which can occur with liquid activated carbon amendments. Therefore, a BOS 100® application will provide consistent target area treatment for an attenuated time frame and in the case of the on-site target area, can help reduce any upgradient source area groundwater moving through the treated area to mitigate continued off-site migration of CVOC impacted groundwater.
- The co-location of iron and carbon ensures that the treatment mechanism is present when chlorinated compounds gets sorbed to the carbon. Abiotic dechlorination by the iron mineralizes contaminants freeing up sorption sites to remove more CVOCs from groundwater.
    - Alternative approaches incorporating injectable activated carbon and enhanced in-situ dechlorination require multiple, separate amendments which achieve less efficient treatment since the sorbed CVOCs are not in the same location as the treatment amendments. When CVOCs load carbon sorption sites without a treatment mechanism the system will be prematurely ineffective limiting the lifespan of the injected reagent.
    - The co-location of activated carbon and reactive iron prevents or extends the time to sorption site saturation and subsequent desorption of CVOCs over time. If desorption of CVOCs from activated carbon does occur, those CVOCs can be sorbed to nearby non-mobile activated carbon with the target area.

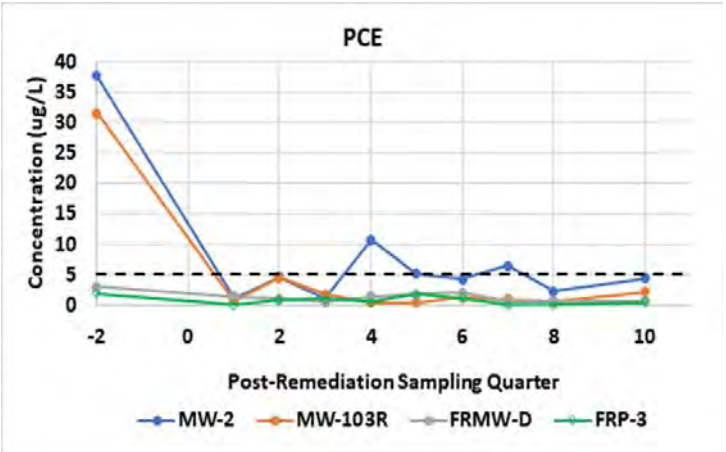


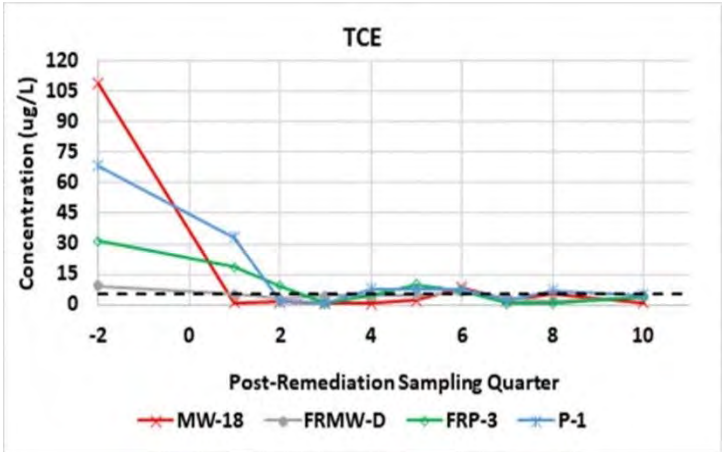
BOS 100® features reactive iron cooked onto the surface of activated carbon. CVOCs adsorb to the activated carbon and subsequently are dechlorinated abiotically by the iron. The dechlorination reactions destroy the CVOCs creating new sorption sites to remove additional CVOCs from groundwater.

Non-BOS 100® injectable activated carbon alternatives use separate activated carbon and reactive iron reagents. CVOCs either adsorb to activated carbon or react with ZVI. Sorbed CVOCs remail on the activated carbon until they are desorbed by competing organic molecules or through equilibrium with the aqueous phase. If ZVI is remaining near the activated carbon, those CVOCs may be abiotically dechlorinated.

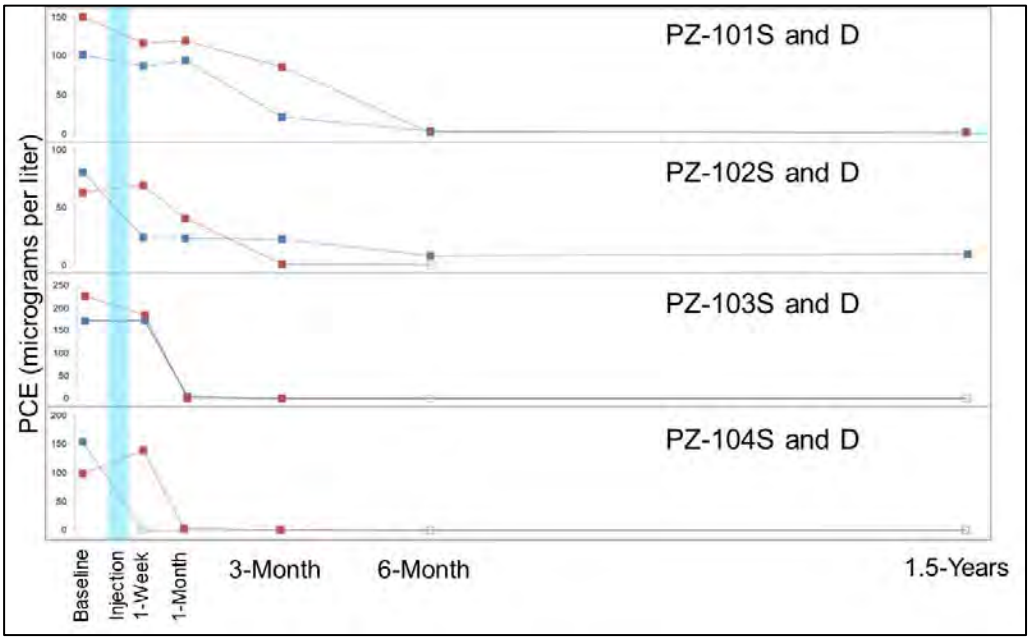
- The approach is effective for treating site contaminants in the range of detected concentrations at the site and can effectively treat low concentrations of CVOCs. The graphics below show CVOC concentrations in groundwater downgradient from BOS 100® barriers at two different sites. Reductions in CVOC concentrations in groundwater are rapid and maintained downgradient of the barrier.

Site 1 – New Jersey BOS 100® PRB





Site 2 – North Carolina BOS 100® PRB



- BOS 100® applications can be designed to ensure extended active lifetime. Therefore, there is often no need for additional injections than could be expected with other in-situ carbon amendments. Upgradient CVOCs in groundwater flowing through target treatment areas will continue to be removed and dechlorinated over many years.
- BOS 100® amendment is not sensitive to groundwater conditions (pH, oxidation-reduction potential, dissolved oxygen), in contrast with many enhanced reductive dechlorination amendments (carbon substrate electron donors, ZVI). Adsorption reactions of activated carbon for removing CVOCs from groundwater are not changed by oxidizing or reducing environments.
- BOS 100® Trap & Treat® processes have provided long-term CVOC plume management in numerous PRB applications and hot-spot targeted applications.

3.2 Remedial Design Characterization

ISOTEC recommends that a remedial design characterization (RDC) be performed prior to field implementation. The RDC is a crucial step towards developing and implementing a cost effective and successful injection project. The goal of the RDC is to develop a robust set of data that will be used to supplement and update the existing site data to:

-Determine the mass of contamination in the soil and groundwater as a function of depth and location in order to refine the preliminary injection design; and

-Determine the appropriate means of accessing the impacted area and applicable installation techniques required for future in-situ treatment.

In order to better quantify the total mass present at the site, the collection of soil samples from minimum 10-20 boring locations is recommended. There is not much soil data available for this site except for the vadose zone source area that was recently sampled. There are no saturated soil samples from the two proposed impacted areas designated for treatment, or in between the areas. In addition to the soil samples, groundwater samples should be collected (if possible) prior to abandonment of the completed boreholes. MW-C04 was recently sampled in 2020 but much of the remaining data is old and in the case of the off-site target area, were collected from temporary well points in 2012 and 2013. The remedial design characterization will extend to ~25 ft bgs (or depth of refusal which is currently assumed to be ~22 ft bgs). The scope of work associated with the characterization effort is as follows. For the purpose of this proposal, it is assumed that sample collection and shipment to RPI's laboratory will be performed by ISOTEC, or others.

Soil Sampling

--Minimum 10-20 soil borings (where site access allows) to 22-25 ft bgs will be advanced using dual tube direct push drilling. Additional borings should be advanced and samples collected if time allows. Soils will be analyzed every 2 feet starting at 12 feet bgs and from discrete intervals identified to be visibly stained or with elevated PID readings.

Groundwater Sampling

-At each of the soil boring locations, groundwater samples will be collected from temporary wells installed in the same borehole.

-The existing monitoring wells in the area of will be developed/purged and sampled.

In order to reduce the cost of the total project remediation effort, the RDC samples can be analyzed by the Remediation Products, Inc. (RPI) Group Project Support Laboratory in Golden, Colorado for volatile organic compounds (VOCs) using Method 8260B. The groundwater samples will also be sampled for Anions using Method 300.1 Ion Chromatography. The laboratory analysis is for remedial design use only and is not for regulatory compliance. **The analytical services performed by RPI Group are provided at no cost to the client.**

It will require multiple days to collect the soil and groundwater samples. The results of this characterization will be used to refine and finalize the BOS 100® loadings throughout the impacted areas. Historically, preliminary remedial designs have been reduced in overall scale both laterally and vertically by implementing an RDC. The final design loadings will vary with depth and location based on the distribution of contaminants' mass. Soil and groundwater analysis and subsequent laboratory result evaluation will require approximately 3-4 weeks to complete before implementing a Final Injection Design. The Proposed RDC sampling is intended to supplement the existing data and refine the Preliminary Design.

RDC will provide high resolution evaluation of COC locations both vertically and horizontally, which allows ISOTEC to have more spatial certainty for remediation targeting. Therefore, ISOTEC can better predict quantities of reagent and level of effort needed to achieve goals, which enables us to provide significantly tighter cost proposals. If requested, ISOTEC can supply estimated costs for the RDC which will include a drilling subcontractor and ISOTEC personnel on site for a few days to collect the samples.

4.0 TREATMENT PLAN

4.1 Site Access and Usage for Remediation

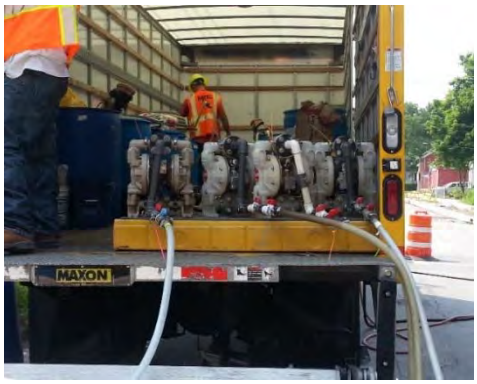
The scope of work calls for excavation of source area soils (to be completed by others) followed by placement of a suitable remedial substrate to be applied to the bottom of the excavation pit to aid in the remediation of residual groundwater contamination; and injection of colloidal activated carbon (or equivalent products) in two hot-spot areas of the site with overburden groundwater concentrations greater than 500 ppb. A detailed utility mark out will be performed (by others) in all proposed work areas prior to any excavating or drilling occurring at the site.

Based on review of the site settings, proposed treatment areas reside within an active DPW parking lot (source area excavation limits and on-site impacted overburden groundwater area) and also within a sensitive residential setting located off of Manning Circle (off-site impacted overburden groundwater area). Utmost care will be taken to minimize all impacts to the surrounding community and sensitive areas and ISOTEC will work with EA/NYSDEC to set up staging areas for trailers and injection equipment, personnel, and chemical deliveries. EA/NYSDEC will secure any required traffic control measures and access agreements to perform work in the designated areas and allow adequate room for storage of ISOTEC equipment and reagents during field activities. There are multiple fire hydrants located near the respective treatment areas and ISOTEC is assuming that access to the hydrants will be allowed for a continued water source during the proposed field work. While working in the DPW yard areas, water can also be obtained from the active building if allowed. Any costs or permitting required for access to water will obtained by EA/NYSDEC.

Because the actual off-site area is not clearly defined in the RFP documents and access for equipment and personnel is not understood, the actual staging areas to be utilized during field implementation are unknown. As such, any costs and scope of work required for site restoration are not included in this proposal and are assumed to be completed by others. ISOTEC will take steps to minimize any disturbance to grassy or landscaped areas in the active work zones to mitigate the extent of restoration efforts (if required) following the injections in this area.

Amendment Staging and Injection Set-Up. All amendments will be purchased by ISOTEC. Delivered amendments will be stored in a secure on-site staging area agreed upon by ISOTEC and EA/NYSDEC. BOS 100® solutions will be batched within ISOTEC's mobile trailer.

The trailer and associated crew will focus on injecting into one target area at a time and will re-locate the trailer to the next area when treatment in the first area is complete. At the end of each injection day, ISOTEC will roll-up all hoses and put the equipment away. ISOTEC has completed numerous projects in a similar manner where all equipment had to be kept inside the box truck/trailer, and all supplies had to be removed from the site/street at the end of the workday (Photograph to the right is from a project where ISCO was injected into 4 wells simultaneously within the street in a residential neighborhood where no residual supplies could be left at the end of the workday).



Temporary staging areas will be finalized on-site in discussion with all project related stakeholders. Ideally, the staging areas will be located near to each respective target area, but materials and equipment may be located in a box truck to maximize mobility and minimize site disruption. It is anticipated that the staging areas may need to be moved around from time to time within each area due to the extensive aerial size of the proposed target areas. To minimize the number of staging areas required, ISOTEC is assuming that injections into the source area excavation pit and on-site groundwater area will occur from the same setup area. Temporary perimeter boundaries will be established around active injection areas using a combination of delineators, caution tape/rope, cones, or temporary snow fencing. ISOTEC will supply hose ramps if needed if the injection lines need to be run across active roadways.

4.2 Source Area Excavation & Reagent Placement

The proposed plan for the impacted source area soils is for a targeted excavation of an ~600 ft^2 area. The impacted soils will be removed from the site. Excavation work and transportation and disposal of impacted soils is to be performed by others. Upon completion of the excavation down to the target depth, the ROD calls for placement of a remedial substrate (colloidal activated carbon, or equivalent) to be applied to the open pit area to aid in the remediation of residual groundwater contamination.

The extent of the proposed excavation area surrounds recently collected (July and November 2020) PDI soil boring locations SB-01, SB-05, SB-06, SB-07 and SB-08. Soil impacts in this area were recently detected as high as 18-45 mg/kg for PCE from location PDI-SB-01 at a depth between 7-8 ft below bgs. Review of the boring log from this location, as well as other nearby locations indicated that the soils were wet at depths between 7-9 ft bgs. Based on the elevated PCE concentrations noted between 7-8 ft bgs and the boring logs noting wet soils between 7-9 ft bgs in the area, the depth for excavation was determined at 8 ft bgs and appears to assume that the water table was also in this vertical interval.

The nearest monitoring well location in this area is MW-C03. Depth to water (DTW) readings from this well in 2011 and 2012 (there are no recent samples collected from this well location) indicate the top of the water table is approximately 14.8-14.9 ft bgs. It may be possible that site conditions related to depth to groundwater in this area have changed since MW-C03 was last sampled in 2012 but based on the historical DTW measurements noted, the bottom of the proposed excavation limit of 8 ft bgs would sit approximately 5-6 above the water table in this area.

Placing an amendment in the bottom of the excavation prior to backfilling has been applied at sites as a remediation practice for some time now. Typically, in these situations however, the excavation is completed down to the approximate water table/smear zone where introduced amendments can potentially interact and treat residual impacts that were not addressed during the excavation and removal of site soils. This approach is usually applied at petroleum based contamination sites where lighter impacted contaminants reside at the smear zone and shallow groundwater depths. When applied, the amendments are usually sprayed or dumped into the excavation pit and slowly mixed in with the excavator bucket (or other tooling) to maximize contact with residual remaining impacts and introduced reagents. At this site however, the contaminants are heavier CVOC compounds and the depth of the proposed excavation will not extend down to the inferred depth to water as intended, and specified in the RFP.

The proposed reagent is typically applied to saturated zone aquifers where groundwater provides a medium of transport for dissolved impacts to contact the injected/placed BOS 100® amendments. As discussed above, it appears that the placement of reagent at this site will be in the vadose zone soils above the water table. There is evidence that injection of BOS products completed in the vadose zone can act as a protective barrier for infiltration of additional contamination from shallow horizons that may eventually migrate down to the underlying groundwater, and any residual vapors remaining in the impacted vadose zone can be readily absorbed by activated carbon. Water infiltration can provide another transport mechanism (assumed to be a much slower process than if you have natural groundwater movement). If the distribution of the BOS 100® applied to the bottom of the pit is spread out and covers the extent of the hole, there is still potential added benefits related to adsorption of any residual vapors and barrier protection to the underlying groundwater if contamination from adjacent areas eventually migrates downward at the site through the placed amendment.

There are a few options for this area to be considered based on the above discussion.

- An alternative to ensure the placement of BOS 100® is applied at the smear would be to extend the excavation limits down to the water table depth noted at the site during fieldwork. Based on available information from MW-C03, the DTW in this area is ~14.8-14.9 ft bgs. This approach would incur additional soil mass to be excavated along with increased transportation and disposal costs.
- Continue with the proposed scope of work as intended and place BOS 100® amendments at the bottom of the pit to be blended in with the excavator bucket. Potential benefits would be absorption of any remaining vapors in the area by the activated carbon and also a long term barrier to prevent downward future migration of contamination from shallower horizons. It is being assumed that ~400 lbs. of BOS 100® will be applied to the open pit area over 1 day.

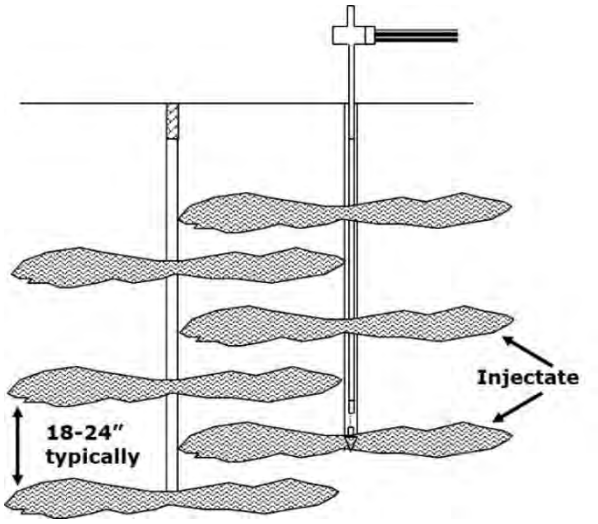
- If after further review of site data, EA/NYSDEC deems the proposed remedy in this area to be a non-effective treatment option due to the significant difference in the actual DTW from where the bottom of the excavation is planned, remove this portion of the scope of work and allow the excavation of impacted soils in the source area to be the complete remedy for this area. Although MW-C03 is located in the suspected source area, PCE groundwater data collected from this well in 2012 was only 53 ppb, which is well below the concentration of 500 ppb being addressed by the overburden groundwater remedy in the 2 target areas.

If the placement of BOS 100® is performed, it is being assumed that it will occur during the same mobilization as the groundwater injections. The mixing trailer will be positioned so that extended hose runs can reach both the excavation area as well as the on-site groundwater treatment area. Different batching/dosing will be applied to the two different areas so there will be some down time associated with cleaning out the mixing tanks before moving to the next area. ISOTEC will spray the prepared BOS 100® batches to the excavation pit. Others will be responsible for mixing the product with the backfill material once applied into the hole.

4.3 Overburden Groundwater Injection Approach

BOS 100® is injected under pressure as a slurry amendment. Pressurized injections allow for distribution of slurry reagents into the subsurface and to establish desired radius of influence to establish overlapping reactive zones within the treatment areas. Injection points within the target areas will be located on a closely spaced grid using 7.5-foot spacing.

Injection points will be installed using direct-push point technology. A top-down approach will be utilized for the BOS 100® slurry injections, with the shallow discrete interval at each location completed first. Subsequent injections within the same direct push point will follow every two-foot interval until all the proposed injection intervals within a given location are completed. Injections are delivered as a discrete interval with two-feet between each vertical interval at each point, with adjacent points having injection intervals off-set by one foot. As shown in the image to the right this top-down injection strategy is aimed at applying the amendment uniformly, throughout the entire impacted vertical interval.



ISOTEC will connect to each point via a dedicated injection point head, which will consist of an influent injection port, ball valves, quick disconnect cam fittings and a pressure gauge. Approximately 15-30 gallons of fluid applied in each discrete interval.

All temporary DPT injection points will be abandoned the same day injection activities have been completed by filling with bentonite chips and hydrating with water.

Treatment areas design details are provided in **Table 2** including both conforming and recommended dosing rates.

Table 2: Treatment Design Summary

AOC	Size (ft^2)	Interval (ft bgs)	Spacing (ft)	BOS 100® Points	Injection Days	BOS 100® (lbs.) Recommended
On-Site Area	1,400	13-22	7.5	25	4	1,300
Off-Site Area	3,000	13-19	7.5	54	6	1,900
Total	4,400			79	10	3,200

4.4 Waste Management

ISOTEC will minimize generation of decontamination waste and maximize recycling of materials. Using direct-push injection point technique, no soil is generated that will require off-site disposal. The only wastewater anticipated to be generated during proposed field work will be from decontamination of injection tooling at the end of the project. ISOTEC will containerize any decontamination water generated for future off-site disposal by EA/NYSDEC.

Wastes generated during proposed work will primarily be containers/packaging for delivery of remedial amendments. This can be disposed of as municipal waste and will be disposed appropriately as needed or at the end of the treatment program.

4.4.1 Site Restoration

Site restoration work will include removal of all site related trash following completion of the injection program (or on a daily basis as needed) and abandonment of each borehole using hydrated bentonite to the surface. ISOTEC will coordinate with EA for surface restoration for each injection point based on the area (e.g., asphalt cold patch, topsoil, grass seed). Any additional restoration related to work vehicles/drill rigs disturbing portions of the site will be the responsibility of EA/NYSDEC (if required). To the extent possible ISOTEC will minimize disturbing existing conditions at the site.

4.4.2 Performance Monitoring

Baseline, interim and post-treatment performance monitoring is assumed to be performed by EA/NYSDEC.

ISOTEC can offer additional laboratory analyses at no cost for performance evaluation through the RPI Group laboratory in Colorado (RPI is the manufacturer of BOS 100®). In addition to CVOCs, analyses will include ethane/ethene and chloride (breakdown products of CVOC). This value-added service has been used on numerous ISOTEC injection programs to provide a more thorough evaluation of remediation effectiveness.

5.0 PROJECT COORDINATION

The ISOTEC team will provide comprehensive support and services to complete the scope of work.

ISOTEC's Senior Project Manager Mike Temple and Technical Director Prasad Kakarla, P.E. will be the primary points of contact with EA and will provide office support and will directly oversee all ISOTEC field staff and subcontractors. Additional support will be provided by Senior Remediation Engineer Paul Dombrowski, P.E., who has direct experience designing and/or implementing a broad range of in-situ groundwater technologies including numerous BOS 100® and permeable reactive barrier projects.

The only subcontractor to be used on the project under the supervision of ISOTEC will be a New York licensed Direct Push Technology (DPT) drilling contractor. EA/NYSDEC will procure a separate crew for the excavation work and for a detailed utility mark out in the proposed injection areas.

ISOTEC (or ISOTEC's subcontracted driller) will contact Safe Dig New York prior to on-site drilling activities.

ISOTEC anticipates working during normal business hours from 7:00 AM to 5:00 PM, Monday through Friday. ISOTEC will conduct the injections using our specialized injection system trailer supported by a 4-5 person injection crew (including the driller).

ISOTEC will interface directly with EA/NYSDEC regarding schedules, mobilization, on-site health and safety, injection progress reporting, and overall technical strategy. Due to the sensitive site setting in a residential neighborhood, communication between ISOTEC, EA/NYSDEC and neighborhood property owners will be maintained to minimize disruption to neighborhood activities and traffic patterns.

5.1 Project Reporting

ISOTEC will record all field notes including names of all on-site personnel, hours worked, equipment used, well construction logs, boring logs, injection point ID, injection start time, injection stop time, volume, flow rate, well head pressures, any health and safety instances/meetings, deliveries that occurred, groundwater sampling activities performed, meetings attended, and any other pertinent information during each day of injections. All details will be presented in the Daily Reports submitted electronically to EA the following day. Following completion of all proposed field work a summary report will be submitted detailing all field related activities, summary of injection totals, summary of chemical shipments delivered to the site and any other pertinent information related to the injection program.

6.0 HEALTH AND SAFETY

Health and safety for ISOTEC employees, our subcontractors, site workers, and the public are a top priority to ISOTEC. ISOTEC processes are some of the safest treatment processes due to the use of stabilized reagents injected in a controlled manner to reduce the possibility of any hazard occurring. **ISOTEC has not had a significant health and safety incident in over 26 years of field application.** The injection and amendment handling processes have been designed with health and safety as a prime consideration. All members of the ISOTEC team have completed health and safety training consistent

with the Occupational Safety and Health Act (Title 29 of the Code of Federal Regulations 1910.120) with current certificates. All employees receive an annual physical, drug screening and 8-hour safety refresher course. Site supervisors complete an additional eight hours of OSHA training. The site supervisor has completed an additional eight hours of OSHA supervisor training. As with any activity, by applying safety measures, plus understanding how a process works, limits the potential for unwanted incidents to occur.

A site-specific HASP will be prepared and submitted prior to field mobilization. A detailed Activity Hazard Analysis (AHA) for major activities will be prepared to identify any potential hazards related to field implementation activities. All ISOTEC Team staff (ISOTEC and team subcontractors) will operate under this single site-specific HASP. **All ISOTEC Team staff (ISOTEC and team subcontractors) will have stop-work authority to correct or modify site operations**. The site-specific HASP and/or JHAs will be modified due to changing conditions or field modifications to improve safety.

ISOTEC will designate an on-site health and safety officer (HSO) who will be responsible for ensuring that all on-site personnel (ISOTEC, ISOTEC team subcontractors, oversight, visitors, etc.) operate according to safety policies and regulations as detailed in the HASP and task AHA. Daily health and safety tailgate meetings will be conducted by the ISOTEC HSO prior to starting each day's field activities to discuss AHA, potential hazards, and identify any new hazards that were encountered during previous day's activities. Part of the ISOTEC HSO's role will be to assess inventory of PPE, safety supplies, first aid kits, and other safety materials as part of daily activities; ISOTEC staff would bring new supplies to the site the following day, as needed.

6.1 Novel Coronavirus (Covid-19)

COVID-19 is a new respiratory disease, caused by a virus (novel coronavirus) that has not previously been encountered in humans. Reported illnesses have ranged from mild symptoms to severe illness and death for confirmed COVID-19 cases. Primary symptoms of this infection may appear 2-14 days after exposure and include fever, cough, and shortness of breath, and in severe cases, pneumonia (fluid in the lungs). ISOTEC has created operating procedures for implementing site remediation activities related to COVID-19, including an ISOTEC Coronavirus Action Plan. The ISOTEC COVID-19 procedures have been revised multiple times as additional information has become available. ISOTEC, in coordination with EA, will verify that all work is completed in accordance with all federal, state, and local guidelines and using safe work practices for the health of site workers and the general public.

7.0 LIST OF ASSUMPTIONS AND EXCEPTIONS

Besides the technical design assumptions stated above, the following items are excluded from the proposed costs, which are assumed to be the responsibility of EA or client.

- Site access, traffic control, injection permits, water supply, any required pre-clearing, and private utility mark out.
- Baseline and post-treatment performance monitoring and analysis.
- Secure staging area(s) for ISOTEC reagents and equipment.

- Disposal of any IDW.
- Regarding site restoration, ISOTEC's proposed scope of work includes backfilling each injection borehole to ~4-inches below grade with bentonite and finishing the top 4 inches with an asphalt patch, concrete patch or similar to match the surrounding ground surface. Any additional site restoration work, if required, is assumed to be completed by EA.

8.0 PROJECT COSTS

Item (description)	Quantity	Unit	Unit Cost	Cost
Injection and Placement of BOS 100® • Mobilization/demobilization of staff, equipment, and materials to the site to perform the work. • Procurement and delivery of BOS 100® reagents (3,600 lbs. total for all 3 areas) into the excavation source pit area and two overburden groundwater target areas (see **Table 2** for details) • NY State licensed driller with direct-push drill rig. • Field Implementation – includes site supervisor and 2 technicians and field injection. • Estimated 10-11 days of injections (plus one mobilization day) • Project Management, Health and Safety Plan, and Daily Reporting. • Box truck for storage of reagents and equipment. • Temporary bathroom rental.	**1**	**LS**	**$161,640**	**$161,640**
Additional Injection Days • If additional injections days are required to inject proposed amendments and/or volumes they will be billed for ~$8,950/day (as needed), which includes ISOTEC personnel, equipment, drill rig/operator.		**Day**	**$8,950**	

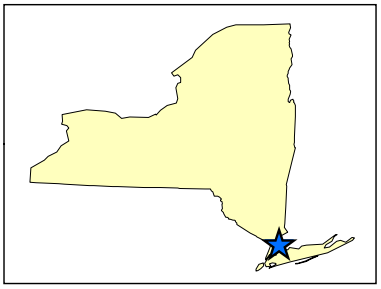
8.1 Standard Terms and Conditions

1. The above quote is not a guaranteed price to clean up the contamination noted at the referenced site. The number of ISOTEC treatments will be dependent on the amount of contamination and site geology. The higher the concentration of contamination and the tighter the geology, the greater the number of necessary treatments.
2. Treatment program reagent volumes and concentrations presented within this proposal are based on information provided by the consultant.
3. Scheduling is based on a first come first serve basis, with an authorized proposal (or subcontract) being the primary basis for scheduling, followed by payment history. ISOTEC will not schedule fieldwork without an authorized proposal (or subcontract), or outstanding receivables over 30 days.

4. Work to be performed in modified Level D personal protective equipment (PPE). Higher-level PPE requires a change order for additional costs associated with such.
5. Regulatory approval will be the responsibility of Client.
6. Site monitoring and pre- and post-treatment sampling will be the responsibility of Client.
7. Cancellation of a scheduled treatment program within 3 weeks of authorized program start will be subject to a $10,000 cancellation fee.
8. ISOTEC will require adequate and secure staging areas for chemical preparation and storage.
9. Traffic control, if required will be the responsibility of Client.
10. Access to an available nearby water source and any associated costs will be the responsibility of the client.
11. Work performed will be completed during regular business hours (Monday through Friday) between 8 AM and 5 PM. Alternative scheduling will require a change order.
12. Disposal of hazardous wastes and/or reagents collected will be handled by the client. The potential for reagent channeling along utility corridors and other preferential pathways exists with any injection program. ISOTEC is not responsible for seepage or surfacing of reagents and/or hazardous materials into any utility corridor, subsurface collection system or other preferential pathway, nor any costs associated with collection and disposal of such.
13. An initial invoice for reagent procurement will be issued upon approval and authorization of this proposal. Payment terms for this initial invoice is net 30 days. Remaining balance invoices will be submitted monthly proportional to the amount of work performed. Payment terms are net 30 days (unless other terms and conditions apply), 1.5% interest per month will be added to any outstanding balances that exceed 60 days. Price quotations are valid for 90 days. Any legal or other costs incurred in collecting delinquent amounts shall be incurred by the Client.
14. Information included within this proposal is to be considered confidential and for Client use only without written authorization by ISOTEC.
15. Without the prior consent of ISOTEC, Client and any affiliated or related companies will not for a period of 2 years from the date of this proposal and/or signed contract, directly or indirectly solicit for employment or engage as a consultant any person who is now employed by ISOTEC.

FIGURES

G:\Projects\State&Local\NYSDEC - D009806\Work Assignments\16025111 Crystal Cleaners RD\06 GIS\01 MXD\Design\Figure1 SiteLocation.mxd



0 50 100 150 200
Feet

N

Legend

- Crystal Cleaners Property Boundary
- Proposed Excavation Area
- Overburden Groundwater Remedial Area

Figure 1
SITE LAYOUT AND AREAS OF CONCERN
Crystal Cleaners
Pelham, New York

Map Date: 12/7/2020
Projection:
NAD_1983_StatePlane_New_York_East_FIPS_3101_Feet

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

APPENDIX A
ISOTEC CASE STUDIES

EISD Treatment Program: PRBs to Treat PCE and CVOCs Plumes

Site

- Former Manufacturing Facility Site, New Jersey

Contaminants of Concern

- CVOCs primarily PCE and TCE.
- Large dilute plumes with PCE and TCE concentrations ranging from 2 to 120 µg/l.

Geology/ Hydrology

- Low pH groundwater regionally
- Site geology was mostly overburden sand in deep target treatment area identified as plating & solvent handling area.
- Differential layers of constituent clay, silt, and fine sand was seen in treatment area identified as firing range area.

EISD BOS 100® Treatment Program

- Multiple permeable reactive barriers (PRB) were constructed across the treatment area for effective CVOC plume reduction.
- An approach involving the pressurized injection of slurry amendments was implemented to create close grid overlapping barriers
- 6 PRBs with a total length of 750 feet were installed in the two areas.
- A total of 228 temporary DPT injection points were utilized to inject ~ 124,740 gallons of BOS 100® amendments in two major treatment areas over the course of the injection event.
- Following the construction of reactive barriers in the two treatment areas, most performance monitoring wells were reduced to low criteria for PCE and TCE

IN-SITU OXIDATIVE TECHNOLOGIES, INC.
WWW.ISOTEC-INC.COM

ISOTEC Case Study No. 93

EISD Treatment Program: Impacted Groundwater Treatment Utilizing BOS 100® PRBs

Former Manufacturing Facility Site
New Jersey

INTRODUCTION

ISOTEC was retained to implement an enhanced in-situ dechlorination (EISD) treatment program at a former manufacturing site located in New Jersey to address impacted soil and groundwater. Treatment was performed in two separate plume areas of concern: plating and solvent handling area (3.5 acres) and a firing range area (0.7 acres). Primary contaminants of concern at the site include chlorinated volatile organic compounds (CVOCs), primarily tetrachloroethene (PCE) and trichloroethene (TCE). ISOTEC developed a remedial approach for treatment of a large plume in a permeable, low-pH aquifer with a goal of attaining low drinking water criteria. The EISD remedial approach chosen for the site, BOS 100™ Trap & Treat, consisted of injecting a slurry of activated carbon impregnated with reactive iron metal, bacterial culture, and carbon substrate. BOS 100® was selected to remediate groundwater through multiple processes (adsorption to activated carbon, abiotic dechlorination). A series of permeable reactive barriers (PRBs) were placed selectively in the large dilute plumes and oriented perpendicular to groundwater flow to capture and treat CVOCs for site-wide plume reduction.

SITE BACKGROUND/GEOLOGY

Baseline concentrations of CVOCs measured prior to injection in groundwater from monitoring wells on site ranged from less than 10 to 120 micrograms per liter (µg/l). The property is an unoccupied open area with some portions currently in use for

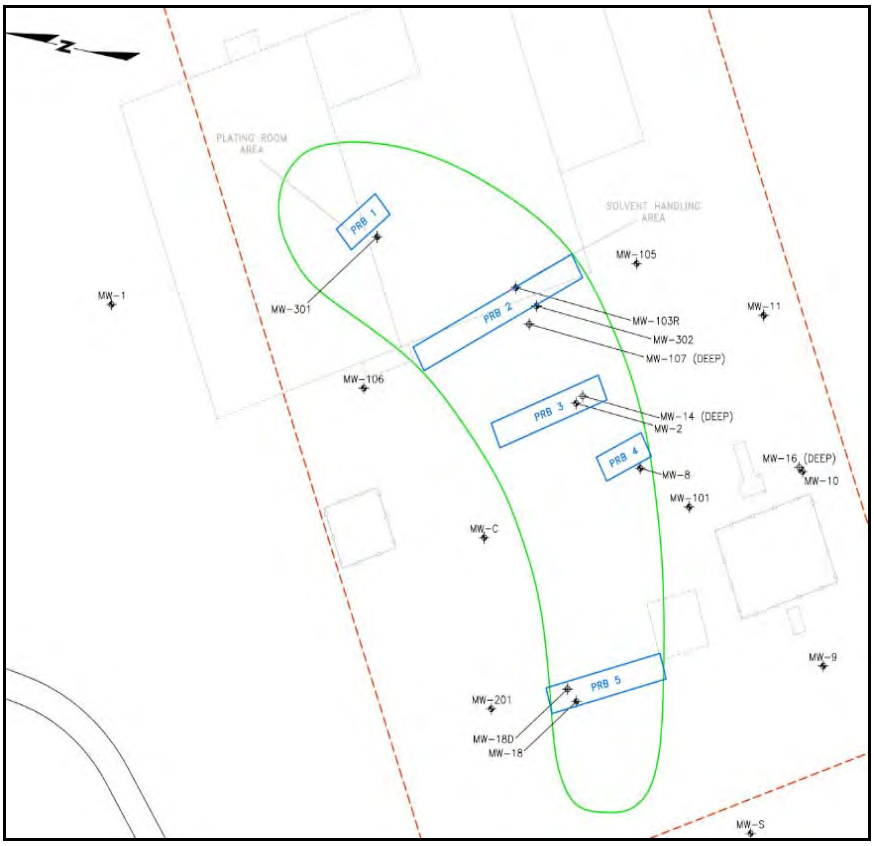
agricultural purposes, with future use proposed as residential development. Depth to groundwater ranged from 12 to 18 feet below ground surface (bgs), and site soils consists of sand in the plating and solvent handling areas. The plume thickness varied at different injection locations, and vertical target treatment zone ranged from 12 to 55 feet bgs. The soil in firing range area is heterogeneous with clay, silts, and fine sands encountered at differential depth intervals. Depth to groundwater was at ~18 bgs and the target treatment layer thickness was approximately 25 to 27 feet bgs.

ENHANCED IN-SITU DECHLORINATION TREATMENT PROGRAM AND IMPLEMEMENTATION

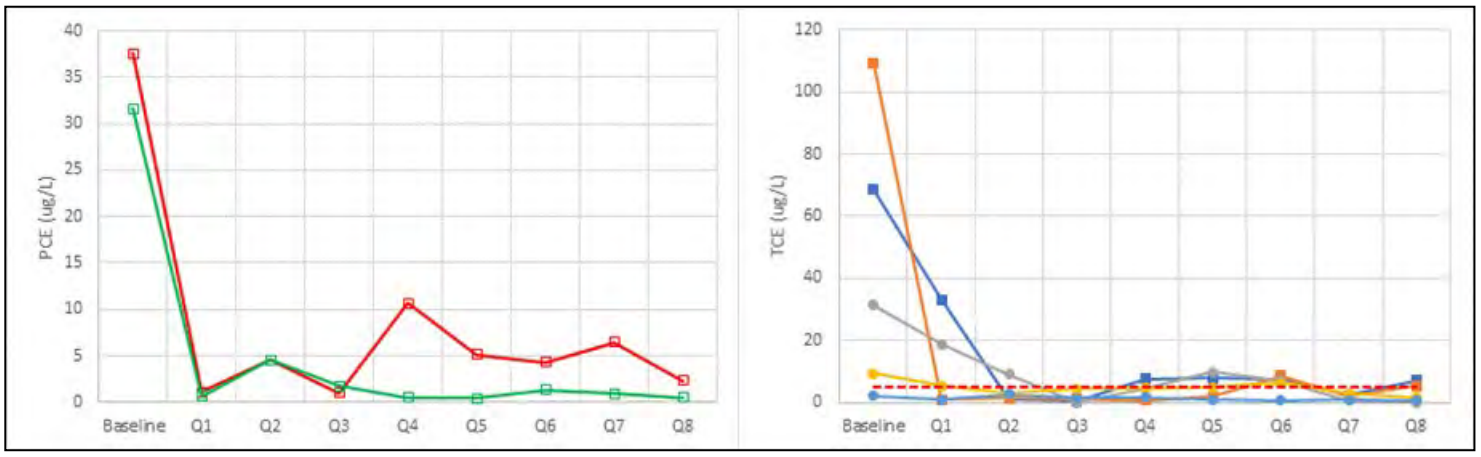
The full-scale treatment program was performed in two areas of concern over a 30-days event from November to December 2017. A total of 111,780 gallons (~31,527 lbs.) of BOS 100® were injected in plating & solvent handling area into 180 injection points to create five PRBs across an estimated area of 17,700 square feet. A total of 12,960 gallons (~3,618 lbs.) of BOS 100® were injected in fire ranging area into 48 injection wells to create a PRB across an estimated area of 2,400 square feet. The constructed reactive barriers have an extended treatment longevity for continued treatment of low concentration residual CVOCs in groundwater through sorption to activated carbon and abiotic and biotic dechlorination. Pressurized injection approach was implemented to distribute slurry reagents into the subsurface and to produce the desired radius of influence to develop overlapping reactive zones within the barriers. All injection points were temporary points installed using direct-push point technology.

CURRENT PROJECT STATUS

The overall objective was to treat CVOCs plume area and accelerate in achieving New Jersey Groundwater Quality Standards in the performance monitoring wells across the site. Groundwater samples collected at three, six, nine and twelve months after injection indicate a significant decrease in PCE and TCE concentrations compared to pre-injection period. Concentrations downgradient of treatment areas were below site cleanup levels for most of the groundwater monitoring wells with other wells downgradient of the PRBs typically showing downward trending results.



Permeable Reactive Barriers (PRBs) in plating and solvent handling area located to capture directional groundwater flow



EISD Treatment Program: PRBs to Treat PCE and CVOCs Plumes

Site

- Active Warehouse Facility, Massachusetts

Contaminants of Concern

- PCE (2,200 – 12,000 µg/L)

Geology/ Hydrology

- Low permeability silt and till

BOS 100® Treatment Program

- Grid treatment with 175 injection points
- Injections performed inside and outside active warehouse and coordinated to not disrupt operations
- Significant decrease in PCE concentrations recorded in samples collected after injection with 88 to greater than 99 percent reduction.

IN-SITU OXIDATIVE TECHNOLOGIES, INC.
WWW.INSITUOXIDATION.COM

ISOTEC Case Study No. 92

INJECTABLE ACTIVATED CARBON: PCE SOURCE AREA TREATMENT UTILIZING BOS 100® TECHNOLOGY

Active Warehouse Facility
Massachusetts

INTRODUCTION

ISOTEC was retained to implement groundwater remediation at an active warehouse and distribution facility utilizing BOS 100® injectable activated carbon, which consists of a slurry based activated carbon impregnated with reactive iron metal. The objective of the remediation program was source area mass reduction of tetrachloroethene (PCE) and downgradient residual PCE concentrations. The groundwater remediation was performed as part of a combined remedy program that also included soil vapor extraction.

ISOTEC supported the consultant in performing a comparative evaluation of different in-situ remediation approaches, including chemical oxidation, enhanced bioremediation, and injectable activated carbon. BOS 100® was selected based on site objectives, cost, and other site-specific factors.

SITE BACKGROUND/GEOLOGY

Past manufacturing operations at the site resulted in soil and groundwater impacts with chlorinated volatile organic compounds (CVOCs). PCE concentrations had been detected as high as 47,000 µg/L historically. Injection baseline concentrations of PCE measured in groundwater monitoring wells within the treatment area ranged from 2,200 to 12,000 µg/L. Site soils consist of dense, low permeability silt and till. Depth to groundwater is approximately 8 feet below ground surface (bgs), and the injections targeted impacted soils above an aquitard at approximately 20 feet bgs.

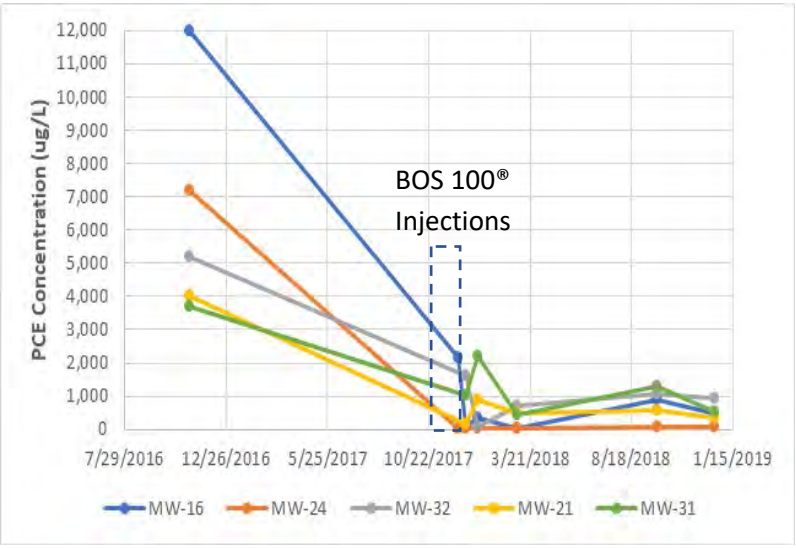
IN-SITU TREATMENT PROGRAM

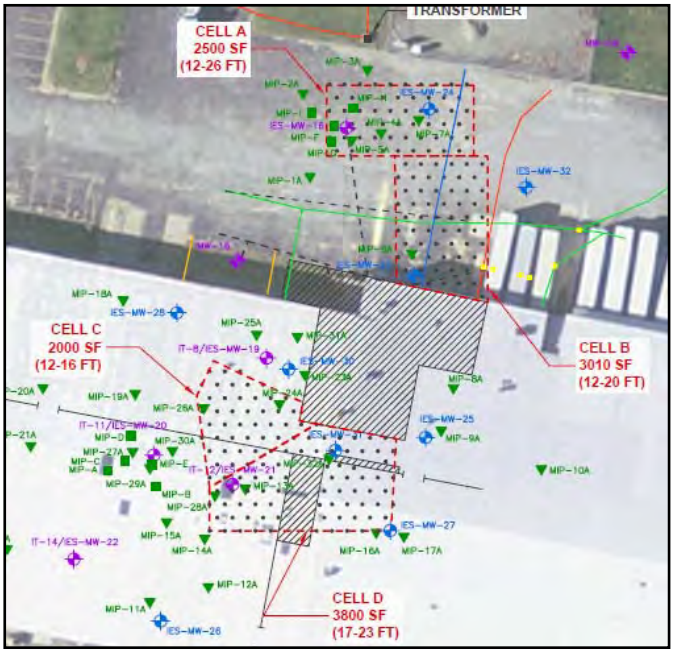
The groundwater treatment program was implemented both inside and outside an active warehouse facility over 19 injection days. ISOTEC injected BOS 100® into 90 locations outside the building

and 106 locations inside the building; with injection points divided into four subareas. All injection points were temporary points installed using direct-push point technology. ISOTEC subcontracted a concrete coring firm to efficiently core through the concrete slab for the inside points. Injection operations and sequencing was coordinated around minimizing disturbance of warehouse operations and maintaining active forklift lanes through the treatment area. A total of 16,900 pounds of BOS 100® was injected.

CURRENT PROJECT STATUS

The overall objective of remediation was to reduce PCE concentrations in groundwater to less than 1,000 µg/L in the treatment zones. Groundwater samples collected approximately three weeks after injections indicated rapid decrease in PCE concentrations. Quarterly samples collected for 12 months after injection demonstrated PCE in monitoring wells within the injection areas were all below the goal of 1,000 µg/L. Ethene was detected in multiple monitoring wells as a product of reductive dechlorination.





EISBR Pilot Program:

Site

- Denitrification Demonstration Test
  Cape Cod, MA.

Contaminants of Concern

- Nitrate

Geology/ Hydrology

- Site geology consists of mostly medium to coarse sands with gravel and silt lens.
- Depth to water at approximately 35 feet bgs.

Treatment Program

- Denitrification PRB through application of Terra Systems SRS-NR (Slow Release Substrate-Nitrate Removal) EVO and sodium bicarbonate.
- PRB length of 110 feet, consisting of 17 direct-push injection points (7 points in a single row and 10 points in a pair of rows).
- Injection interval from 36 to 68 feet bgs.
- Total solution volume injected was ~11,000 gallons.
- Field monitoring data during the injections indicated negligible change to turbidity and conductivity in downgradient monitoring wells achieving project objective to minimize migration of EVO and establish a robust PRB.

Project Status

- SRS-NR EVO is anticipated to last in the aquifer and support denitrification for 3+ years. Quarterly performance monitoring will be conducted starting in 2017 to evaluate performance including nitrate removal, EVO migration and persistence.

The IN-SITU OXIDATIVE TECHNOLOGIES, INC.
WWW.INSITUOXIDATION.COM

ISOTEC Case Study No. 80

ENHANCED IN-SITU BIOREMEDIATION (EISBR): DENITRIFCIATION PERMEABLE REACTIVE BARRIER UTILIZING EMULSIFIED VEGETABLE OIL

Nitrate Plume Demonstration Test
Cape Cod, Massachusetts

SITE BACKGROUND

ISOTEC was retained to implement a Denitrification Permeable Reactive Barrier (PRB) demonstration test for the treatment of nitrate in groundwater using Emulsified Vegetable Oil (EVO). Septic systems are used to manage nearly 85 percent of the wastewater flow from residences and businesses on Cape Cod. As a result, nitrate emanating from septic systems travels as a plume without significant attenuation in groundwater to coastal waters. The Project represented the first to implement a "Hybrid" approach under the Cape Cod 208 Water Quality Plan, approved by both the USEPA and Massachusetts Department of Environmental Protection, which uses non-traditional technologies including PRBs. Application of EVO introduces a carbon food substrate into the subsurface to enhance activity of naturally occurring denitrifying bacteria.

Site soils consist of sandy formation with high groundwater flow velocities (1 to 2 feet per day). Gravel and clayed silt lenses exist within the subsurface. Groundwater is encountered at approximately 35 feet bgs, with the nitrate plume extending at least to 70 feet bgs.

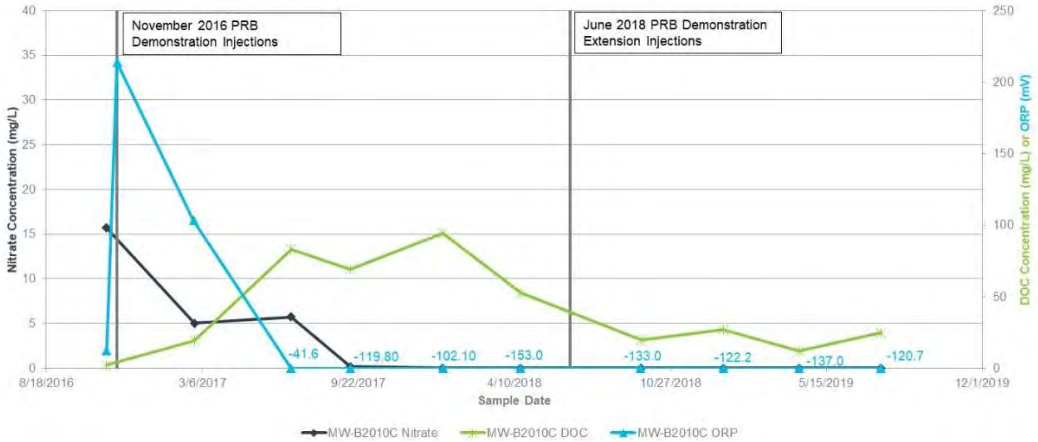
TREATMENT PROGRAM AND IMPLEMEMENTATION

The demonstration test PRB was approximately 110 feet long and consisted of 17 direct push injection points. The vertical injection interval was 36 to 68 feet bgs. This PRB was established utilizing the first ever use of a custom Terra Systems EVO solution formulated specifically for extended longevity in a permeable aquifer with high groundwater flow velocity.

Total volume of EVO injected for the PRB was ~11,000 gallons (approximately 14% effective pore volume), applied at a 4:1 ratio with sodium bicarbonate as pH buffer. Performance monitoring conducted during the injection program indicated negligible changes in turbidity or conductivity in monitoring wells 7 and 10 feet downgradient, which achieved the treatment objective to minimize migration of EVO and to establish a robust PRB.

PROJECT STATUS

PRB performance and longevity is being assessed through a quarterly monitoring program. SRS-NR EVO is anticipated to last in the aquifer and support denitrification for 5+ years. Quarterly performance monitoring to evaluate performance including nitrate removal, EVO migration and persistence has demonstrated the effectiveness to reduce nitrate to low concentrations to significantly reduce the nitrogen mass flux through a PRB for more than 4 years after injection.



ISCO Treatment Program: MGP Related Impacts

Site

- Former Manufacturing Gas Plant, Upstate, NY

Contaminants of Concern

- VOCs/ SVOCs
- PAHs
- TPH-GRO
- TPH-DRO
- NAPL

Geology/Hydrology

- Site geology consists of a very thin coarse gravel and fine sand layer located in between two confining layers of silty clay. Majority of remaining COCs were believed to be present within the thin gravel/sand layer.

ISCO Treatment Program

- MFR and BASP treatments.
- Three treatment events.
- Treatment Area = 4,900 $ft^{2.}$
- Treatment interval 9-18 ft bgs.
- Injection pathway system consisted of 43 permanent well injection locations installed in an active roadway.
- A total of 38,693 gallons of reagents were injected over the course of three events.
- Continuous air/dust monitoring was performed due to the sensitivity of the location.

Results

- MFR and BASP treatments.
- Three treatment events.

IN-SITU OXIDATIVE TECHNOLOGIES, INC.
WWW.INSITUOXIDATION.COM

ISOTEC Case Study No. 83

ISCO Treatment Program: MGP Related Impacts via Modified Fenton's Reagent (MFR) and Base Activated Sodium Persulfate (BASP)

Former Manufacturing Gas Plant
Upstate, New York

INTRODUCTION

ISOTEC was retained to implement an *In-Situ Chemical Oxidation* (ISCO) treatment program within the downgradient residual plume area of a former Manufactured Gas Plant (MGP) site utilizing a combination of modified Fenton's reagent (MFR) and base activated sodium persulfate (BASP) to address impacted soils and groundwater. The oxidants and dosages were selected based on bench scale testing that ISOTEC collaborated on. Target contaminants of concern (COCs) included volatile organic contaminants (VOCs), semi-volatile organic contaminants (SVOCs), poly-aromatic hydrocarbons (PAHs), total petroleum hydrocarbon gasoline range organics (TPH-GRO) and diesel range organics (TPH-DRO) and free-phase NAPL impacts.

SITE BACKGROUND/GEOLOGY

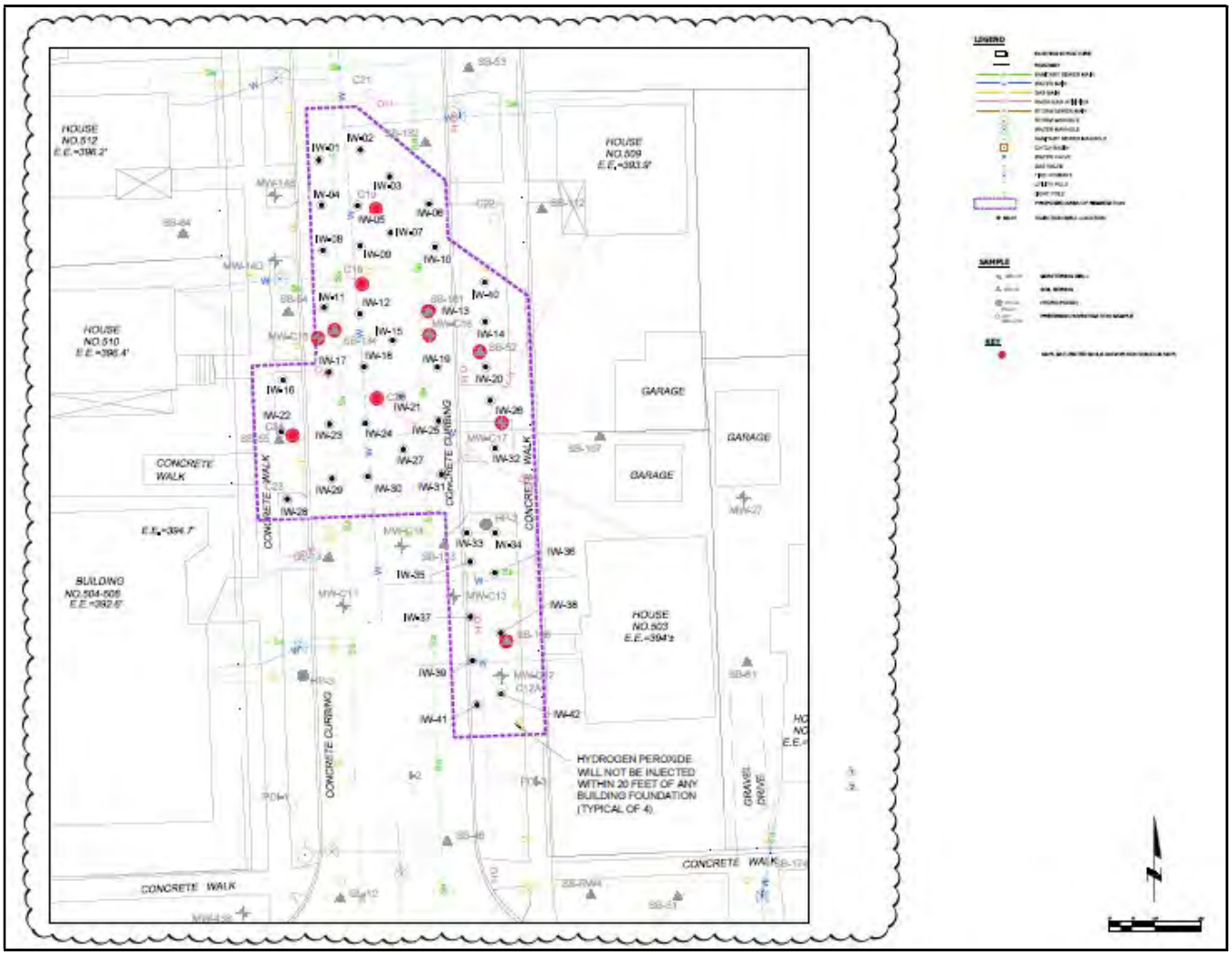
Past MGP operations at the site resulted in soil and groundwater COC impacts. The ISCO target treatment area was located on an neighborhood roadway/ sidewalk lined with residential and commercial properties. Numerous subsurface utilities existed within the target area and each proposed injection point location was initially pre-cleared down to ~5 feet (ft) below ground surface (bgs) to ensure that no lines were damaged during drilling. The treatment area was approximately 4,900 square feet (ft^2) and targeted a very narrow layer (0.5 to 4 feet) of coarse gravel/fine sand located in between two confining layers of silty clay. Injection well screens were selectively placed within the overall 9-18 ft bgs depth interval based on data collected from past soil borings and from new soil borings overseen by ISOTEC during the injection well installation. Selective placement of each well screen allowed for an effective method of delivering injected ISCO reagents where the significant mass of MGP impacts were located and traveling within the narrow coarse gravel/fine sand layer.

ISCO TREATMENT PROGRAM AND IMPLEMEMENTATION

The ISCO treatment program was implemented over three planned injection events lasting 15-20 injection days per event. A total of 43 PVC permanent injection were installed at a spacing of approximately 12 feet. Due to the sensitive site setting located within an active neighborhood roadway and along portions of the adjacent sidewalks, extreme caution and thorough planning of the injection approach was taken into account for the actual field implementation. Through coordination with the City DPW and first responders, daily road closure of the targeted area was implemented during each injection event to minimize contact between field personnel/chemicals and both pedestrian and vehicular traffic. As an added precaution, chemicals were staged within a fenced area each day/night and the injection equipment/process was staged within a box truck that contained all regents and chemicals to minimize contact with nearby residents and allowed for quicker daily equipment setup and breakdown each day. All pumps and batching were conducted from the back of a box truck with hoses out to active injection wells that were designed to allow for quick disassembly in case emergency personnel/vehicles needed to access the work zone roadway. For added precaution to protect the surrounding community, dust/air monitoring was performed every day, active injection points were covered up with poly-sheeting to prevent accidental spraying of reagents, and venting of completed injection points through a carbon knock-out drum was performed to mitigate release of impacted vapors into the breathing zone. To minimize disruption to nearby residents, the impacted work areas were opened back up each night to allow normal vehicular/pedestrian activity to commence. Modifications to the ISCO strategy, oxidant sequencing, and amendment dosages were made in collaboration with the consultant during and between events to improve remedial performance and maintain safety working in a high-profile, residential road.

Three injection events were conducted over a 16 month time period with a total of 38,693 gallons safely injected into the subsurface within a very sensitive site setting. Upon completion of the 3 full-scale injection applications, a significant reduction of total BTEX and PAHs was noted across the treatment area. Following ISCO, groundwater concentrations reduced sufficiently to transition to long-term monitoring consistent with the Record of Decision.

Site Map


HOUSE NO.512 E.E.=398.2'
HOUSE NO.509 E.E.=393.9'
HOUSE NO.510 E.E.=396.4'
GARAGE
GARAGE
GARAGE
CONCRETE WALK
CONCRETE WALK
CONCRETE CURBING
CONCRETE CURBING
BUILDING NO.504-508 E.E.=392.6'
HOUSE NO.503 E.E.=394'±
E.E.=394.7'
HYDROGEN PEROXIDE WILL NOT BE INJECTED WITHIN 20 FEET OF ANY BUILDING FOUNDATION (TYPICAL OF 4)
GRAVEL DRIVE
CONCRETE WALK
CONCRETE WALK
LEGEND
SAMPLE
KEY

This page left intentionally blank.

To: Emily Cummings (EA Science and Engineering) 2/24/2021

sent via email

From: Keith M Gaskill, LPG, Sr Design Specialist
kgaskill@regenesis.com 317-800-4529

Subject: ***Preliminary Design and Cost Estimate***

Site: *Crystal Cleaners*
Pelham, NY

Applicable Product(s)	**Links to View/Download Product Information**
Bio-Dechlor INOCULUM® Plus	BDI Plus
PlumeStop® Liquid Activated Carbon™	PlumeStop
Hydrogen Release Compound®	HRC

REGENESIS is pleased to present you with this design and cost estimate for the proposed treatment at your site utilizing the remediation technologies presented above. Included within this document you will find the following attachments supporting the proposed approach:

- Map Depicting Treatment Areas
- Remedial Design and Cost Estimate
- Product Technical Sheets
- Standard Assumptions
- Terms and Conditions

Remedial Approach

We are proposing application of PlumeStop® Liquid Activated Carbon™ (PlumeStop) and Hydrogen Release Compound (HRC®) to treat residual chlorinated solvents. PlumeStop is a colloidal form of activated carbon with a surface treatment which reduces its interactions with the soil matrix. This allows it to move through soil pores leaving a coating on the soil matrix as it distributes from the injection point. This provides a very large sorption surface which will result in immediate reduction of these contaminants while concentrating contaminants to allow for more efficient and controlled remediation through destructive technologies like HRC. HRC will provide a controlled release of hydrogen to stimulate anaerobic bioremediation. As contaminants are degraded to non-toxic and non-sorptive end products, the PlumeStop sorption surface will be regenerated. This allows for further sorption and treatment of contaminants which may diffuse back into the groundwater from the soil matrix over time. Bio-Dechlor INOCULUM® Plus is added to provide a live microbial culture that is known to fully degrade these compounds.

PlumeStop was developed specifically to allow for the activated carbon particles to flow into and through contaminated aquifer flux zones in a “flooding” delivery fashion. Because PlumeStop particles are so small (1 to 2 micrometers and the size of a red blood cell) they can flow into silty soils without fracturing. Once in the formation they “paint” the aquifer and eventually become positionally stable with no occlusion of aquifer pore-space. In comparison, other carbon products use a “fine grained” activated carbon that is larger than the pore-space diameter of most soils and must be fractured at high pressures (commonly 200 to 600 psi or higher) for delivery into the

formation. Such high pressure fracturing is an uncontrolled process that frequently results in short circuiting, random fractured directions, and preferential flow into wells and utility corridors. Fractures must also be placed every 2 or 3 vertical feet which leaves ample opportunity for missed flow paths between those fractures. In comparison, PlumeStop is a liquid carbon suspension that injects under low-pressure (usually less than 60 psi) and high volumes to flood conductive zones of an aquifer and the end results is a "painting" of all conductive soils as compared to intermittent carbon seams (roughly 1 cm or smaller) as seen with other carbon injections. During PlumeStop application, real-time field verification is performed where soil cores are taken to confirm distribution and micro-adjustments to volumes and pressures are made to ensure product overlap. As a result, PlumeStop provides complete capture zones and greater design flexibility which results in much more consistent and predictable results.

The costs presented assume the proposed remediation technologies will be applied by our Remediation Services Division (RRS). RRS will provide all personnel and equipment to complete the application including subcontracting of a direct push drilling rig and operator. Please refer to the attached standard RRS' assumptions for remedial applications.

Assumptions

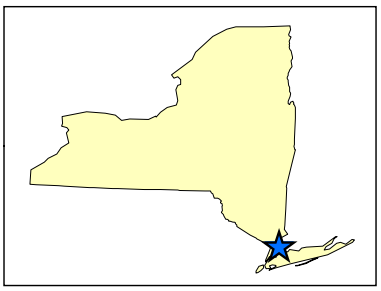
In generating this design proposal REGENESIS relied upon professional judgment and site specific information provided by others. Using this information as input, we performed calculations based upon known chemical and geologic relationships to generate an estimate of the mass of product and subsurface placement required to affect remediation of the site. The attached design summary tables specify the assumptions used in preparation of this technical design. We request that these modeling input assumptions be verified by your firm.

REGENESIS developed this Scope of Work in reliance upon the data and professional judgments provided by those whom completed the earlier environmental site assessment(s). The fees and charges associated with the Scope of Work were generated through REGENESIS' proprietary formulas and thus may not conform to billing guidelines, constraints or other limits on fees. REGENESIS does not seek reimbursement directly from any government agency or any governmental reimbursement fund (the "Government"). In any circumstance where REGENESIS may serve as a supplier or subcontractor to an entity which seeks reimbursement from the Government for all or part of the services performed or products provided by REGENESIS, it is the sole responsibility of the entity seeking reimbursement to ensure the Scope of Work and associated charges are in compliance with and acceptable to the Government prior to submission. When serving as a supplier or subcontractor to an entity which seeks reimbursement from the Government, REGENESIS does not knowingly present or cause to be presented any claim for payment to the Government.

Closing

Please feel free to contact me if you need additional information or have any questions regarding our evaluation and/or this correspondence (contact info listed above). Thank you for considering REGENESIS as part or your remedial solution for this project.

G:\Projects\State&Local\NYSDEC - D009806\Work Assignments\16025111 Crystal Cleaners RD\06 GIS\01 MXD\Design\Figure1 SiteLocation.mxd



0 50 100 150 200
Feet

N

Legend

- Crystal Cleaners Property Boundary
- Proposed Excavation Area
- Overburden Groundwater Remedial Area

Figure 1
SITE LAYOUT AND AREAS OF CONCERN
Crystal Cleaners
Pelham, New York

Map Date: 12/7/2020
Projection:
NAD_1983_StatePlane_New_York_East_FIPS_3101_Feet

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

Groundwater Treatment Grid Areas

REGENESIS

Project Info

Crystal Cleaners
Pelham, NY
Saturated Sand Unit

Prepared For:
Emily Cummings (EA Science and Engineering)

Target Treatment Zone (TTZ) Info	Unit	Value
Grid Treatment Areal Extent	sq ft	4,400
Top Treat Depth	ft	8.0
Bot Treat Depth	ft	20.0
Vertical Treatment Interval	ft	12.0
Treatment Zone Volume	ft^3	52,800
Treatment Zone Volume	cy	1,956
Soil Type	---	silty sand
Porosity	cm^3/cm^3	0.40
Effective Porosity	cm^3/cm^3	0.20
Treatment Zone Pore Volume	gals	157,989
Treatment Zone Effective Pore Volume	gals	78,994
Treatment Zone Pore Volume	liters	598,050
Treatment Zone Effective Pore Volume	liters	299,025
Fraction Organic Carbon (foc)	g/g	0.003
Soil Density	g/cm^3	1.6
Soil Density	lb/ft^3	100
Soil Weight	lbs	5.3E+06
Hydraulic Conductivity	ft/day	10.0
Hydraulic Conductivity	cm/sec	3.53E-03
Hydraulic Gradient	ft/ft	0.005
GW Velocity	ft/day	0.25
GW Velocity	ft/yr	91

Sources of Hydrogen Demand	Unit	Value
Dissolved Phase Contaminant Mass	lbs	5
Sorbed Phase Contaminant Mass	lbs	12
Competing Electron Acceptor Mass	lbs	119
Total Mass Contributing to H2 Demand	**lbs**	**136**

Mass Flux and HRC Demand	Unit	Value
Groundwater Mass Flux through TTZ	L/day	1,699
Stoichiometric HRC Demand	lbs	762
Mass Flux HRC Demand	lbs	773
Total HRC Demand	**lbs**	**1,535**

Application Dosing	Unit	Value
PlumeStop to be Applied	**lbs**	**9,200**
HRC to be Applied	**lbs**	**1,560**
BDI Plus to be Applied	**Liters**	**19**

PlumeStop® Application Design Summary

Saturated Sand Unit

PlumeStop	
Treatment Type	**Grid**
Treatment Areal Extent (sq ft)	4400
Spacing Within Rows (ft)	9
Spacing Between Rows (ft)	9
DPT Injection Points	**54**
Top Application Depth (ft bgs)	8
Bottom Application Depth (ft bgs)	20
PlumeStop to be Applied (lbs)	**9,200**
PlumeStop to be Applied (gals)	1,021

PlumeStop Volume Totals

Mixing Water (gal)	43,077
Total Application Volume (gals)	**44,098**
Injection Volume per Point (gals)	817

Anaerobic Bioremediation - HRC

HRC Application Points	**54**
HRC to be Applied (lbs)	**1,560**
HRC per point (lbs)	29
Total Application Volume (gals)	**144**
Injection Volume per Point (gals)	2.7

Bioaugmentation - BDI Plus

BDI Plus Application Points	**54**
BDI Plus to be Applied (Liters)	**19**
BDI Plus per point (Liters)	0.4

Technical Notes

Injection Radius for Soil Coverage (ft-est.avg.)
5.7

PlumeStop Inject. Conc. (mg/L)
5,000

Special Instructions:

Assumptions/Qualifications

In generating this preliminary estimate, Regenesis relied upon professional judgment and site specific information provided by others. Using this information as input, we performed calculations based upon known chemical and geologic relationships to generate an estimate of the mass of product and subsurface placement required to affect remediation of the site.

REGENESIS developed this Scope of Work in reliance upon the data and professional judgments provided by those whom completed the earlier environmental site assessment(s). The fees and charges associated with the Scope of Work were generated through REGENESIS' proprietary formulas and thus may not conform to billing guidelines, constraints or other limits on fees. REGENESIS does not seek reimbursement directly from any government agency or any governmental reimbursement fund (the "Government"). In any circumstance where REGENESIS may serve as a supplier or subcontractor to an entity which seeks reimbursement from the Government for all or part of the services performed or products provided by REGENESIS, it is the sole responsibility of the entity seeking reimbursement to ensure the Scope of Work and associated charges are in compliance with and acceptable to the Government prior to submission. When serving as a supplier or subcontractor to an entity which seeks reimbursement from the Government, REGENESIS does not knowingly present or cause to be presented any claim for payment to the Government.

Prepared by: Keith M Gaskill, LPG, Sr Design Specialist
Date: 2/24/2021

Groundwater Treatment Grid Areas

REGENESIS

Purchasing Information		
Crystal Cleaners	**--**	**Saturated Sand Unit**
PlumeStop Required	**lbs**	**9,200**
HRC to be Applied	**lbs**	**1,560**
BDI Plus to be Applied	**Liters**	**19**
Estimated Tax and Freight %*	%	18%
Estimated Tax and Freight Cost	$	$16,456
Estimated Total Product Cost	**$**	**$107,875**
Estimated RRS Application Cost	**$**	**$69,056**
Total Estimated Project Cost**	**$**	**$176,931**
Estimated RRS Days to Apply	**---**	**14**

Currently Available Packaging Options

Package Type***	# of packages	lbs required
PlumeStop-2,000 lb reinf. plastic totes	4	8,000
PlumeStop-400 lb poly drums	3	1,200
HRC-40 lb HDPE Pails	39	1,560
BDI-18 Liter kegs	1	19

***Note that the combined tax and freight costs are preliminary estimates only. Please contact your local sales manager or Customer Service at 949-366-8000 to obtain a shipping quote. You will be asked to provide a ship-to address and estimated time of delivery.**

****Total Project cost is only an estimate; actual project cost may change as the final scope and/or RRS proposal are developed.**

*****Available Package Types are subject to change.**

Source Treatment Area

REGENESIS

Project Info
Crystal Cleaners
Pelham, NY
Saturated Sand Unit
Prepared For:
Emily Cummings (EA Science and Engineering)

Target Treatment Zone (TTZ) Info	Unit	Value
Grid Treatment Areal Extent	sq ft	600
Top Treat Depth	ft	8.0
Bot Treat Depth	ft	20.0
Vertical Treatment Interval	ft	12.0
Treatment Zone Volume	ft^3	7,200
Treatment Zone Volume	cy	267
Soil Type	---	silty sand
Porosity	cm^3/cm^3	0.40
Effective Porosity	cm^3/cm^3	0.20
Treatment Zone Pore Volume	gals	21,544
Treatment Zone Effective Pore Volume	gals	10,772
Treatment Zone Pore Volume	liters	81,552
Treatment Zone Effective Pore Volume	liters	40,776
Fraction Organic Carbon (foc)	g/g	0.003
Soil Density	g/cm^3	1.6
Soil Density	lb/ft^3	100
Soil Weight	lbs	7.2E+05
Hydraulic Conductivity	ft/day	10.0
Hydraulic Conductivity	cm/sec	3.53E-03
Hydraulic Gradient	ft/ft	0.005
GW Velocity	ft/day	0.25
GW Velocity	ft/yr	91

Sources of Hydrogen Demand	Unit	Value
Dissolved Phase Contaminant Mass	lbs	1
Sorbed Phase Contaminant Mass	lbs	2
Competing Electron Acceptor Mass	lbs	16
Total Mass Contributing to H2 Demand	**lbs**	**19**

Mass Flux and HRC Demand	Unit	Value
Groundwater Mass Flux through TTZ	L/day	1,699
Stoichiometric HRC Demand	lbs	104
Mass Flux HRC Demand	lbs	773
Total HRC Demand	**lbs**	**877**

Application Dosing	Unit	Value
PlumeStop to be Applied	**lbs**	**1,600**
HRC to be Applied	**lbs**	**920**
BDI Plus to be Applied	**Liters**	**19**

PlumeStop® Application Design Summary

Saturated Sand Unit

PlumeStop	
Treatment Type	**Grid**
Treatment Areal Extent (sq ft)	600
Spacing Within Rows (ft)	9
Spacing Between Rows (ft)	9
DPT Injection Points	**7**
Top Application Depth (ft bgs)	8
Bottom Application Depth (ft bgs)	20
PlumeStop to be Applied (lbs)	**1,600**
PlumeStop to be Applied (gals)	178
PlumeStop Volume Totals	
Mixing Water (gal)	7,492
Total Application Volume (gals)	**7,669**
Injection Volume per Point (gals)	1,096
Anaerobic Bioremediation - HRC	
HRC Application Points	**7**
HRC to be Applied (lbs)	**920**
HRC per point (lbs)	131
Total Application Volume (gals)	**85**
Injection Volume per Point (gals)	12.1
Bioaugmentation - BDI Plus	
BDI Plus Application Points	**7**
BDI Plus to be Applied (Liters)	**19**
BDI Plus per point (Liters)	2.7

Technical Notes

Injection Radius for Soil Coverage (ft-est.avg.)

6.6

PlumeStop Inject. Conc. (mg/L)

5,000

Special Instructions:

Assumptions/Qualifications

In generating this preliminary estimate, Regenesis relied upon professional judgment and site specific information provided by others. Using this information as input, we performed calculations based upon known chemical and geologic relationships to generate an estimate of the mass of product and subsurface placement required to affect remediation of the site.

REGENESIS developed this Scope of Work in reliance upon the data and professional judgments provided by those whom completed the earlier environmental site assessment(s). The fees and charges associated with the Scope of Work were generated through REGENESIS' proprietary formulas and thus may not conform to billing guidelines, constraints or other limits on fees. REGENESIS does not seek reimbursement directly from any government agency or any governmental reimbursement fund (the "Government"). In any circumstance where REGENESIS may serve as a supplier or subcontractor to an entity which seeks reimbursement from the Government for all or part of the services performed or products provided by REGENESIS, it is the sole responsibility of the entity seeking reimbursement to ensure the Scope of Work and associated charges are in compliance with and acceptable to the Government prior to submission. When serving as a supplier or subcontractor to an entity which seeks reimbursement from the Government, REGENESIS does not knowingly present or cause to be presented any claim for payment to the Government.

Prepared by: Keith M Gaskill, LPG, Sr Design Specialist
Date: 2/24/2021

Source Treatment Area

REGENESIS

Purchasing Information		
Crystal Cleaners	**--**	**Saturated Sand Unit**
PlumeStop Required	**lbs**	**1,600**
HRC to be Applied	**lbs**	**920**
BDI Plus to be Applied	**Liters**	**19**
Estimated Tax and Freight %*	%	18%
Estimated Tax and Freight Cost	$	$4,549
Estimated Total Product Cost	**$**	**$29,822**
Estimated RRS Application Cost	**$**	**$21,360**
Total Estimated Project Cost**	**$**	**$51,182**
Estimated RRS Days to Apply	**---**	**3**

Currently Available Packaging Options

Package Type***	# of packages	lbs required
PlumeStop-2,000 lb reinf. plastic totes	4	8,000
PlumeStop-400 lb poly drums	3	1,200
HRC-40 lb HDPE Pails	23	920
BDI-18 Liter kegs	1	19

***Note that the combined tax and freight costs are preliminary estimates only. Please contact your local sales manager or Customer Service at 949-366-8000 to obtain a shipping quote. You will be asked to provide a ship-to address and estimated time of delivery.**

****Total Project cost is only an estimate; actual project cost may change as the final scope and/or RRS proposal are developed.**

*****Available Package Types are subject to change.**

PlumeStop® Liquid Activated Carbon™ Technical Description

PlumeStop Liquid Activated Carbon is an innovative groundwater remediation technology designed to rapidly remove and permanently degrade groundwater contaminants. PlumeStop is composed of very fine particles of activated carbon (1-2µm) suspended in water through the use of unique organic polymer dispersion chemistry. Once in the subsurface, the material behaves as a colloidal biomatrix, binding to the aquifer matrix, rapidly removing contaminants from groundwater, and promoting permanent contaminant biodegradation.

This unique remediation technology accomplishes treatment with the use of highly dispersible, fast-acting, sorption-based technology, capturing and concentrating dissolved-phase contaminants within its matrix-like structure. Once contaminants are sorbed onto the regenerative matrix, biodegradation processes achieve complete remediation.

Distribution of PlumeStop in water

To see a list of treatable contaminants with the use of PlumeStop, view the Range of Treatable Contaminants Guide.

Chemical Composition

- Water - CAS# 7732-18-5
- Colloidal Activated Carbon ≤2.5 - CAS# µm 7440-44-0
- Proprietary Additives

Properties

- Physical state: Liquid
- Form: Aqueous suspension
- Color: Black
- Odor: Odorless
- pH: 8 - 10

Storage and Handling Guidelines

Storage
Store in original tightly closed container
Store away from incompatible materials
Protect from freezing

Handling
Avoid contact with skin and eyes
Avoid prolonged exposure
Observe good industrial hygiene practices
Wash thoroughly after handling
Wear appropriate personal protective equipment

PlumeStop® Liquid Activated Carbon™ Technical Description

Applications

PlumeStop is easily applied into the subsurface through gravity-feed or low-pressure injection.

Health and Safety

Wash hands after handling. Dispose of waste and residues in accordance with local authority requirements. Please review the Material Safety Data Sheet for additional storage, usage, and handling requirements here: PlumeStop SDS.

REGENESIS

www.regenesis.com
1011 Calle Sombra, San Clemente CA 92673
949.366.8000

HYDROGEN RELEASE COMPOUND

HRC® Technical Description

HRC® is an engineered, hydrogen release compound designed specifically for enhanced, *in situ* anaerobic bioremediation of chlorinated compounds in groundwater or highly saturated soils. Upon contact with groundwater, this viscous, polylactate ester material becomes hydrated and subject to microbial breakdown producing a controlled-release of hydrogen for periods of up to 18-24 months on a single application.

Example of HRC

HRC enables enhanced anaerobic biodegradation by adding hydrogen (an electron donor) to groundwater and/or soil to increase the number and vitality of indigenous microorganisms able to perform the naturally occurring process of enhanced reductive dechlorination. During this process, certain naturally occurring microorganisms replace chlorine atoms on chlorinated contaminants with the newly available hydrogen effectively reducing the contaminant to a less harmful substance with the preferred and innocuous endpoints of ethene or ethane.

For a list of treatable contaminants with the use of HRC, view the Range of Treatable Contaminants Guide.

Chemical Composition

- Glycerol Tripolylactate- CAS #201167-72-8
- Glycerin- CAS #56-81-5
- Lactic acid- CAS #50-21-5

Properties

- pH - 3 (10% solution/water)
- Appearance – Viscous gel/liquid. Amber color
- Odor – Odorless

Storage and Handling Guidelines

Storage
Store away from incompatible materials
Store in original tightly closed container
Store in a cool, dry, well-ventilated place

Handling
Wash thoroughly after handling
Wear appropriate personal protective equipment
Wear eye/face protection
Provide adequate ventilation
Observe good industrial hygiene practices

HYDROGEN RELEASE COMPOUND

HRC® Technical Description

Applications

- Permanent injection wells
- Direct-push injection (barriers and grids)
- Recirculating wells
- Soil borings
- Excavation applications into soil or on top of bedrock
- Gravity feed into bedrock wells

Application instructions for this product are contained in the HRC Application Instructions.

Health and Safety

Avoid contact with eyes, skin, and clothing. Provide adequate ventilation. Wear appropriate personal protective equipment. Observe good industrial hygiene practices.

Please review the HRC Safety Data Sheet for additional storage, usage, and handling requirements.

REGENESIS®

Corporate Headquarters
1011 Calle Sombra, San Clemente CA
92673 949.366.8000

European Office
Cambridge House, Henry Street,
Bath BA1 1BT, United Kingdom

BDI PLUS® Technical Description

Bio-Dechlor INOCULUM Plus (BDI PLUS®) is an enriched natural consortium containing species of Dehalococcoides sp. (DHC). BDI PLUS has been shown to simulate the rapid and complete dechlorination of chlorinated solvents such as tetrachloroethene (PCE), trichloroethene (TCE), dichloroethene (DCE) and vinyl chloride (VC) to non-toxic end products, ethene, carbon dioxide and water.

The culture also contains microbes capable of dehalogenating halomethanes (e.g., carbon tetrachloride and chloroform) and haloethanes (e.g., 1,1,1-TCA and 1,1-DCA) as well as mixtures of these contaminants.

Species of Dehalococcoides sp. (DHC)

For a list of treatable contaminants with the use of BDI PLUS, view the Range of Treatable Contaminants Guide

Chemical Composition

- Non-hazardous, naturally-occurring, non-altered anaerobic microbes and enzymes in a water-based medium.

Properties

- Appearance – Murky, yellow to grey water
- Odor – Musty
- pH 6.0 to 8.0
- Density – Approximately 1.0 grams per cubic centimeter (0.9 to 1.1 g/cc)
- Solubility – Soluble in Water
- Vapor Pressure – None
- Non-hazardous

Storage and Handling Guidelines

Storage
Store in original tightly closed container
Store away from incompatible materials
Recommended storage containers: plastic lined steel, plastic, glass, aluminum, stainless steel, or reinforced fiberglass
Store in a cool, dry area at 4-5°C (39 - 41°F)
Material may be stored for up to 3 weeks at 2-4°C without aeration

Handling
Avoid prolonged exposure
Observe good industrial hygiene practices
Wear appropriate personal protective equipment

BIO-DECHLOR INOCULUM

BDI PLUS® Technical Description

Applications

- BDI PLUS is delivered to the site in liquid form and is designed to be injected directly into the saturated zone requiring treatment.
- Most often diluted with de-oxygenated water prior to injection into either hydraulic push injection points or properly constructed injection wells.
- The typical dilution rate of the injected culture is 10 gallons of deoxygenated water to 1 liter of standard BDI PLUS culture.

Application instructions for this product are contained here BDI PLUS Application Instructions.

Health and Safety

Material is non-hazardous and relatively safe to handle; however avoid contact with eyes and prolonged contact with skin. OSHA Level D personal protection equipment including: vinyl or rubber gloves and safety goggles or a splash shield are recommended when handling this product. An eyewash station is recommended. Please review the Material Safety Data Sheet for additional storage, usage, and handling requirements here: BDI PLUS SDS.

REGENESIS®

www.regenesis.com

Corporate Headquarters
1011 Calle Sombra, San Clemente CA 92673
949.366.8000

European Headquarters
The Tramshed, Beehive Yard
Walcot St, Bath BA1 5BB, United Kingdom

Remedial Design Assumptions and Qualifications

Cost Estimate Disclaimer: The cost listed assumes conditions set forth within the proposed scope of work and assumptions and qualifications. Changes to either could impact the final cost of the project. This may include final shipping arrangements, sales tax or application related tasks such as product storage and handling, access to water, etc. If items listed need to be modified, please contact Regenesis for further evaluation.

Shipping Estimates: Shipping estimates are valid for 30 days. All shipping charges are estimates and actual freight charges are calculated at the time of invoice. Additional freight charges may be assessed for any accessorial requested at the time of delivery. The estimate included within assumes standard shipping.

Standard delivery is between 8am -5pm Monday –Friday. *accessorial – can include, but not limited to lift gate and pallet jack at delivery, inside delivery, time definite deliveries, and delivery appointments.

Please communicate any requirements for delivery with the customer service department at the time the order is placed.

Return Policy: To initiate a return please contact your local sales manager for an RMA. A 15% re-stocking fee will be charged for all returned goods. Return freight must be prepaid. All requests to return product must be in original condition and no product will be accepted for return after 90 days from date of delivery.

Professional Judgement: In generating this estimate, REGENESIS relied upon professional judgment and site specific information provided by others. Using this information as input, we performed calculations based upon known chemical and geologic relationships to generate an estimate of the mass of product and subsurface placement required to affect remediation of the site.

REGENESIS developed this Scope of Work in reliance upon the data and professional judgments provided by those whom completed the earlier environmental site assessment(s), and in reliance upon REGENESIS' prior experience on similar project sites. The fees and charges associated with the Scope of Work were generated through REGENESIS' proprietary formulas and thus may not conform to billing guidelines, constraints or other limits on fees. REGENESIS does not seek reimbursement directly from any government agency or any governmental reimbursement fund (the "Government"). In any circumstance where REGENESIS may serve as a supplier or subcontractor to an entity which seeks reimbursement from the Government for all or part of the services performed or products provided by REGENESIS, *it is the sole responsibility of the entity seeking reimbursement to ensure the Scope of Work and associated charges are in compliance with and acceptable to the Government prior to submission*. When serving as a supplier or subcontractor to an entity which seeks reimbursement from Government, REGENESIS does not knowingly present or cause to be presented any claim for payment to the government.

RRS Assumptions and Qualifications

- Cost outlined will be valid for 60 days from date of proposal. If beyond 60 days, REGENESIS reserves the right to update cost.
- If applicable, sales tax charges for product, freight, and services are considered estimated at the time of proposal submittal. The appropriate sales tax category (i.e., product, freight, and services) and actual sales tax rate is finalized at the time of invoice and may change from date of proposal submittal.
- Client personnel will take delivery of the remediation chemistry prior to RRS mobilization and arrange for secure storage where the material will not be affected by inclement weather. During application activities, the Client will locate the product within 10 feet of the RRS injection trailer.
- Client is responsible for disposal or recycling of totes, drums, pails and pallets. All nonhazardous refuse will be collected and placed in a Client-provided on-site refuse container for disposal. RRS will collect project related refuse and empty treatment chemistry containers daily to keep the site clean.
- A high volume water source (e.g. hydrant) capable of producing at least 30 gpm will be available to RRS for the duration of the project within 300' of the project staging area, at no cost to RRS. RRS will supply 300 linear feet of 1.5 inch National Standard Thread fire hose.
- RRS will have access to the site for equipment operation and secure storage of materials and equipment throughout the duration of the project. All access to each work area location will be clear and free of obstructions. RRS also assumes the injection trailer will be staged within 80 feet of the furthest injection point location.
- Client will provide field water quality meter similar to a YSI 556 with a down-hole sensor, a water level meter, bailers and a technician while on-site for injection activities to assist RRS in assessing groundwater from monitoring wells.
- Client is responsible for securing any permits prior to mobilizing to the site.
- Client is responsible for all soil, air, and groundwater sampling and analysis.
- Client is responsible for transportation and disposal of any contaminated waste generated on-site, though we do not anticipate generating any such waste during direct push injection activities.
- For safety reasons, access to the treatment area will be limited to RRS and Client personnel.
- The remediation design and injection procedures contain the necessary precautions to minimize the likelihood of surfacing of the treatment chemistry. RRS will monitor treatment chemistry application flow rates and pressures as well as observe for signs of reagent surfacing around active injection areas. If surfacing is detected, RRS will stop or slow down injection activities at that location to stop additional surfacing and remove/vacuum up recoverable surfaced fluid. RRS is not be responsible for treatment chemistry infiltration into undesired locations beyond our visible control.

- RRS will call in a public utility locate for the injection area. Private utility locates will be the Client's responsibility. RRS is not responsible for damage to unmarked utilities and subsurface structures. Client will review as-built drawings with RRS to confirm clearance prior to advancing DPT injection tooling and marking injection point locations.
- RRS personnel will have access to the site for work up to 12 hours per day Monday through Friday (daylight hours). However, the standard workday does not exceed 10 hours with travel time Monday through Friday. A 10-hour workday does not mean 10 hours on-site and/or injection pumping. Additional charges may apply for Saturday and/or Sunday work schedules.
- Pricing and work schedule assume union labor and prevailing wages (Davis-Bacon) are not required.
- Proposal assumes standard probing and drilling will begin at ground surface. If hand augering, concrete coring, or air knife services will be required, additional charges will apply.
- RRS assumes that direct-push style drill rig can access all injection point locations and drive injection tooling to the required depth. If site conditions limit the use of the provided direct-push rig for any injection point and other drilling methods are required to complete the task, additional charges will apply.
- All traffic control requirements will be provided by the Client.
- All injection points will be closed/backfilled with bentonite to ground surface by RRS. Additional costs associated with restoration of the ground surface have not been included. If restoration of the ground surface is needed, additional charges will apply.
- Site conditions can change over time and should be monitored post injection. REGENESIS is not responsible for changing site conditions after completing the scope of work and demobilizing from the site. This includes but is not limited to changes related to borehole abandonment (i.e., swelling of backfill material), surface restoration, well conditions, and on-site utilities.
- In generating this estimate, REGENESIS relied upon professional judgment and site-specific information provided by others. Using this information as input, we performed calculations based upon known chemical and geologic relationships to generate an estimate of the mass of product and subsurface placement required to affect remediation of the site.

REGENESIS
1011 Calle Sombra
San Clemente, CA 92673-6244
Tel: 949.366.8000 • Fax: 949.366.8090

Terms and Conditions
Products and Services

1. PAYMENT TERMS. Net 30 Days. Accounts outstanding after 30 days will be assessed 1.5% monthly interest. Volume discount pricing will be rescinded on all accounts outstanding over 90 days. An early payment discount of 1.5% Net 10 is available for cash or check payments only. We accept Master Card, Visa and American Express.

2. **RETURN POLICY.** A 15% re-stocking fee will be charged for all returned goods. All requests to return product must be pre-approved by seller. Returned product must be in original condition and no product will be accepted for return after a period of 90 days.

3 FORCE MAJEURE. Seller shall not be liable for delays in delivery or services or failure to manufacture or deliver due to causes beyond its reasonable control, including but not limited to acts of God, acts of buyer, acts of military or civil authorities, fires, strikes, flood, epidemic, war, riot, delays in transportation or car shortages, or inability to obtain necessary labor, materials, components or services through seller's usual and regular sources at usual and regular prices. In any such event Seller may, without notice to buyer, at any time and from time to time, postpone the delivery or service dates under this contract or make partial delivery or performance or cancel all or any portion of this and any other contract with buyer without further liability to buyer. Cancellation of any part of this order shall not affect Seller's right to payment for any product delivered or service performed hereunder.

4. LIMITED WARRANTY. Seller warrants the product(s) sold and services provided as specified on face of invoice, solely to buyer. Seller makes no other warranty of any kind respecting the product and services, and expressly DISCLAIMS ALL OTHER WARRANTIES OF WHATEVER KIND RESPECTING THE PRODUCT AND SERVICES, INCLUDING ALL WARRANTIES OF MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE AND NON-INFRINGEMENT.

5. DISCLAIMER. Where warranties to a person other than buyer may not be disclaimed under law, seller extends to such a person the same warranty seller makes to buyer as set forth herein, subject to all disclaimers, exclusions and limitations of warranties, all limitations of liability and all other provisions set forth in the Terms and Conditions herein. Buyer agrees to transmit a copy of the Terms and Conditions set forth herein to any and all persons to whom buyer sells, or otherwise furnishes the products and/or services provided buyer by seller and buyer agrees to indemnify seller for any liability, loss, costs and attorneys' fees which seller may incur by reason, in whole or in part, of failure by buyer to transmit the Terms and Conditions as provided herein.

6. LIMITATION OF SELLER'S LIABILITY AND LIMITATION OF BUYER'S REMEDY. Seller's liability on any claim of any kind, including negligence, for any loss or damage arising out of, connected with, or resulting from the manufacture, sale, delivery, resale, repair or use of any goods or performance of any services covered by or furnished hereunder, shall in no case exceed the lesser of (1) the cost of repairing or replacing goods and repeating the services failing to conform to the forgoing warranty or the price of the goods and/or services or part thereof which gives rise to the claim. IN NO EVENT SHALL SELLER BE LIABLE FOR SPECIAL INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING LOST PROFITS, OR FOR DAMAGES IN THE NATURE OF PENALTIES.

7. INDEMNIFICATION. Buyer agrees to defend and indemnify seller of and from any and all claims or liabilities asserted against seller in connection with the manufacture, sale, delivery, resale or repair or use of any goods, and performance of any services, covered by or furnished hereunder arising in whole or in part out of or by reason of the failure of buyer, its agents, servants, employees or customers to follow instructions, warnings or recommendations furnished by seller in connection with such goods and services, by reason of the failure of buyer, its agents, servants, employees or customers to comply with all federal, state and local laws applicable to such goods and services, or the use thereof, including the Occupational Safety and Health Act of 1970, or by reason of the negligence or misconduct of buyer, its agents, servants, employees or customers.

8. EXPENSES OF ENFORCEMENT. In the event seller undertakes any action to collect amounts due from buyer, or otherwise enforce its rights hereunder, Buyer agrees to pay and reimburse Seller for all such expenses, including, without limitation, all attorneys and collection fees.

9. TAXES. Liability for all taxes and import or export duties, imposed by any city, state, federal or other governmental authority, shall be assumed and paid by buyer. Buyer further agrees to defend and indemnify seller against any and all liabilities for such taxes or duties and legal fees or costs incurred by seller in connection therewith.

10. ASSISTANCE AND ADVICE. Upon request, seller in its discretion will furnish as an accommodation to buyer such technical advice or assistance as is available in reference to the goods and services. Seller assumes no obligation or liability for the advice or assistance given or results obtained, all such advice or assistance being given and accepted at buyer's risk.

11. SITE SAFETY. Buyer shall provide a safe working environment at the site of services and shall comply with all applicable provisions of federal, state, provincial and municipal safety laws, building codes, and safety regulations to prevent accidents or injuries to persons on, about or adjacent to the site.

12. INDEPENDENT CONTRACTOR. Seller and Buyer are independent contractors and nothing shall be construed to place them in the relationship of partners, principal and agent, employer/employee or joint ventures. Neither party will have the power or right to bind or obligate the other party except as may be expressly agreed and delegated by other party, nor will it hold itself out as having such authority.

13. REIMBURSEMENT. Seller shall provide the products and services in reliance upon the data and professional judgments provided by or on behalf of buyer. The fees and charges associated with the products and services thus may not conform to billing guidelines, constraints or other limits on fees. Seller does not seek reimbursement directly from any government agency or any governmental reimbursement fund (the "Government"). In any circumstance where seller may serve as a supplier or subcontractor to an entity which seeks reimbursement from the Government for all or part of the services performed or products provided by seller, it is the sole responsibility of the buyer or other entity seeking reimbursement to ensure the products and services and associated charges are in compliance with and acceptable to the Government prior to submission. When serving as a supplier or subcontractor to an entity which seeks reimbursement from the Government, seller does not knowingly present or cause to be presented any claim for payment to the Government.

14. APPLICABLE LAW/JURISDICTION AND VENUE. The rights and duties of the parties shall be governed by, construed, and enforced in accordance with the laws of the State of California (excluding its conflict of laws rules which would refer to and apply the substantive laws of another jurisdiction). Any suit or proceeding hereunder shall be brought exclusively in state or federal courts located in Orange County, California. Each party consents to the personal jurisdiction of said state and federal courts and waives any objection that such courts are an inconvenient forum.

15. ENTIRE AGREEMENT. This agreement constitutes the entire contract between buyer and seller relating to the goods or services identified herein. No modifications hereof shall be binding upon the seller unless in writing and signed by seller's duly authorized representative, and no modification shall be effected by seller's acknowledgment or acceptance of buyer's purchase order forms containing different provisions. Trade usage shall neither be applicable nor relevant to this agreement, nor be used in any manner whatsoever to explain, qualify or supplement any of the provisions hereof. No waiver by either party of default shall be deemed a waiver of any subsequent default.

This page intentionally left blank