Summary Report for In Situ Chemical Oxidation Pilot Study at the Davis-Howland Oil Corporation Site (828088) Rochester, New York

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Prepared for:

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List of Abbreviations and Acronyms

chem-ox	in situ chemical oxidation
DO	dissolved oxygen
E & E	Ecology and Environment Engineering and Geology, P.C
ESG	Environmental Service Group (NY) Inc.
ID	inner diameter
IDW	investigation-derived waste
IW	injection well
K	relative hydraulic conductivity
LaBella	LaBella Associates, DPC
µg/L	micrograms per liter
mV	millivolts
MW	monitoring well
NYSDEC	New York State Department of Environmental Conservation
ORP	oxidation reduction potential
Patriot	Patriot Design & Consulting
PID	photoionization detector
PPE	personal protective equipment
TCLP	toxicity characteristic leaching procedure
TestAmerica	TestAmerica Laboratories, Inc.
VOC	volatile organic compound

1 Introduction

Pursuant to Work Assignment No. D009807-09, Ecology and Environment Engineering and Geology, P.C. (E & E) has prepared this summary report on behalf of the New York State Department of Environmental Conservation (NYSDEC), Department of Environmental Remediation, for the in situ groundwater treatability study conducted at the Davis-Howland Oil Corporation Remediation Site (hereinafter referred to as the "Site"), which is NYSDEC Site No. 828088, located at 200 Anderson Avenue in the city of Rochester, Monroe County, New York (see Figures 1-1 and 1-2).

The objective of the pilot study was to determine the effectiveness of in situ chemical oxidation (chem-ox) treatment to decrease volatile organic compound (VOC) concentrations in the bedrock groundwater in the vicinity of monitoring well (MW) MW-8R.

1.1 Pilot Study Field Activities

Field activities to date included the following:

- **September 14, 2020, through September 18, 2020** – Installation and development of two new bedrock wells at the Site (MW-17R and IW-01);
- **September 25, 2020** – Slug testing of MW-8R, MW-17R, and IW-01;
- **October 12, 2020, through October 15, 2020** – 2020 annual/baseline groundwater sampling for VOCs, sulfate, and alkalinity; collection of field parameters (temperature, pH, conductivity, oxidation reduction potential [ORP], dissolved oxygen [DO], turbidity) for 10 bedrock monitoring wells (PW-1, MW-2R, MW-5R, MW-8R, MW-10R, MW-14R, MW-15R, MW-16R and newly installed MW-17R and IW-01); 2020 annual groundwater sampling for VOCs; and collection of field parameters (temperature, pH, conductivity, ORP, DO, turbidity) at five overburden monitoring wells;
- **October 27, 2020, through October 29, 2020** – Injection of Regenesis PersulfOx reagent into MW-17R and MW-8R;
- **November 30, 2020, through December 3, 2020** – One-month post-injection groundwater sampling for VOCs, sulfate, and alkalinity and collection of field parameters at the 10 bedrock monitoring wells; and
- **December 8, 2020** – Survey of MW-17R and IW-01.

Field activities were conducted by personnel wearing Level D personal protective equipment (PPE) during the work.

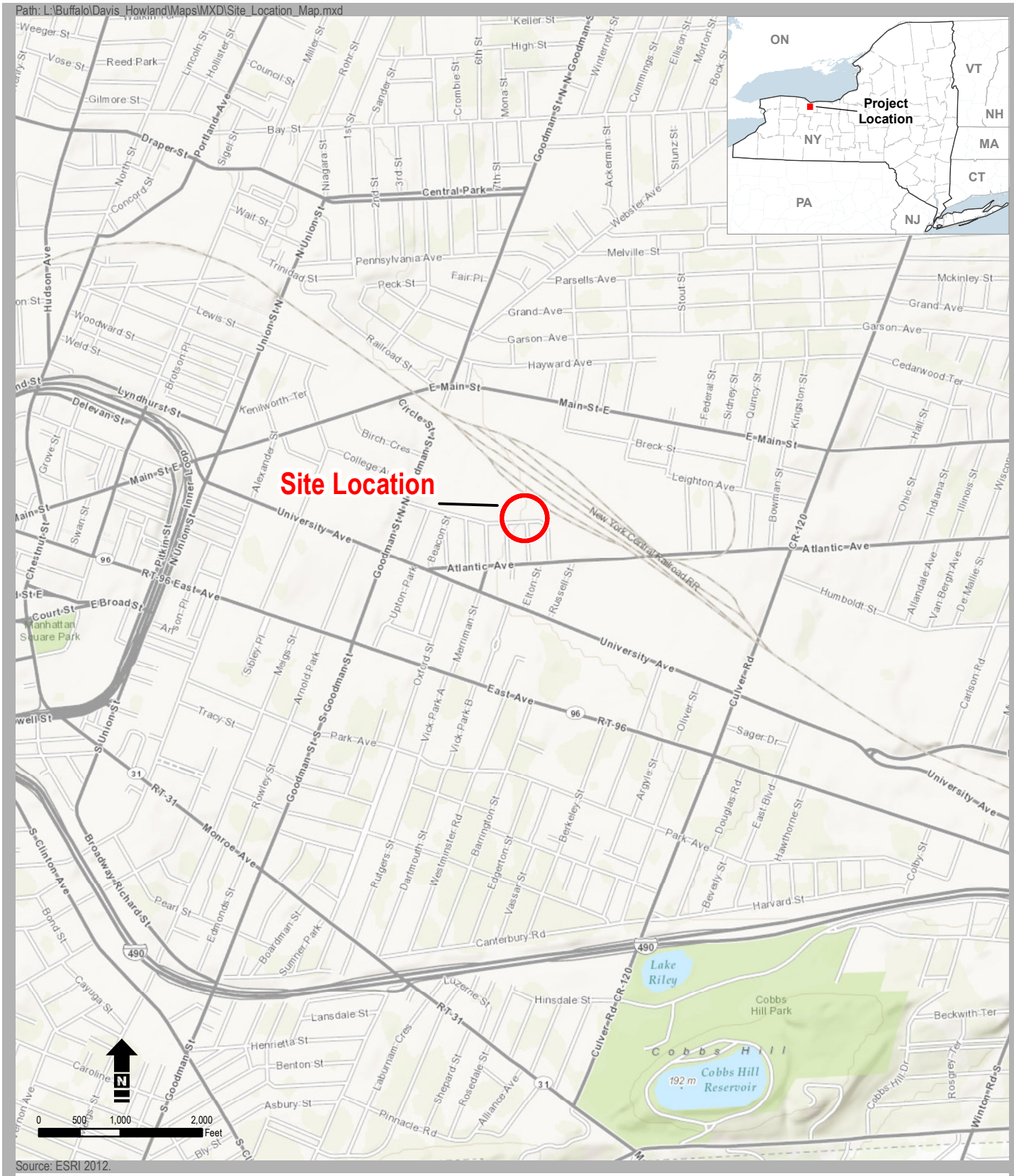
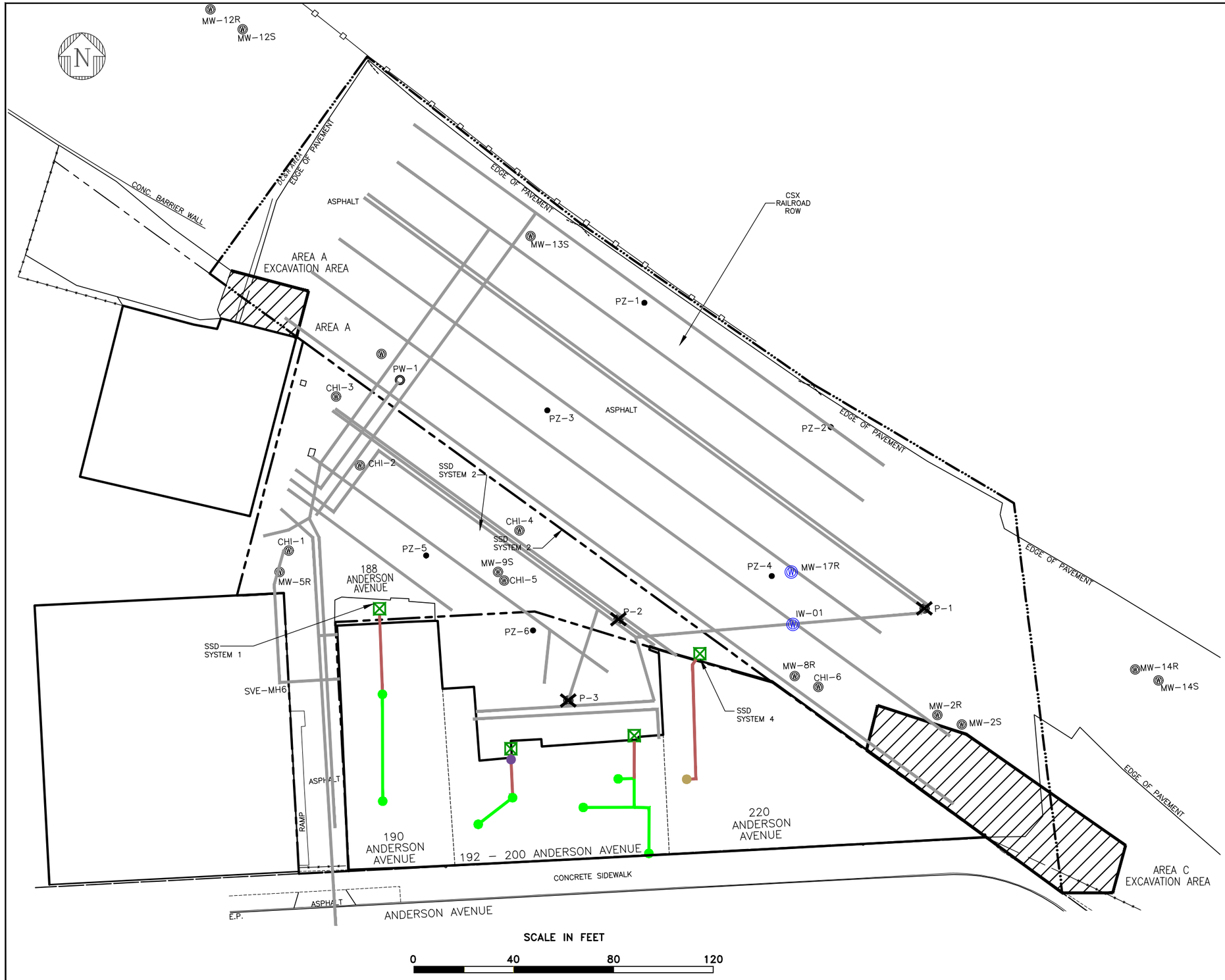


Figure 1-1
Site Location Map
Former Davis-Howland Oil Corporation
Rochester, NY



LEGEND

- MONITORING WELL
- PIEZOMETER
- PUMPING WELL
- NEW WELLS
- DECOMMISSIONED AIR SPARGE/SOIL EXTRACTION SYSTEM
- DECOMMISSIONED PUMPING WELL/MONITORING WELL
- FAN LOCATIONS (EXTERIOR)
- 2 INCH SOLID SCHEDULE 40 PVC VERTICAL RISER
- 3 INCH SOLID SCHEDULE 40 PVC VERTICAL RISER
- 4 INCH SOLID SCHEDULE 40 PVC VERTICAL RISER
- 3 INCH SOLID PVC SCHEDULE 40 PVC OVERHEAD HEADER PIPING
- 4 INCH SOLID PVC SCHEDULE 40 PVC OVERHEAD HEADER PIPING

ABBREVIATIONS

CH	CLEAN HARBOR
IW	INJECTION WELL
MH	MANHOLE
MW	MONITORING WELL
P	SHALLOW OVERBURDEN GROUNDWATER PUMPING WELLS
PW	BEDROCK GROUNDWATER PUMPING WELLS
PZ	PIEZOMETER
SSD	SUB-SLAB DEPRESSURIZATION

NOTES

1. PIEZOMETERS, MONITORING WELLS, BUILDINGS AND PROPERTY LINES ARE BASED ON A SURVEY BY POPLI DESIGN GROUP, ARCHITECTURE AND ENGINEERING P.C. DATED DEC 7, 2012.
2. PUMPING WELL LINES, SOIL VAPOR EXTRACTION LINES AND AIR SPARGE LINES BASED ON AS-BUILT DRAWINGS BY ECOLOGY AND ENVIRONMENT P.C DATED NOVEMBER 2006.
3. STREET LOCATIONS ARE APPROXIMATE.

FIGURE 1-2 LOCATION OF NEW WELLS
FORMER DAVIS HOWLAND OIL CORPORATION SITE
MONROE COUNTY, ROCHESTER, NY

2 Pilot Study Activities

The tasks and requirements of the in situ chem-ox pilot study are specified in the work plan (E & E 2020). The following subsections include performance details associated with each activity and descriptions of deviations from the work plan.

2.1 Field Activities

2.1.1 Bedrock Well Installation

E & E's standby driller subcontractor, LaBella Associates, DPC (LaBella), of Rochester, New York, installed two flush-mounted 4-inch diameter open-hole bedrock wells using rock coring drilling methods, which were completed as monitoring well (MW) -17R and injection well (IW) -01. E & E was on-site and performed oversight of LaBella's field activities.

LaBella used 6 ¼-inch inner diameter (ID) augers to drill through the overburden to the top of the bedrock, approximately 23 feet below ground surface. A 3 ⅞-inch roller bit was used to drill into the top 2 feet of weathered/fractured bedrock and grout a 4-inch ID carbon steel casing into the rock socket. After the minimum set period of 24 hours, an NX core barrel was used to core approximately 14 feet into the bedrock. The breathing zone where the drilling activities took place was monitored using a photoionization detector (PID) and oxygen/lower explosive limit meters.

During borehole advancement, the drilling subcontractor recorded the volume of water added to the borehole. The cores were extracted from the borehole and placed into wooden core boxes (provided by the subcontractor) and scanned with a PID to evaluate the presence and concentration of organic vapors. E & E recorded the description and rock quality designation of the rock cores. Description of the cores included stains; weathering; bedrock lithology; and occurrence, depth, and thickness of fractures. Photos of the bedrock cores are included in the photographic log (see Appendix A).

The protective steel casing for the wells was cut to grade, and the wells were completed as flush-mount fitted wells with locking water-tight caps (J-plugs) and steel protective covers. The drilling logs for MW-17R and IW-01 are provided in Appendix B.

LaBella containerized the drill cuttings into 10 drums, containerized investigation-derived waste (IDW) water in a polyethylene storage tank, and staged the containers adjacent to the Site building.

E & E will coordinate with a subcontractor for off-site disposal of the solid IDW on a date to be determined. E & E discharged the IDW water at the previously approved discharge location inside the building at 190 Anderson Avenue, Rochester, New York, on November 30, 2020 (see Section 2.1.10).

2.1.2 Well Development

Once the drilling was complete, E & E developed each well in accordance with the work plan using a submersible pump set at a rate of approximately 1.8 gallons per minute. The wastewater was containerized in a 750-gallon polyethylene tank provided by LaBella.

E & E discharged the water at the previously approved discharge location inside the building at 190 Anderson Avenue, Rochester, New York, on November 30, 2020 (see Section 2.1.10.3).

2.1.3 Water Level Survey

After the new bedrock wells were developed, E & E collected static groundwater level measurements of 27.70 feet and 27.95 feet for MW-17R and IW-01, respectively.

2.1.4 Slug Tests

After installation and development of MW-17R and IW-01, NYSDEC requested that E & E perform slug tests on the pilot study wells to obtain additional information on the hydraulic conductivity of the wells prior to injection of the reagent. On September 25, 2020, E & E conducted slug tests on MW-8R, IW-01, and MW-17R.

General well and aquifer parameters assumed for the slug tests included:

- Assumed aquifer thickness: 20 feet;
- Open core hole radius: 2 inches (0.167 feet);
- Radius of transducer equipment: 0.25 inches (0.021 feet); and
- Solid slug volume: 0.65-gallon displacement (approximately 1-foot change in wells).

2.1.4.1 Slug Test Results

Table 2-1 provides a summary of the pertinent hydraulic parameters associated with each well. Test results are discussed, by well, following the table.

Table 2-1 Slug Test Results

Well ID	Falling Head Estimated K	Rising Head Estimated K	Average K
MW-8R	0.234 ft/day	0.172 ft/day	0.203 ft/day
IW-01	194 ft/day	272 ft/day	233 ft/day
MW-17R	384 ft/day	333 ft/day	358 ft/day

Key:
ft/day = feet per day
K = relative hydraulic conductivity

MW-8R

Both rising- and falling-head slug tests were performed on this well and the open borehole screen area was fully saturated. Initial test results suggested the well would require approximately 40 to 45 minutes to fully complete a test; however, since this test rate was significantly different than the rates for the other wells (see IW-01 and MW-17R test descriptions below), only the first 5 minutes of slug test data was collected for each test to provide a relative hydraulic conductivity (K) to compare against the estimated K values for the other wells (MW-8R K value is two orders of magnitude lower than the other wells).

IW-01

Both rising- and falling-head slug tests were performed on this well. Data from both test types were analyzed; however, the accuracy of the falling-head results are suspect since the open core-hole screen area was not fully saturated (the injected slug caused groundwater to rise and potentially interact with bedrock or fractures that do not produce groundwater). Therefore, the rising-head results should be considered the more reliable and accurate.

MW-17R

Both rising- and falling-head slug tests were performed on this well. Data from both test types were analyzed; however, the accuracy of the falling-head results are suspect since the open core-hole screen area was not fully saturated (the injected slug caused groundwater to rise and potentially interact with bedrock or fractures that do not produce groundwater). Therefore, the rising-head results should be considered the more reliable and accurate.

2.1.5 Baseline and 2020 Annual Groundwater Sample Collection

Baseline groundwater samples were collected from the bedrock wells starting on October 12, 2020, and running through October 15, 2020. Groundwater samples were submitted to NYSDEC's call-out laboratory, TestAmerica Laboratories, Inc. (TestAmerica), for VOC, sulfate, and alkalinity analyses and E & E validated the data. The water levels and total depth of each bedrock well are presented in Table 2-2, water quality field measurements are presented in Table 2-3, and the alkalinity, sulfate, and detected VOCs analytical results are presented in Table 2-4.

Groundwater samples collected from the remaining overburden wells for the 2020 annual sampling were submitted to TestAmerica for VOC analysis. The field measurements and VOC analytical results for these wells will be presented in the 2020 Periodic Review Report along with the results from the bedrock wells.

Table 2-2 2020 Annual/Baseline Sampling Groundwater Elevations, Bedrock Wells, Davis-Howland Oil Corporation Site

Well ID	Measurement Date	Measured Total Depth (feet TOIC)	Ground Elevation (feet AMSL)	TOIC Elevation (feet AMSL)	Depth to Water (feet TOIC)	Groundwater Elevation (feet AMSL)
IW-01	10/12/2020	37.48	497.99	497.66	27.95	469.71
MW-2R	10/13/2020	30.5	497.72	497.54	17.9	479.64
MW-5R	10/13/2020	34.71	498.63	498.23	14.12	484.11
MW-8R	10/12/2020	35.36	498.09	497.64	22.88	474.76
MW-10R	10/14/2020	35.57	497.81	497.44	20.22	477.22
MW-14R	10/13/2020	33.91	495.44	495.18	9.44	485.74
MW-15R	10/14/2020	30.3	494.5	494.14	16.91	477.23
MW-16R	10/14/2020	31.1	493.43	493.04	22.2	470.84
MW-17R	10/12/2020	36.85	497.81	497.43	27.79	469.64
PW-1	10/15/2020	29.34	498.02	494.41	10.46	483.95

Key:
AMSL = above mean sea level
IW = injection well
MW = monitoring well
TOIC = top of inner casing

Table 2-3 2020 Annual/Baseline Sampling Groundwater Quality Field Measurements, Bedrock Wells, Davis-Howland Oil Corporation Site

Well ID	Measurement Date	pH (s.u.)	Temperature (°C)	ORP (mV)	Conductivity (µS/cm)	DO (mg/L)	Unfiltered Turbidity (NTU)
IW-01	10/12/2020	5.21	15.53	-36	1.09	0.51	1
MW-2R	10/13/2020	6.95	14.83	-25	1.04	5.77	0
MW-5R	10/13/2020	6.91	16.29	-80	1.28	0.38	30.2
MW-8R	10/12/2020	7.44	14.84	-48	1.41	0	6.4
MW-10R	10/14/2020	6.51	14.57	25	1.04	0.07	0
MW-14R	10/13/2020	7.26	14.55	-157	0.87	0	23.1
MW-15R	10/14/2020	7.16	14	23	1.14	7.47	17.7
MW-16R	10/14/2020	7.02	15.6	-229	0.961	5.64	295
MW-17R	10/12/2020	7.67	15.45	-35	1.47	3.51	11.9
PW-1	10/15/2020	6.78	16.8	-116	1.6	0	0.2

Key:
°C = degrees Celsius
DO = dissolved oxygen
mV = millivolts
µS/cm = microSiemens per centimeter
NS = not sampled
NTU = nephelometric turbidity unit
ORP = oxygen reduction potential
s.u. = standard units

Table 2-4 2020 Annual/Baseline Positive VOC, Alkalinity, Sulfate Results, Bedrock Wells, Davis-Howland Oil Corporation Site

Analyte	Screening Criteria [1]	Notes	Location ID: IW-01 / Sample Name: IW-01-OCT20 / Depth: 26 - 37 feet / Date: 10/12/20	MW-2R / MW-2R-OCT20 / 21 - 28 feet / 10/14/20	MW-5R / MW-5R-OCT20 / 12 - 35 feet / 10/13/20	MW-8R / MW-8-OCT20 / 20 - 38 feet / 10/12/20	MW-10R / MW-10R-OCT20 / 19 - 37 feet / 10/14/20	MW-14R / MW-14R-OCT20 / 6.1 - 24 feet / 10/13/20	MW-15R / MW-15R-OCT20 / 15 - 32 feet / 10/15/20	MW-16R / MW-16R-OCT20 / 20 - 33 feet / 10/15/20	MW-17R / MW-17R-OCT20 / 26 - 37 feet / 10/12/20	MW-17R / MW-17R-OCT20-Q / 26 - 37 feet / 10/12/20	PW-1 / PW-1-OCT20 / 7.9 - 29 feet / 10/15/20
Alkalinity by Standard Method 2320B (mg/L)													
Alkalinity, Bicarbonate (As CaCO3)	N/A		**308 J**	**319**	**302**	**326**	**344**	**295**	**406**	**326**	**332 J**	**332 J**	**322**
Alkalinity, Carbonate (As CaCO3)	N/A		0.79 UJ	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 UJ	0.79 UJ	0.79 U
Alkalinity, Hydroxide (As CaCO3)	N/A		0.79 UJ	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 UJ	0.79 UJ	0.79 U
Alkalinity, Total (As CaCO3)	N/A		**308 J**	**319**	**302**	**326**	**344**	**295**	**406**	**326**	**332 J**	**332 J**	**322**
Sulfate by EPA Method 300.0 (mg/L)													
Sulfate (As SO4)	250		**118**	**152**	**277**	**152**	**57.0**	**73.8**	**69.4**	**122**	**204**	**206**	**498**
Volatile Organic Compounds by EPA Method 624.1 (µg/L)													
1,1-Dichloroethane	5		**11 J**	**11 J**	12 U	**76**	12 U	0.59 U	12 U	12 U	**100**	**98**	**34 J**
1,1-Dichloroethene	5		4.3 U	6.8 U	17 U	**35 J**	17 U	0.85 U	17 U	17 U	**23 J**	**23 J**	17 U
Dichloroethylenes	5		**290**	**270**	**450**	**4,000**	64 U	**8.4 J**	64 U	**390**	**1,400**	**1,400**	**290**
Tetrachloroethylene (PCE)	5		1.7 U	2.7 U	6.8 U	3.4 U	6.8 U	0.34 U	6.8 U	6.8 U	**11 J**	**9.7 J**	6.8 U
Trans-1,2-Dichloroethene	5		**3.4 J**	4.7 U	12 U	5.9 U	12 U	**1.0 J**	12 U	12 U	**6.2 J**	**6.4 J**	12 U
Trichloroethylene (TCE)	5		**3.8 J**	4.8 U	12 U	6.0 U	**1100**	**1.7 J**	12 U	12 U	**120**	**110**	12 U
Vinyl Chloride	2		**56**	**140**	**75 J**	**550**	15 U	**9.3**	15 U	**140**	**280**	**260**	**73 J**
TOTAL VOCs			**310**	**420**	**530**	**4,700**	**1,100**	**20**	**ND**	**530**	**1,900**	**1,900**	**400**

Key:

Qualifiers

J = Estimated value

U = Not detected (method detection limit shown)

Notes

N/A = Not regulated/no available criteria

Other

EPA = U.S. Environmental Protection Agency

µg/L = Micrograms per liter

mg/L = milligrams per liter

"-Q" denotes field duplicate sample

VOC = volatile organic compound

Bold values denote positive hits.

Shaded values exceed groundwater screening criteria.

1. New York State Department of Environmental Conservation, Technical and Operational Guidance Series Memorandum #1.1.1: *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations,* 1998 (with updates), Class GA Groundwater Standards and Guidance Values.

Source: Ecology and Environment Engineering and Geology, P.C. 2020

2.1.6 Chem-Ox Reagent Injection

Based on the limited Site data associated with the bedrock capacity, it was initially assumed that it would take two workdays to inject 5,000 gallons of PersulfOx solution into IW-01. Based on the information obtained from installation and development of IW-01 and MW-17R, and from the results of the slug tests and baseline groundwater sampling, NYSDEC and E & E agreed that the reagent would instead be injected into MW-17R and MW-8R over a period of three days.

Over the course of three days (October 27, 2020, through October 29, 2020), LaBella, injected the reagent into MW-17R and MW-8R. E & E was on-site to oversee the injection activities and collect field measurements of water quality, alkalinity, and sulfate concentrations at Site bedrock wells at the beginning and end of each day during the injections (see Tables 2-5, 2-6, and 2-7).

Thirty-nine 55-pound bags of PersulfOx were delivered to the Site in powder form, which was mixed with potable water from a nearby fire hydrant to form a solution with a total volume of 5,150 gallons. The solution was mixed in 250-gallon cubes with approximately seven to seven and a half bags of PersulfOx for every 250 gallons of potable water. A total of 4,150 gallons of solution were injected into MW-17R and 1,000 gallons of solution were injected into MW-8R.

2.1.7 Well Survey

Patriot Design & Consulting (Patriot) of Rochester, New York, a service-disabled veteran-owned small business surveyor, surveyed the locations of MW-17R and IW-01 on November 8, 2020. Patriot also surveyed MW-8R, which confirmed the previously surveyed location. E & E was on-site during the surveyor's field activities.

The survey included horizontal locations and vertical elevations, including the ground elevation and the elevation of the inner riser of each well. The survey data were used to update the Site base map (see Figure 1-2).

2.1.8 One-Month Post-Injection Groundwater Sample Collection

One-month post-injection groundwater samples were collected from the bedrock wells from November 30, 2020, through December 3, 2020, and were submitted to NYSDEC's call-out laboratory, TestAmerica, for VOC, sulfate, and alkalinity analyses. E & E then validated the data. The water level and total depth of each bedrock well are presented in Table 2-8; water quality field measurements are presented in Table 2-9; and the alkalinity, sulfate, and detected VOCs analytical results are presented in Table 2-10.

Table 2-5 October 27, 2020, Field Measurements during Chem-Ox Injection Pilot Study, Davis-Howland Oil Corporation Site

Well ID	Temp (°C)	pH	Conductivity (µs/cm)	ORP (mV)	DO (mg/L)	DO (% L)	TDS (ppm)	Turbidity (NTU)	Total Alkalinity (mg/L)	Total Sulfate (mg/L)	Time
Morning Readings											
MW-2R	14.5	7.73	109.9	-7	9.09	84.8	54.99	10.97	814	-10	11:25
MW-5R	15.7	7.1	918.9	-64	2.75	25.6	481	1.29	1,073	159	12:20
MW-8R	13.4	7.04	1,063	-16	2.55	23.3	557.7	3.34	1049	131	11:05
MW-14R	15.6	7.23	117.3	70	5.9	54.9	58.98	11.7	1132	-8.46	12:05
MW-15R	13.1	6.94	383.8	-15	3.5	32.3	197.1	6.57	1,153	1.11	12:50
MW-16R	14	7.21	281.9	18	5.93	55.8	143.8	1.9	1,173	-0.026	12:55
MW-17R	11.7	6.4	1,230	45	3.35	30	645.4	15.8	1,127	189	9:40
PW-1	16.9	7.26	334.3	-68	2.21	20.8	170.8	2.1	961	35.6	12:30
Afternoon Readings											
IW-01	13.8	7.31	1,048	-41	2.97	27	549.9	11.38	1,138	136	16:20
MW-2R	14.5	7.74	112.1	-9	9.23	87.6	56.16	18.3	843	-6.88	14:30
MW-5R	16.4	7.25	915.8	-86	3.02	29.5	478.2	7.04	1,115	154	14:35
MW-8R	14.3	7.19	1,051	2	3.37	13	550.6	6.69	1,184	138	14:20
MW-16R	14.6	7.17	992.1	-54	3.05	28.89	520	20.8	1,144	106	15:05
PW-1	17.1	7.26	457.3	-77	2.39	23.8	235.2	1.15	1042	27	14:45

Notes:
Performance monitoring was performed at bedrock wells during PersulfOx injection from October 27, 2020 to October 29, 2020.
Water quality parameter measurements for process monitoring during injection were collected with hand-held field meters.
Alkalinity and sulfate samples were collected and measured with a hand-held field meter.

Key:
°C = degrees Celsius
DO = dissolved oxygen
mV = millivolts
µS/cm = microsiemens per centimeter
NS = not sampled
NTU = nephelometric turbidity unit
ORP = oxygen reduction potential
s.u. = standard units

Table 2-6 October 28, 2020, Field Measurements during Chem-Ox Injection Pilot Study, Davis-Howland Oil Corporation Site

Well ID	Temp (°C)	pH	Conductivity (µs/cm)	ORP (mV)	DO (mg/L)	DO (% L)	TDS (ppm)	Turbidity (NTU)	Total Alkalinity (mg/L)	Total Sulfate (mg/L)	Time
Morning Readings											
IW-01	13.8	7.19	1,177	-52	2.36	21.2	619.6	11.7	1,103	161	8:35
MW-2R	13.7	7.81	149.7	-37	9.62	87.6	75.48	79.9	1,117	24.9	8:50
MW-5R	16.3	7.1	964.5	-45	2.59	23.8	510.3	14	1,161	159	9:15
MW-8R	13.8	6.69	1,137	126	3.82	35.2	595.1	8.64	1,474	140	8:25
MW-10R	14.3	7.23	864.3	63	2.2	20.5	449.7	4.29	1,145	62.9	10:20
MW-14R	15.5	7.64	127.2	68	5.46	51.7	64.06	9.89	778	-7.9	9:00
MW-15R	13.1	7.17	498.4	5	3.27	30.3	257.1	9.58	1,018	16.3	9:45
MW-16R	13.8	7.08	1,086	-5	2.86	26.4	567.4	12.3	1,059	116	9:40
PW-1	17	7.43	358.5	-57	2.53	24	183.3	3.11	1,038	31.7	9:30
Afternoon Readings											
IW-01	13.8	10.01	15,770	322	4.61	43.6	9,275	34.5	1,022	275	13:50
MW-2R	14.3	9.23	435.1	411	9.31	89.3	224.9	83.1	1,000	30	13:55
MW-5R	16.7	7.37	972.2	141	2.91	29.2	509.3	16.6	1,038	159	14:20
MW-14R	15.6	8.55	129.7	386	5.86	56.9	65.4	9.13	791	-7.95	14:00
MW-15R	13.7	7.24	544.2	76	3.62	35	280.9	8.9	1,036	27.1	14:45
MW-16R	14.5	7.24	1,078	59	3.39	33	565	13.8	1,078	117	14:40
PW-1	17.8	7.48	354.8	36	2.8	28.3	181.8	4.76	1,012	37.3	14:30

Notes:
Performance monitoring was performed at bedrock wells during PersulfOx injection from October 27,2020 to October 29, 2020.
Water quality parameter measurements for process monitoring during injection were collected with hand-held field meters.
Alkalinity and sulfate samples were collected and measured with a hand-held field meter.

Key:
°C = degrees Celsius
DO = dissolved oxygen
mV = millivolts
µS/cm = microsiemens per centimeter
mg/L = milligrams per liter
NS = not sampled
NTU = nephelometric turbidity unit
ORP = oxygen reduction potential
ppm = parts per million

Table 2-7 October 29, 2020, Field Measurements during Chem-Ox Injection Pilot Study, Davis-Howland Oil Corporation Site

Well ID	Temp (°C)	pH	Conductivity (µs/cm)	ORP (mV)	DO (mg/L)	DO (% L)	TDS (ppm)	Turbidity (NTU)	Total Alkalinity (mg/L)	Total Sulfate (mg/L)	Time
Morning Readings											
IW-01	13.6	6.14	2,049	355	2.97	27.3	1,087	75.3	1,169	305	8:30
MW-2R	13.9	5.76	4,102	438	2.1	19.6	2,261	>1,000	1,691	166	8:40
MW-5R	16.8	7.16	982.9	285	2.85	28.2	513.7	15.1	1,021	160	8:50
MW-10R	13.6	7.24	473.6	166	3.69	34.8	244	7.45	1,051	40.7	9:25
MW-14R	15.6	6.72	145	388	5.23	50.6	73.72	37.3	790	-5.27	8:45
MW-15R	14.1	7.2	564.5	192	4.94	47.3	291.8	9.01	1,031	28.8	9:20
MW-16R	15.3	7.24	1,099	215	2.4	23.2	576.4	15.1	1,042	112	9:15
PW-1	17.9	7.25	361.6	182	2.67	26.9	185.5	5.37	969	33.4	8:55
Afternoon Readings											
IW-01	13.5	9.95	41,020	431	4.41	41.6	25,600	>1,000	1,094	486	12:15
MW-2R	14.3	6	4,221	486	2.3	21.9	2,328	>1,000	1,333	477	12:20
MW-5R	16.9	7.35	984.7	162	2.54	25.1	515.8	6.24	1,015	162	12:35
MW-10R	13.8	7.32	565.8	102	4.21	40.1	292.4	9.99	1,023	43.7	13:00
MW-14R	15.9	7.1	138.3	440	5.39	52.3	69.76	12.1	819	-6.57	12:25
MW-15R	13.8	7.25	686.9	102	4.55	43.5	355.8	9.63	1,021	27	12:55
MW-16R	15.5	7.34	1,154	71	2.91	28	606.4	11.4	1,164	119	12:50
PW-1	17.8	7.36	361.5	253	3.38	33.9	185.3	4.37	977	25.9	12:40

Notes:
Performance monitoring was performed at bedrock wells during PersulfOx injection from October 27, 2020 to October 29, 2020.
Water quality parameter measurements for process monitoring during injection were collected with hand-held field meters.
Alkalinity and sulfate samples were collected and measured with a hand-held field meter.

Key:
°C = degrees Celsius
DO = dissolved oxygen
mV = millivolts
µS/cm = microsiemens per centimeter
mg/L = milligrams per liter
NS = not sampled
NTU = nephelometric turbidity unit
ORP = oxygen reduction potential

Table 2-8 One-Month Post-Injection Sampling Groundwater Elevations, Bedrock Wells, Davis-Howland Oil Corporation Site

Well ID	Measurement Date	Measured Total Depth (feet TOIC)	Ground Elevation (feet AMSL)	TOIC Elevation (feet AMSL)	Depth to Water (feet TOIC)	Groundwater Elevation (feet AMSL)
IW-01	11/30/2020	37.4	497.99	497.66	26.74	470.92
MW-2R	12/1/2020	30.41	497.72	497.54	14.21	483.33
MW-5R	12/2/2020	34.73	498.63	498.23	14.15	484.08
MW-8R	12/1/2020	33.9	498.09	497.64	14.36	483.28
MW-10R	12/2/2020	35.55	497.81	497.44	19.45	477.99
MW-14R	12/2/2020	23.7	495.44	495.18	11.09	484.09
MW-15R	12/1/2020	30.32	494.5	494.14	16.44	477.7
MW-16R	12/1/2020	31.05	493.43	493.04	19.4	473.64
MW-17R	11/30/2020	36.6	497.81	497.43	26.29	471.14
PW-1	11/30/2020	28	498.02	494.41	10.62	483.79

Key:
AMSL = above mean sea level
MW = monitoring well
TOIC = top of inner casing

Table 2-9 One-Month Post-Injection Sampling Groundwater Quality Field Measurements, Bedrock Wells, Davis-Howland Oil Corporation Site

Well ID	Measurement Date	pH (s.u.)	Temperature (°C)	ORP (mV)	Conductivity (µS/cm)	DO (mg/L)	Unfiltered Turbidity (NTU)
IW-01	11/30/2020	7.55	12.43	-43	1.37	0	7.7
MW-2R	12/1/2020	7.52	11.25	273	0.129	11.42	35.6
MW-5R	12/2/2020	6.52	12.58	410	1.85	0.35	6.1
MW-8R	12/1/2020	8.17	13.53	350	23.4	0.79	31.5
MW-10R	12/2/2020	7.06	11.76	-146	1.0	0.52	0
MW-14R	12/1/2020	7.16	12.5	-65	0.819	0.56	16.6
MW-15R	12/1/2020	7.42	12.53	30	1.12	8.91	46.5
MW-16R	12/2/2020	6.11	14.03	165	1.07	11.55	66.5
MW-17R	11/30/2020	7.95	13.59	-92	1.29	0.93	7.6
PW-1	11/30/2020	7.52	14.98	-52	1.96	0.3	12.9

Key:
°C = degrees Celsius
DO = dissolved oxygen
mV = millivolts
µS/cm = microsiemens per centimeter
NS = not sampled
NTU = nephelometric turbidity unit
ORP = oxygen reduction potential
s.u. = standard units

2.1.9 Decontamination Procedures

Decontamination was performed in accordance with NYSDEC-approved procedures. Intrusive and groundwater sampling equipment was decontaminated before and after each location was drilled and sampled, and downhole tooling was decontaminated prior to and following each use.

A temporary decontamination area was established on-site using heavy plastic sheeting as a pad. The primary purpose of the pad was to contain and collect fluids from decontamination associated with down-hole tooling and drill rig units. Fluids generated during decontamination were containerized in the 750-gallon polyethylene tank.

2.1.10 Investigation-derived Waste Management

The following types of IDW were generated: soil cuttings from subsurface drilling; the heavy plastic used for the decontamination pad; decontamination water from drilling equipment and purge water from well installation and development; purge water from 2020 annual/baseline sampling; purge water from one-month post-injection sampling; and spent PPE.

2.1.10.1 Soil and Rock Cuttings from Monitoring Well Boreholes

Drill cuttings were containerized in 55-gallon drums and stored on-site under a plastic tarp pending receipt of analytical results and disposal. E & E performed sample collection of the drill cuttings generated from the pilot study. The soil sample was analyzed for toxicity characteristic leaching procedure (TCLP) VOCs and TCLP metals by the NYSDEC call-out laboratory, TestAmerica. The results of the analyses indicated that the IDW soil was non-hazardous.

Quotes were requested after sampling and characterization of the IDW. Environmental Service Group (NY) Inc. (ESG) was selected as the subcontractor to dispose of the drill cuttings. E & E will coordinate with ESG for off-site disposal of the solid IDW on a date to be determined.

2.1.10.2 Decontamination Pad

The heavy plastic used for the decontamination pad was containerized in a 55-gallon drum with the drill cuttings.

2.1.10.3 Decontamination Water and Purge Water from Installation and Development of Monitoring Wells

The IDW waters were stored in the 750-gallon polyethylene storage tank at the Site pending sampling and analysis. E & E performed sample collection of the wastewater generated from the pilot study. The aqueous sample was analyzed for VOCs and TCLP VOCs by the NYSDEC call-out laboratory, TestAmerica. The analytical results indicated that the wastewater was within the limits of the Site's Monroe County discharge permit.

Table 2-10 One-Month Post-Injection Positive VOC, Alkalinity, Sulfate Results, Bedrock Wells, Davis-Howland Oil Corporation Site

Analyte	Screening Criteria [1]	Notes	Location ID: IW-01 / Sample Name: IW-01-NOV20 / Depth: 26 - 37 feet / Date: 11/30/20	MW-2R / MW-2R-DEC20 / 21 - 28 feet / 12/01/20	MW-5R / MW-5R-DEC20 / 12 - 35 feet / 12/02/20	MW-8R / MW-8-DEC20 / 20 - 38 feet / 12/01/20	MW-8R / MW-8-DEC20-Q / 20 - 38 feet / 12/01/20	MW-10R / MW-10R-DEC20 / 19 - 37 feet / 12/02/20	MW-14R / MW-14R-DEC20 / 6.1 - 24 feet / 12/02/20	MW-15R / MW-15R-DEC20 / 15 - 32 feet / 12/01/20	MW-16R / MW-16R-DEC20 / 20 - 33 feet / 12/02/20	MW-17R / MW-17R-NOV20 / 26 - 37 feet / 11/30/20	PW-1 / PW-1-NOV20 / 7.9 - 29 feet / 11/30/20
Alkalinity by Standard Method 2320B (mg/L)													
Alkalinity, Bicarbonate (As CaCO3)	N/A		**358**	**41.5**	**304 J**	**909**	**918**	**337**	**335**	**402**	**430**	**319**	**338**
Alkalinity, Carbonate (As CaCO3)	N/A		0.79 U	0.79 U	0.79 UJ	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	**0.96 J**	0.79 U
Alkalinity, Hydroxide (As CaCO3)	N/A		0.79 U	0.79 U	0.79 UJ	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U
Alkalinity, Total (As CaCO3)	N/A		**359**	**41.5**	**304 J**	**909**	**918**	**337**	**335**	**402**	**430**	**320**	**338**
Sulfate by EPA Method 300.0 (mg/L)													
Sulfate (As SO4)	250		**260**	**10.4**	**298**	**5780**	**5950**	**51.8**	**60.2**	**85.3**	**475**	**187**	**642**
Volatile Organic Compounds by EPA Method 624.1 (µg/L)													
1,1,1-Trichloroethane (TCA)	5		**1.5**	0.24 U	0.24 U	0.24 U	0.24 U	**5.8**	0.24 U	0.24 U	0.24 U	0.48 U	**1.0**
1,1,2-Trichloroethane	1		0.15 U	0.15 U	0.15 U	**0.83 J**	**0.67 J**	0.30 U	0.15 U	0.15 U	0.15 U	0.30 U	0.15 U
1,1-Dichloroethane	5		**13**	0.26 U	**13**	**21**	**21**	**2.9**	0.26 U	**0.55 J**	**15**	**31**	**34**
1,1-Dichloroethene	5		**4.3**	0.12 U	**2.8**	0.12 U	0.12 U	**7.5**	0.12 U	0.12 U	**4.4**	**7.6**	**3.7**
Benzene	1		0.43 U	0.43 U	**1.0**	0.43 U	0.43 U	0.86 U	0.43 U	0.43 U	0.43 U	0.86 U	**1.2**
Bromomethane	5		0.45 U	0.45 U	0.45 U	**0.60 J**	**0.53 J**	0.90 U	0.45 U	0.45 U	0.45 U	0.90 U	0.45 U
Chloroethane	5		0.32 U	0.32 U	0.32 U	**0.91 J**	**0.79 J**	0.64 U	0.32 U	0.32 U	0.32 U	0.64 U	0.32 U
Chloroform	7		0.33 U	0.33 U	0.33 U	**1.7**	**1.6**	0.65 U	0.33 U	0.33 U	0.33 U	0.65 U	0.33 U
Chloromethane	5		0.43 U	0.43 U	0.43 U	**21**	**21**	0.87 U	0.43 U	0.43 U	0.43 U	0.87 U	0.43 U
Dichloroethylenes	5		**180**	**2.5**	**390**	**170**	**180**	**21**	**10**	**11**	**350**	**570**	**280**
Tetrachloroethylene (PCE)	5		**0.34 J**	0.25 U	0.25 U	0.25 U	0.25 U	**3.1**	0.25 U	0.25 U	0.25 U	**4.2**	0.25 U
Trans-1,2-Dichloroethene	5		**2.2**	0.24 U	**6.3**	**5.9**	**6.0**	**4.3**	**0.93 J**	**0.91 J**	**2.3**	**6.1**	**4.1**
Trichloroethylene (TCE)	5		**2.4**	0.31 U	**19**	**0.97 J**	**1.2 J**	**680**	**1.5**	**1.8**	0.31 U	**37**	**20**
Vinyl Chloride	2		**23**	**0.42 J**	**53**	**4.5**	**5.4**	0.68 U	**3.2**	**0.85 J**	**110**	**83**	**65**
TOTAL VOCs			**230**	**2.9**	**490**	**230**	**240**	**730**	**16**	**15**	**480**	**740**	**410**

Key:

Qualifiers

J = Estimated value

U = Not detected (method detection limit shown)

Notes

N/A = Not regulated/no available criteria

Other

µg/L = Micrograms per liter

"-Q" denotes field duplicate sample

EPA = U.S. Environmental Protection Agency

VOC = volatile organic compound

Bold values denote positive hits.

Shaded values exceed groundwater screening criteria.

1. New York State Department of Environmental Conservation, Technical and Operational Guidance Series Memorandum #1.1.1: *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations,* 1998 (with updates), Class GA Groundwater Standards and Guidance Values.

Source: Ecology and Environment Engineering and Geology, P.C. 2020

Approval was received from Monroe County for discharge of the purge water on November 10, 2020, and E & E discharged the water at the previously approved discharge location inside the building at 190 Anderson Avenue, Rochester, New York, on November 30, 2020.

2.1.10.4 Purge Water from the 2020 Annual/Baseline Groundwater Sampling

Purged and decontamination water was stored on-site in two 50-gallon drums pending sampling and analysis. E & E performed sample collection of the water generated from the baseline and annual sampling. The aqueous sample was analyzed for VOCs by the NYSDEC call-out laboratory, TestAmerica. The analytical results indicated that the wastewater was within the limits of the Site's Monroe County discharge permit. Approval was received from Monroe County for discharge of the purge water on November 4, 2020, and E & E discharged the water at the previously approved discharge location inside the building at 190 Anderson Avenue on November 30, 2020.

2.1.10.5 Purge Water from the One-month Post-injection Sampling

Purged and decontamination water is stored on-site in a 50-gallon drum. E & E performed sample collection of the water generated from the one-month post-injection sampling on December 3, 2020. The aqueous sample was analyzed for VOCs by the NYSDEC call-out laboratory, TestAmerica. The analytical results indicated that the wastewater was within the limits of the Site's Monroe County discharge permit. Approval was received from Monroe County for discharge of the purge water on January 11, 2021. E & E will discharge the water at the previously approved discharge location inside the building at 190 Anderson Avenue, tentatively scheduled for May 2021 during the six-month post-injection groundwater sampling event.

2.1.10.6 Used PPE

Used PPE was double-bagged and removed from the Site for disposal as non-hazardous solid waste at the end of each workday.

3 Summary of Results

During injection, an increase in ORP was noted at most Site bedrock wells (see Tables 2-5, 2-6, and 2-7). An increase in ORP is one of the primary indicators associated with PersulfOx injection. The ORP in IW-01 increased from -41 millivolts (mV) to 431 mV during injection and was -43 mV at one-month post-injection. The ORP in MW-8R increased from -16 mV to 126 mV during injection and was 350 mV at one-month post-injection. The ORP in MW-17R was 45 mV pre-injection and -92 mV one-month post-injection.

Other expected trends include an increase in alkalinity, sulfate, DO, and conductivity. From pre-injection to one-month post injection, alkalinity, sulfate, and conductivity increased at IW-01 and MW-8R and decreased at MW-17R. DO increased at MW-8R and decreased at IW-01 and MW-17R.

Table 3-1 presents the VOC, sulfate, and alkalinity results, and field parameter measurements from the 2020 annual/baseline and one-month post-injection sampling events. This table will be updated with results from the three-month and nine-month sampling events in the supplementary summary reports and trends will be evaluated.

VOC concentrations decreased in eight of the 10 bedrock wells, including the three pilot study wells. Total VOC concentrations in MW-15R were non-detect in October 2020 and 15 µg/L post-injection. Total VOC concentrations in PW-1 were 400 µg/L in October 2020 and 410 µg/L post-injection.

The following results are from the sampling performed prior to injection in October 2020 to the one-month post injection sampling conducted November 30 to December 3, 2020, following injection of the PersulfOx:

- MW-8R: Total VOC concentrations decreased from 4,700 micrograms per liter (µg/L) to 240 µg/L;
- IW-01: Total VOC concentrations decreased from 310 µg/L to 230 µg/L; and
- MW-17R: Total VOC concentrations decreased from 1,900 µg/L to 740 µg/L.

Table 3-1 Summary of Pre- and Post-injection Analytical Results and Field Parameters

Analyte / Field Parameter	IW-01		MW-8R		MW-17R	
	Pre-Injection	Post-Injection	Pre-Injection	Post-Injection	Pre-Injection	Post-Injection
	10/12/2020 Annual (Baseline) Sampling	11/30/2020 1-Month Sampling	10/12/2020 Annual (Baseline) Sampling	12/1/2020 1-Month Sampling	10/12/2020 Annual (Baseline) Sampling	11/30/2020 1-Month Sampling
Total VOCs (µg/L)	310	230	4,700	240	1,900	740
Total Alkalinity (mg/L)	308	359	326	918	332	320
Total Sulfate (mg/L)	118	260	152	5,950	206	187
Temp (°C)	15.53	12.43	14.84	13.53	15.45	13.59
pH	5.21	7.55	7.44	8.17	7.67	7.95
Conductivity (µS/cm)	1,090	1,370	1,410	2,340	1,470	1,290
ORP (mV)	-36	-43	-48	350	-35	-92
DO (mg/L)	0.51	0	0	0.79	3.51	0.93
Turbidity (NTU)	1	7.7	6.4	31.5	11.9	7.6

Key:
°C = degrees Celsius
DO = dissolved oxygen
mV = millivolts
µg/L = micrograms per liter
µS/cm = microSiemens per centimeter
NS = not sampled
NTU = nephelometric turbidity unit
ORP = oxygen reduction potential
VOC = volatile organic compound

Figures 3-1 and 3-2 show VOC concentration contours at the Site, which were modeled from the VOC results from each well during the 2020 annual/baseline and one-month post-injection sampling events.

While the analytical data show a reduction in VOC concentrations after the injections, the results should be considered preliminary, and additional data is needed over time. Therefore, an evaluation of the effectiveness of the injections associated with the reduction of VOC concentrations will be provided in the next report.

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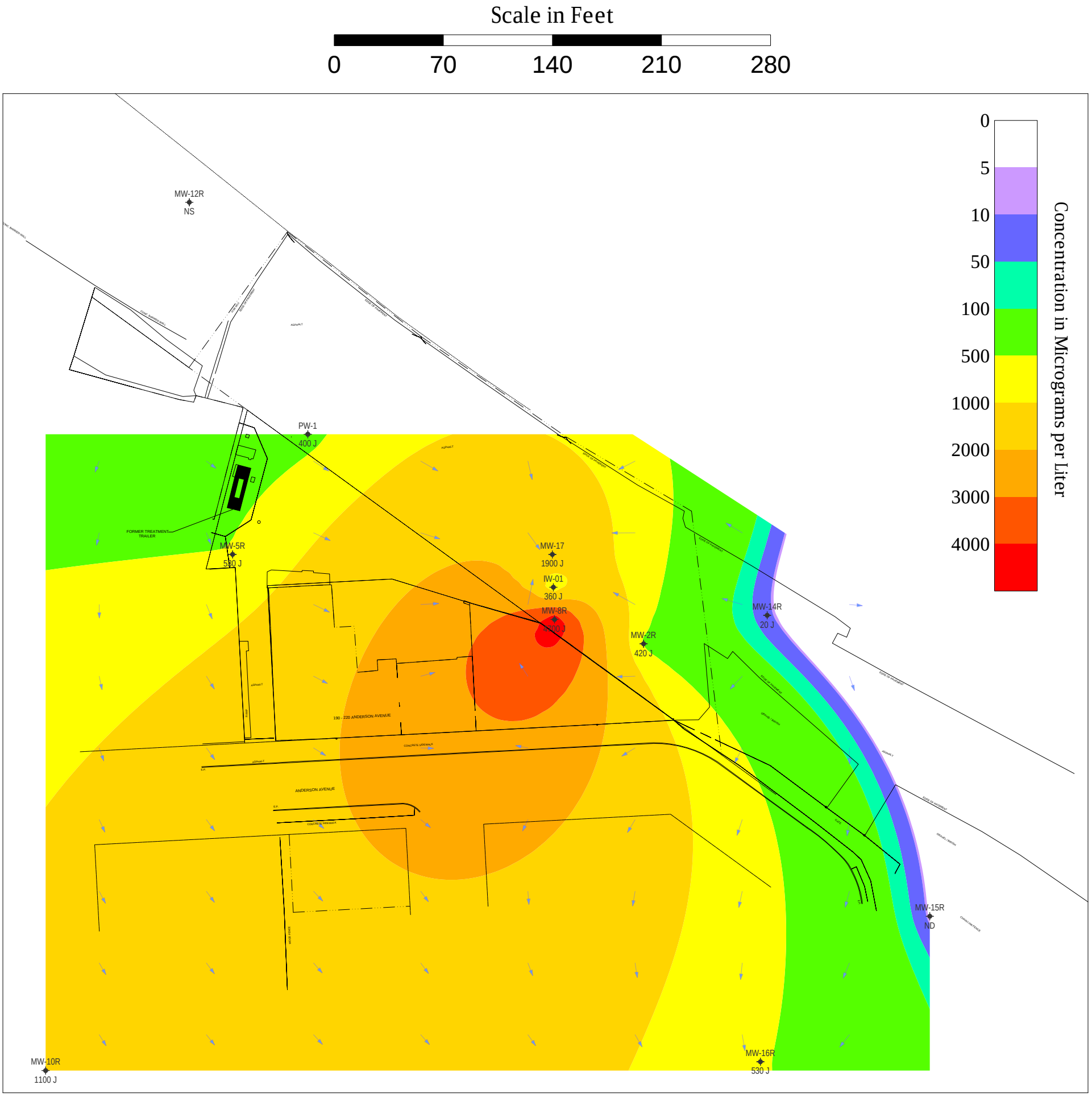
EE1705007.0009
DavisHowland_CHEMISTRY_BDRK_2020.srf - 12/14/2020

N

Total VOC Concentrations (µg/L)



Notes:
1) VOC = volatile organic compound.
2) ND = not detected
3) NS = not sampled

Legend

Groundwater Flow Direction
and Relative Magnitude of Gradient

ecology and environment
engineering and geology, p.c.
Environmental Specialists

FIGURE 3-1
Pre-Injection / Baseline Total VOCs
Bedrock Groundwater, October 2020
Davis-Howland Oil Corporation Site
Rochester, New York

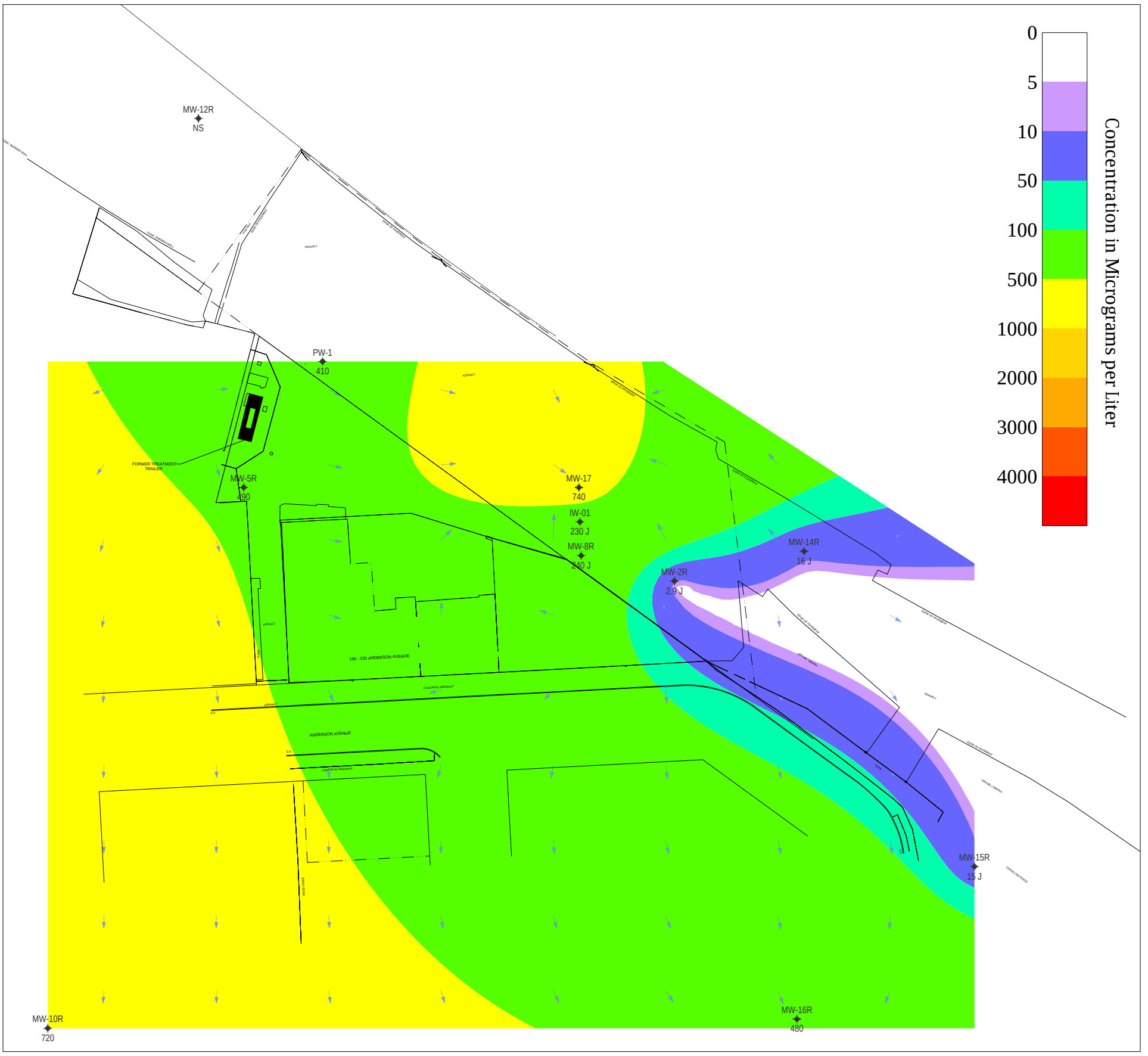
EE1705007.0009
DavisHowland_CHEMISTRY_BDRK_2020.srf - 12/14/2020

N

Total VOC Concentrations (µg/L)

Scale in Feet

0 70 140 210 280



Notes:
1) VOC = volatile organic compound.
2) NS = not sampled

Legend

Groundwater Flow Direction
and Relative Magnitude of Gradient

ecology and environment
engineering and geology, p.c.
Environmental Specialists

FIGURE 3-2
1-Month Post-Injection Total VOCs
Bedrock Groundwater, December 2020
Davis-Howland Oil Corporation Site
Rochester, New York

4 Schedule

The three-month post-injection sampling event is scheduled to be conducted during the week of February 1, 2021. The nine-month post-injection sampling event will be combined with the 2021 annual sampling event, anticipated to be performed in August 2021. The supplemental summary reports will be submitted as appendices to the pilot study summary report approximately 30 days after receipt of the three-month analytical data and again after receipt of the nine-month analytical data.

5 References

Ecology and Environment Engineering and Geology, P.C. (E & E). 2020. *Work Plan for In Situ Chemical Oxidation Pilot Study at the Davis-Howland Oil Corporation Site (828088) Rochester, New York, September 2020*

A Photographic Log

Photo Log

E & E Project No.: 1705007.0009.03	**NYSDEC WA No.: D009807-09**
Project Name: Davis-Howland Oil Corporation	**Project Location: Rochester, NY**

Facing northwest: LaBella using an auger to drill through overburden at IW-01. (9/14/2020)

Facing west: LaBella using an auger at MW-17R and containerizing soil cuttings. (9/15/2020)

Facing southwest: LaBella deploying grout to secure the casing at MW-17R. (9/15/2020)

Facing west: LaBella using rotary drill bit at IW-01 to clear grout from rock socket before drilling with NX-core barrel. (9/16/2020)

Photo Log

E & E Project No.: 1705007.0009.03	**NYSDEC WA No.: D009807-09**
Project Name: Davis-Howland Oil Corporation	**Project Location: Rochester, NY**

Facing west: LaBella using drilling fluid (water) and NX-core barrel to drill bedrock at IW-01. (9/16/2020)

Facing east: IW-01 bedrock core and core information. (9/16/2020)

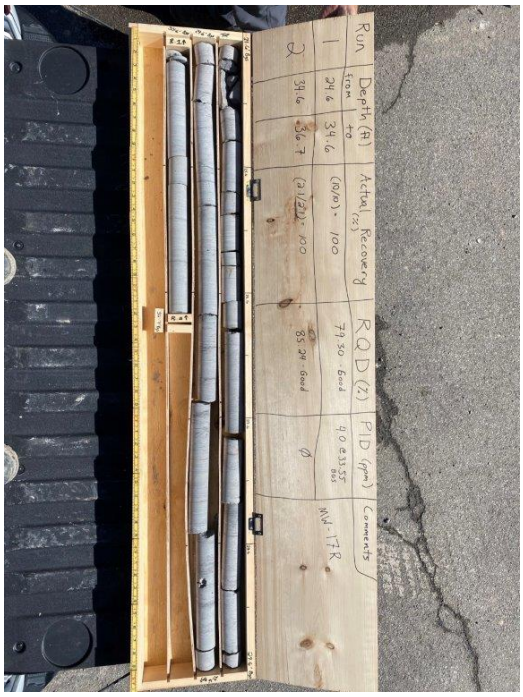
Facing east: MW-17R bedrock core and core information with IW-01 core box in the background. (9/16/2020)

Facing northwest: LaBella deconning equipment on a decontamination pad with decontamination water. IDW drum in foreground. (9/16/2020)

Photo Log

E & E Project No.: 1705007.0009.03	NYSDEC WA No.: D009807-09
Project Name: Davis-Howland Oil Corporation	Project Location: Rochester, NY

Vug-sized void space and in MW-17R NX-core with crystalline precipitate present and a pit-size void space to the left of the pen tip. (9/16/2020)



MW-17R core with depth measurements and core information. (9/18/2020)

Cross-section of a portion of the MW-17R core. (9/18/2020)

IW-01 core with depth measurements and core information. (9/18/2020)

Photo Log

E & E Project No.: 1705007.0009.03	NYSDEC WA No.: D009807-09
Project Name: Davis-Howland Oil Corporation	Project Location: Rochester, NY

Segment of IW-01 core with depth measurements. (9/18/2020)

Facing east. Injection setup showing air tank connected to bladder system, injection hose running from 250-gallon cube to well, air compressor, and pump. (10/27/2020)

Facing northeast. Injection setup at MW-8R showing cube containing PersulfOx solution, generator, air compressor, air tank for the bladder packer system, and the injection hose in the well. (10/28/2020)

Facing east. Gravity feeding PersulfOx solution from 250-gallon cube into monitoring well MW-17R. (10/28/2020)

B Drilling Logs

EM 1110-1-4000
31 AUG 94

HTRW DRILLING LOG

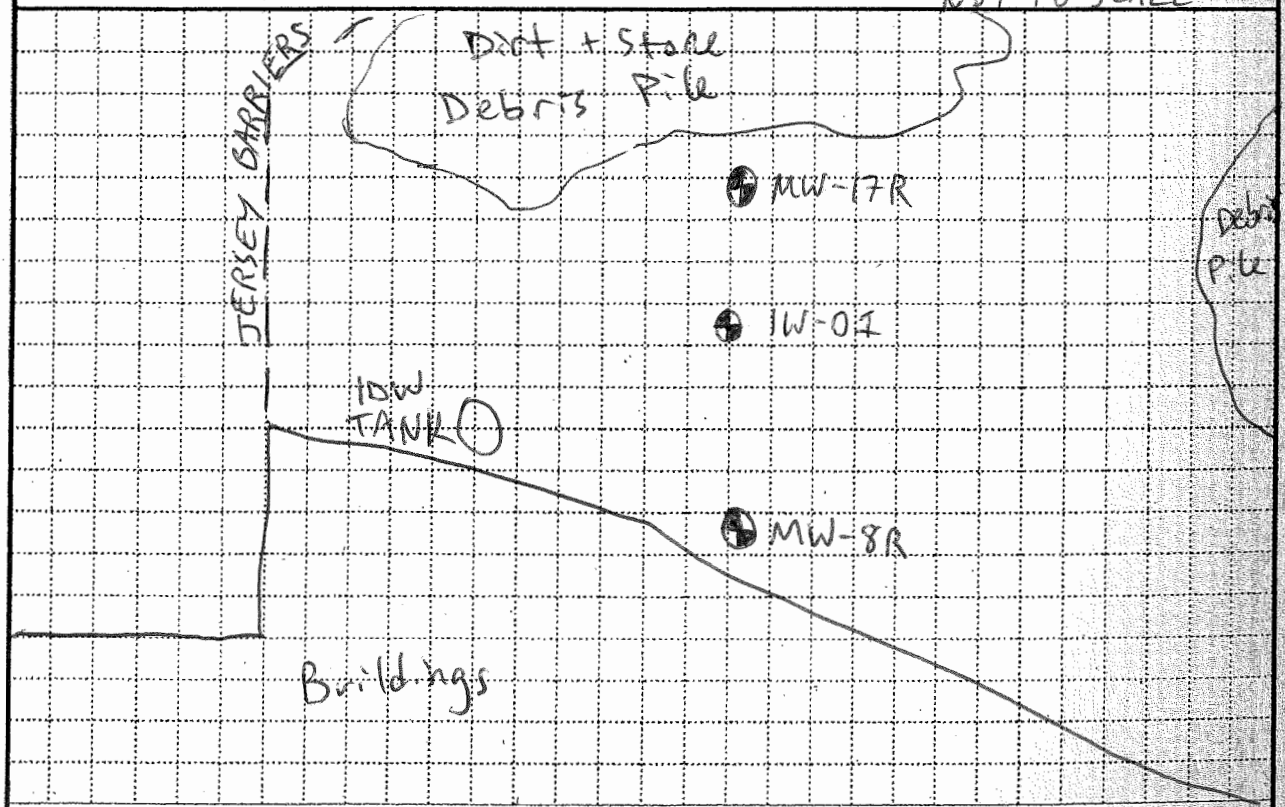
District			Hole Number: IW-01
1. Company Name: EEEGPL/WSP	2. Drill Subcontractor: LaBella		Sheet: 1 of Sheets: 4
3. Project: Davis Howland Oil Co.		4. Location: Rochester, NY	
5. Name of Driller: Chris Stone		6. Manufacturer's Designation of Drill	
7. Sizes and Types of Drilling and Sampling Equipment: 6 1/4" ID, 10 1/4" OD Auger; NX Core Barrel; 3 7/8" rotary drill bit; CME Track-mounted Drill Rig		8. Hole Location	
		9. Surface Elevation	
		10. Date Started: 9-14-2020	11. Date Completed: 9-16-2020
12. Overburden Thickness: 23.1'		15. Depth Groundwater Encountered: 27.87 ft TOIC ~42.5 hrs elapsed	
13. Depth Drilled into Rock: 14'		16. Depth to Water and Elapsed Time After Drilling Completed: (CP)	
14. Total Depth of Hole: 37.1'		17. Other Water Level Managements (Specify)	

18. Geological Samples	Disturbed	Undisturbed	19. Total Number of Core Boxes
N/A	N/A	N/A	1

20. Samples For Chemical Analysis	VOC	Metals	Other (Specify)	Other (Specify)	Other (Specify)	21. Total Core Recovery %

22. Disposition of Hole	Backfilled	Monitoring Well	Other (Specify)	23. Signature of Inspector
Well		X		

LOCATION SKETCH/COMMENTS **SCALE:** NOT TO SCALE



PROJECT DHOC **HOLE NO.** IW-01

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

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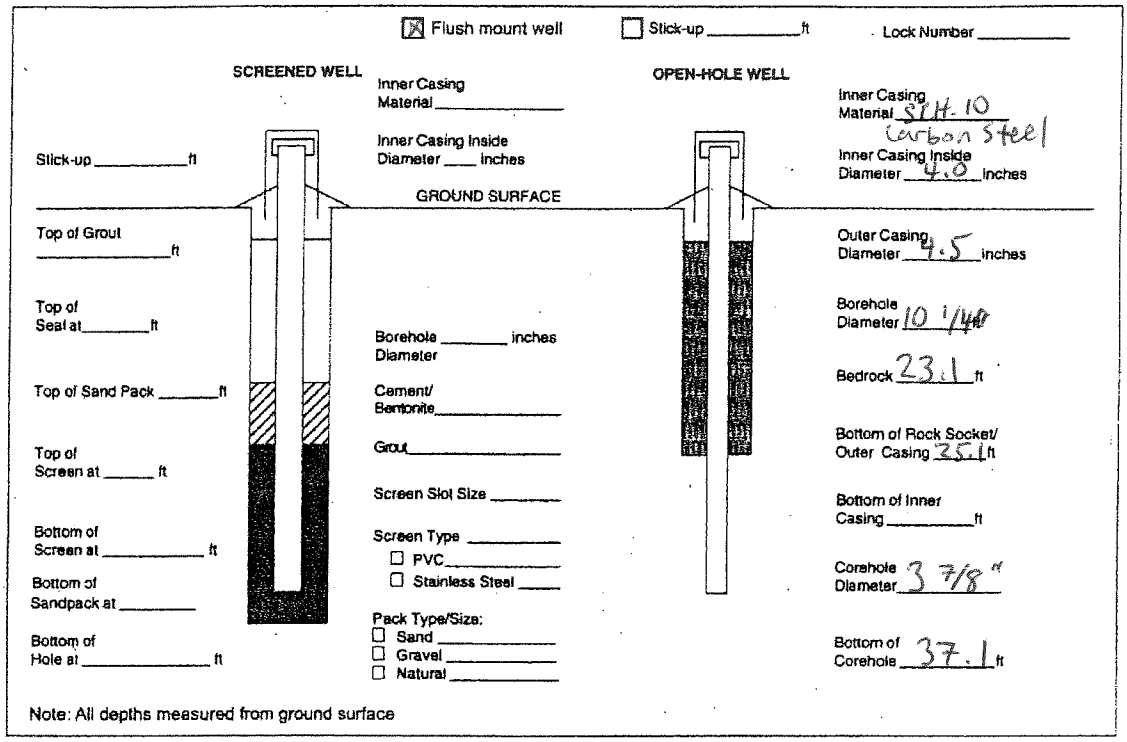
HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE DRILL LOG FORM

Well Construction Log for Well No. IW-01



Comments

- 0-20 gal. blew out top of casing directed to ground around casing by bucket covering casing (IDW drill water)
- Bedrock initially noted @23.5' BGS changed to be @23.1' BGS after more precise measurement

Investigation Derived Waste					
Container ID	Source	Date	Contents	Volume	Location/Comments
IW-01	IW-01	9-14-20	Soil cuttings/ excess grout	55 gal.	5 drums; excess grout from
IDW WATER TANK	IW-01	9-16-20	drill water	80 gal.	Drill fluid
IDW WATER TANK	IW-01	9-18-20	Purge Water	164 gal.	From development

EM 1110-1-4000
31 AUG 94

HTRW DRILLING LOG (Continuation Sheet)

Hole Number: IW-01

Project: DITOC | Inspector: C. PORRECA | Sheet 2 of 4 Sheets

Elevation (A)	Depth (B)	Description of Materials (C)	Field Screening Results (D)	Geotech Sample or Core Box No. (E)	Analytical Sample No. (F)	Blow Count (G)	Remarks (H)
	1–4	Dark brown/ black asphalt/gravel subbase					
	3–4	sub. rounded gravels					
	5–7	Boulder					
	8–10	Clayey-sand w/gravel lt.-med. brown					
	11–15	gray-brown clayey-sand w/gravel					

PROJECT: DITOC | HOLE NO.: IW-01

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

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HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE DRILL LOG FORM

 Borehole No. 1W-01

Depth(feet)	Core Recovery	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
Ø-5.5		Dark brown/black asphalt/gravel subbase	●	○	○
5.5-7.5		Dark grey/black sub-rounded gravel	○	●	○
		(lg. boulder break-up)	○	○	○
7.5-12		SC - Clayey sand w/gravel, lt.-med. brown	●	○	○
12-17		SC - Clayey sand w/gravel, gray/brown	●	○	○
			○	○	○
			○	○	○
			○	○	○
			○	○	○
			○	○	○
			○	○	○
			○	○	○
			○	○	○
			○	○	○
			○	○	○
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			○	○	○
			○	○	○

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EM 1110-1-4000
31 AUG 94

HTRW DRILLING LOG (Continuation Sheet)

Hole Number: IW-01
Sheet 3 of 4 Sheets

Project: DITOC
Inspector: C. PORRECA

Elevation (A)	Depth (B)	Description of Materials (C)	Field Screening Results (D)	Geotech Sample or Core Box No. (E)	Analytical Sample No. (F)	Blow Count (G)	Remarks (H)
	16						
	17	SW-SM					
	18	dark gray /					
	19	brown					
	20						
	21						
	22						
	23	Bedrock @ 23.1' BGS					
	24	Rock Socket drilled to (2' Thick) 25.1' BGS					
	25						
	26	Run 1 ↓					
	27						
	28	Gray Diabase					
	29						
	30		1.0				

PROJECT: DITOC
HOLE NO.: IW-01

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ENG FORM 5056A-R, AUG 94
(Proponent: CECW-EG)

HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE DRILL LOG FORM

Depth(feet).	Core Recovery	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
17-23.1		(SW-SM) well-graded sand w/silt +	●	○	○
		gravel, dark gray/brown	○	○	○
25.1-34.1		Run 1: RQD = (0.55 + 1.05 + 1.2 + 0.95 +	●	○	○
	97.56%	0.91 + 0.48 + 0.8 + 0.65 + 1.05 + 0.62) =	○	○	○
		8.26/9.00 = 91.78% - Excellent	○	○	○
		- Hard, slightly weathered, massive bedding,	○	○	○
		very wide fracture spacing (none present	○	○	○
		in run), 1 vug present @ 33.3' BGS,	○	○	○
		Gray dolostone	○	○	○
			○	○	○
			○	○	○
			○	○	○
			○	○	○
			○	○	○
			○	○	○
			○	○	○
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			○	○	○
			○	○	○

EM 1110-1-4000
31 AUG 94

HTRW DRILLING LOG (Continuation Sheet)

Hole Number: IW-01

Project: DHOC | Inspector: C. PORRECA | Sheet 4 of 4 Sheets

Elevation (A)	Depth (B)	Description of Materials (C)	Field Screening Results (D)	Geotech Sample or Core Box No. (E)	Analytical Sample No. (F)	Blow Count (G)	Remarks (H)
	31	Run 1 ↓					
	32	Gray Dolostone					
	33						
	34						
	35	Run 2 ↓					
	36	Gray Dolostone Ø					
	37	End of Coring - 37.1' BGS					
	38						

PROJECT: DHOC | HOLE NO.: IW-01

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

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HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE DRILL LOG FORM

 Borehole No. 1W-01

Depth(feet).	Core Recovery	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
34.1-37.1		Run 2: RQD = (0.41 + 0.39 + 0.34 + 1.07 +	●		
		0.56) = 2.77/3.00 = 92.33% - Excellent			
		- Same description as above			

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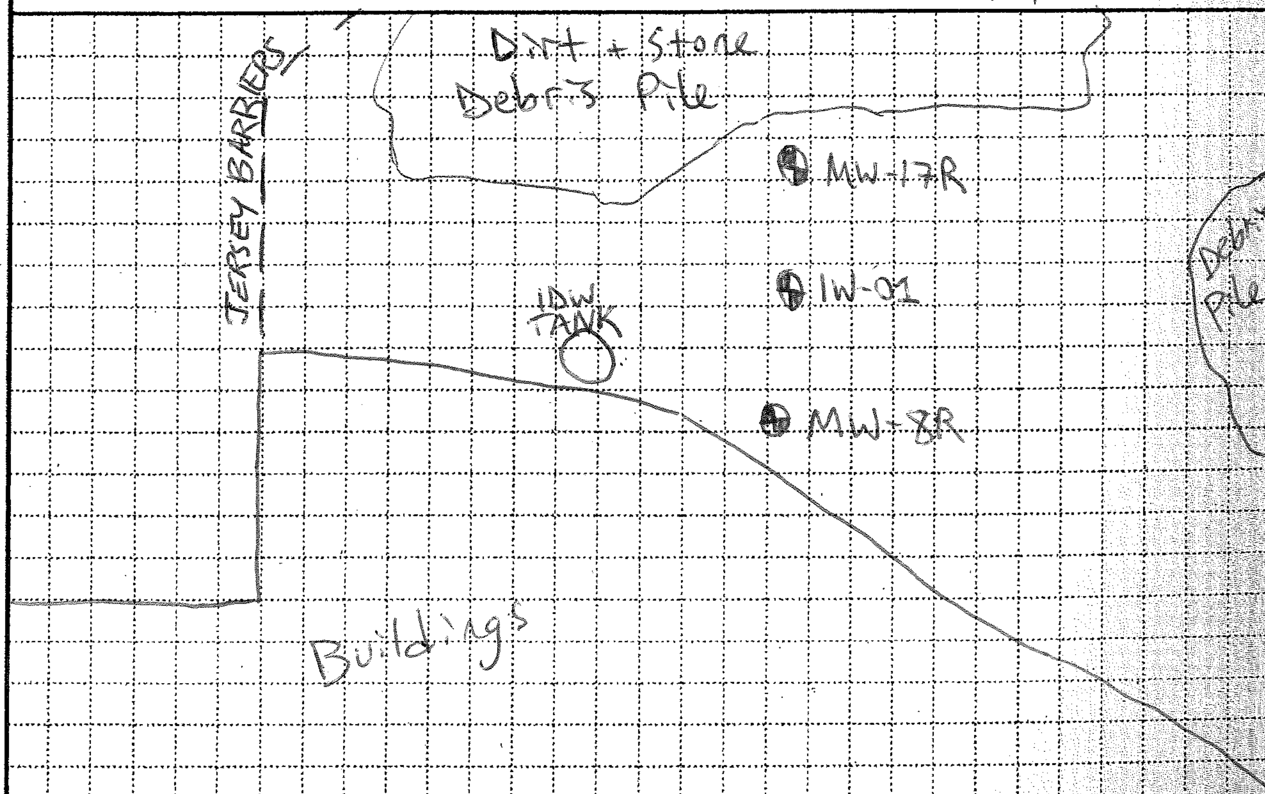
Geotech Logbook.doc-10/24/08

HTRW DRILLING LOG

District	
Hole Number	MW-17R
Sheet 1 of 4 Sheets	
1. Company Name	EEEGPC / WSP
2. Drill Subcontractor	LaBella
3. Project	Davis Howland Oil Co.
4. Location	Rochester, NY
5. Name of Driller	C. Stone
6. Manufacturer's Designation of Drill	
7. Sizes and Types of Drilling and Sampling Equipment	6 1/4" ID 1/4" OD Auger; NX Core Barrel; 3 7/8" rotary drill kit
8. Hole Location	
9. Surface Elevation	
10. Date Started	9-15-2020
11. Date Completed	9-17-2020
12. Overburden Thickness	22.6'
15. Depth Groundwater Encountered	
13. Depth Drilled Into Rock	14.1'
16. Depth to Water and Elapsed Time After Drilling Completed	27.63 ft TOIC, 3 hrs elapsed
14. Total Depth of Hole	36.7'
17. Other Water Level Managements (Specify)	
18. Geological Samples	N/A
Disturbed	
Undisturbed	
19. Total Number of Core Boxes	1
20. Samples For Chemical Analysis: VOC	
Metals	
Other (Specify)	
21. Total Core Recovery %	
22. Disposition of Hole: Backfilled	
Monitoring Well	X
Other (Specify)	
23. Signature of Inspector	[signature]

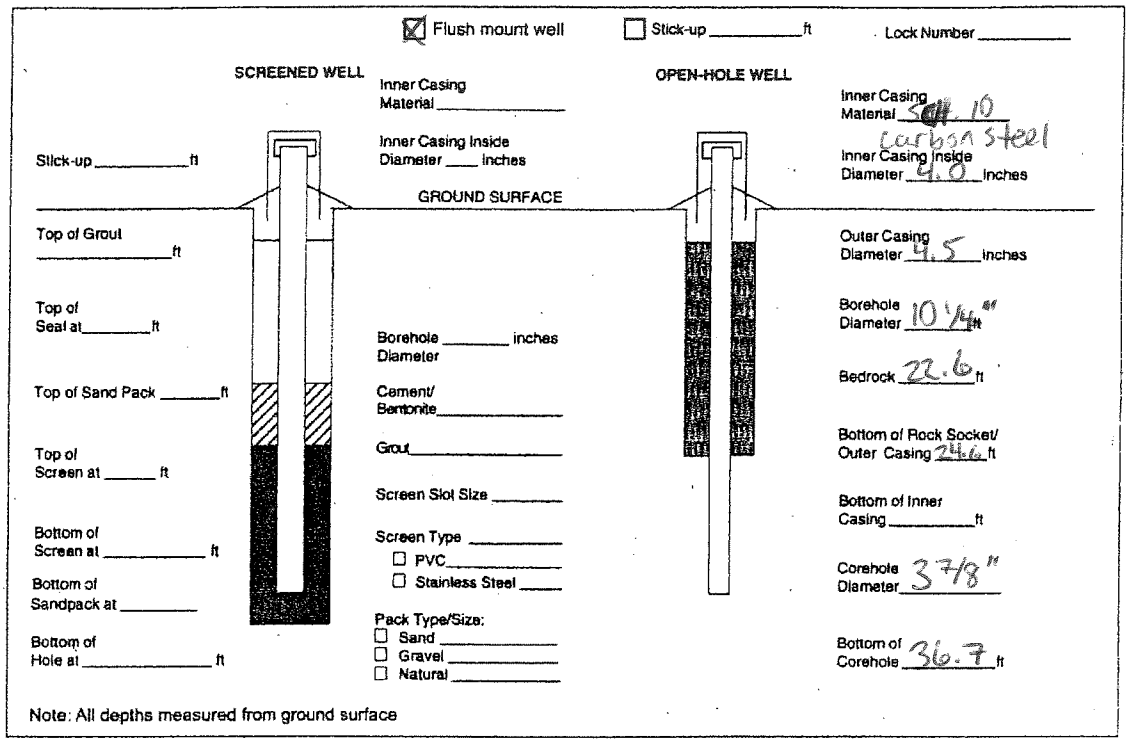
LOCATION SKETCH/COMMENTS SCALE: Not to Scale



PROJECT	DHOC
HOLE NO.	MW-17R

HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE DRILL LOG FORM

Well Construction Log for Well No. MW-17R



Comments

- Bedrock initially noted @ 23.5' BGS but corrected to 22.6' BGS after more precise measurement

Investigation Derived Waste					
Container ID	**Source**	**Date**	**Contents**	**Volume**	**Location/Comments**
MW-17R	MW-17R	9-15-20	Soil cuttings	55 gal.	- 3 drums
IDW WATER TANK	MW-17R	9-16-20	drill water	80 gal.	
MW-17R	MW-17R	9-17-20	grout/drill fluid	55 gal.	- 1 drum
MW-17R + IW-01	decon pad	9-17-20	decon pad plastic liner	25 gal.	- 1 drum
IDW WATER TANK	MW-17R	9-17-20	Purge Water	155 gal.	- from development

Note: Neal Short (LaBella) pumped de-con. water from decon. pad into IDW poly. tank on 9-25-20.

EM 1110-1-4000
31 AUG 94

HTRW DRILLING LOG (Continuation Sheet)

Hole Number: MW-17R

Project: Davis Howland Oil Co. | Inspector: C. Porreca | Sheet 2 of 4 Sheets

Elevation (A)	Depth (B)	Description of Materials (C)	Field Screening Results (D)	Geotech Sample or Core Box No. (E)	Analytical Sample No. (F)	Blow Count (G)	Remarks (H)
	1–4	asphalt + gravel subbase					
	5–9	Big Rock encountered Sand + gravel w/ silt	44 ppm				
	10–15	gray/brown silty sand w/ gravel	10 ppm				

PROJECT: Dioc

HOLE NO.: MW-17R

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

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HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE DRILL LOG FORM

Depth(feet)	Core Recovery	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
0-4.5		Dark brown/black asphalt + gravel subbase	●	○	○
4.5-6.5		Med. brown well-graded (SW-SM) sand	●	○	○
		w/silt + gravel, organic rich	○	○	○
6.5-11		Med. brown well-graded (SW-SM) sand	○	●	○
		w/silt + gravel, organic rich	○	○	○
11-22.6		lt. brown - gray-brown (SM) silty	○	●	○
		sand w/gravel	○	○	○

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HTRW DRILLING LOG (Continuation Sheet)

Hole Number	MW-17R
Project	Ditoc
Inspector	
Sheet	3 of 4 Sheets

Elevation (A)	Depth (B)	Description of Materials (C)	Field Screening Results (D)	Geotech Sample or Core Box No. (E)	Analytical Sample No. (F)	Blow Count (G)	Remarks (H)
	16	gray-brown silty sand w/gravel	7 ppm				
	17		5.7 ppm				
	18						
	19						
	20		1.4 ppm				
	21						
	22	BEDROCK @ 22.6' BGS	1.3 ppm				
	23						
	24	ROCK SOCKET drilled 2' thick to 24.6' BGS					
	25	Run 1 ↓					
	26						
	27						
	28						
	29						
	30						

PROJECT DHOC

HOLE NO. MW-17R

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE DRILL LOG FORM

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 Borehole No. MW-17R

Depth(feet).	Core Recovery	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content (Dry / Moist / Wet)
11-22.6		lt. brown/gray-brown (SM)	Moist
		Silty sand w/gravel	
24.6-34.6		RUN 1: RQD = (0.43 + 0.85 + 0.52 + 0.68 +	
	100%	0.62 + 0.45 + 0.83 + 0.36 + 0.52 +	
		0.71 + 1.04 + 0.92) = 7.93/10.00	
		= 79.3% - GOOD	
		- Hard, slightly weathered, massive	
		bedding, very wide fracture spacing	
		(1 fracture total, at 33.9' BGS), 1 vug	
		present @ 33.9' BGS, trace, sporadic	
		pits throughout, gray dolostone	

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HTRW DRILLING LOG (Continuation Sheet)

Project	Inspector	Hole Number	Sheet	Sheets
DHoc	C. Porreca	MW-17R	4	of 4

Elevation (A)	Depth (B)	Description of Materials (C)	Field Screening Results (D)	Geotech Sample or Core Box No. (E)	Analytical Sample No. (F)	Blow Count (G)	Remarks (H)
	31	Run 1					
	32						
	33		4.0				
	34						
	35	Run 2	Ø				
	36	36.7' BGS					
	37	End of Coring.					

PROJECT DHoc HOLE NO. MW-17R

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

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HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE DRILL LOG FORM

Depth(feet).	Core Recovery	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
34.6-36.7		Run 2: RQD = (0.76 + 1.03) = 1.79/2.10	●	○	○
	100%	= 85.24% - GOOD	○	○	○
		Actual measured depth = 36.7' BGS	○	○	○
		*same description as above	○	○	○

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