1888 BATHGATE AVENUE REDEVELOPMENT SITE
BRONX, NEW YORK
REMEDIAL SYSTEM OPTIMIZATION REPORT

NYSDEC Site Number: C203088

Prepared for:
NYSDEC Region 2
1 Hunter's Point Plaza
47-40 21st Street
Long Island City, New York 11101

On Behalf Of:
Wilfrid East Properties LLC, Wilfrid Realty Corp.,
Wilfrid East LIHTC LLC, Wilfrid Properties LLC,
Wilfrid West Properties LLC, Wilfrid LIHTC LLC, and
ACMH Wilfrid Housing Development Fund Corporation
48-02 25th Avenue, Suite 400
Astoria, New York 11103

Prepared By:
RESNY Engineering
1218 Central Ave, Suite 100,
Albany, NY 12205

and

ALC Environmental
39 West 29th Street, 8th Floor
New York, NY 10001

April 20, 2023

TABLE OF CONTENTS

FIGURES

TABLES

APPENDIX - A

APPENDIX - B

APPENDIX - C

CERTIFICATION

The Remediation Groundwater Sampling was performed in general conformance with the New York State Department of Environmental Conservation (NYSDEC) Technical Guidance for Site Investigation and Remediation DER-10. This Quarterly Groundwater Monitoring was performed by:

Colin Eckhardt March 1, 2023

Environmental Scientist Date Signature
ALC Environmental

I, Jeffrey Diamond, am a Qualified Environmental Professional, as defined in RCNY § 43-1402(ar). I have primary direct responsibility for implementation and preparation of this Remediation Groundwater Sampling Report for the Site located at 1888 Bathgate Avenue, Bronx, NY 10457. I am responsible for the content of this Quarterly Groundwater Monitoring Report, having reviewed its contents and certify that this Quarterly Groundwater Monitoring Report is accurate to the best of my knowledge and contains all available environmental information and data regarding the property.

Jeffrey Diamond March 16, 2023

Qualified Environmental Professional Date Signature
ALC Environmental

I, Hazem Hijazi, P.E, certify that I am currently a New State registered professional engineer as defined in 6NYCRR Part 375 and that this report was prepared in accordance with applicable statues and regulations and is in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Hazem Hijazi April 20, 2023

Professional Engineer NYPE#082819 Date Signature
RESNY Engineering– 1218 Central Ave, Suite 100, Albany, NY 12205

1.0 Introduction and Background

In September 2022, RESNY Engineering (RESNY) and ALC Environmental (ALC) prepared a Remedial System Optimization (RSO) Workplan to address residual contamination in groundwater at 4181 Third Avenue in the Bronx, New York (the "Site"). The RSO Workplan proposed certain activities required to optimize the NYSDEC-approved remedy. This RSO Report summarizes these activities and provides the results of recent groundwater sampling and targeted analysis to evaluate the viability of bioremediation as a treatment alternative to address residual contamination in groundwater at the Site. For reference, a Topographic Map and Site Location Map are presented in **Figures 1** and **2**.

Previous remediation activities at the Site have proven effective and are summarized in the Site Management Plan, dated December 2018 (SMP). The remedial implementation of soil excavation effectively removed all on-site soils that exceeded the restricted residential soil cleanup objectives (RRSCOs) to a maximum depth of 15 feet below grade. Post-excavation soil endpoint samples were collected, except at locations excavated down to bedrock. Additional information regarding the soil excavation and cleanup activities is summarized in the SMP.

In addition, previous remediation of groundwater utilizing in-situ chemical oxidation (ISCO) effectively addressed impacted groundwater at the Site. However, some exceedances of certain chlorinated volatile organic compounds (CVOCs) remain. The purpose of the remedial groundwater sampling summarized herein is to confirm the presence and concentration (in number of colonies per milliliter) of the *Dehalococcoides* (DHC) bacteria in the groundwater at the Site. The DHC bacteria - through anaerobic biodegradation - is an effective reductive dechlorination agent in reducing CVOCs ultimately to ethene.

This natural or enhanced bioremediation utilizing DHC bacteria enhancement is being considered as a remedial option for the Site as natural microorganisms have been proven effective at reducing the concentrations of CVOCs in the groundwater. In fact, the presence of DHC has been associated with complete dechlorination to ethene at sites across North America. While a number of bacterial cultures capable of utilizing PCE and TCE as growth supporting electron acceptors have been isolated, *DHC* may be the most important because they are the only bacterial group that has been isolated to date which is capable of complete reductive dechlorination of PCE to ethene.

Here, the application process utilizing DHC bacteria enhancement can be conducted through the existing monitoring well network. This is especially useful since the existing building on the Site is protected from vapor intrusion by a vapor barrier. DHC bacteria application in areas of the Site other than the existing monitoring well network would jeopardize the integrity of the vapor barrier that envelops the building foundation by drilling and piercing through the vapor barrier to deliver the required chemicals.

The groundwater sampling performed on March 1, 2023, is the assessment phase of the bioremediation process. The objective is to identify potential biodegradation or biotransformation processes by performing targeted sampling for the presence of the DHC bacteria in the

groundwater at locations across the area of interest. Samples collected from the groundwater monitoring wells MW-11 and MW-13 were selected for this purpose.

The second step in the bioremediation process is the design phase. To support a Site -specific bioremediation strategy, the DHC bacteria must be present in the groundwater at concentrations to support the dechlorination of the groundwater contaminants. The presence of the DHC bacteria at low concentrations that will not support dechlorination, can be enhanced to support growth of the DHC bacteria in the groundwater by the addition of nutrients such as emulsified vegetable oil and / or additional microbial cultures. Once the design is completed in terms of the amount of nutrients/microbial cultures and application process, the actual injection will be implemented.

The last step in the bioremediation process is performance monitoring.

Quarterly groundwater sampling will continue along with the collection of geochemical indicator parameters to assess the remedy process and a decline in the concentrations of tetrachloroethylene (PCE), trichloroethylene (TCE), cis-1,2-dichloroethylene (C12-DCE), trans-1,2-dichloroethylene (T12-DCE), and vinyl chloride will be a guide for the remedy performance determination.

This report summarizes the results and findings of groundwater sampling performed at the Site on March 1, 2023 and a plan to institute bioremediation as a method to decrease the concentrations of CVOCs in the groundwater at the Site. The Site activities were performed in general conformance with the NYSDEC approved RSO Workplan.

2.0 Groundwater Sampling

On March 1, 2023, ALC conducted a special groundwater sampling event from two of the four existing post-remedial groundwater monitoring wells installed at the Site. A representative groundwater sample was collected from groundwater monitoring wells MW-11 and MW-13. The locations of these two groundwater monitoring wells are shown in **Figure 3**. The groundwater sampling was conducted by determining the volume of standing groundwater in each monitoring wells and then purging three volumes of standing groundwater from each groundwater monitoring well. The groundwater from each of the two groundwater monitoring wells sampled, was purged and sampled with a peristaltic pump with new tubing for each collected groundwater sample. The general biochemical indicators, including pH, specific conductivity, temperature, dissolved oxygen, oxidation–reduction potential (ORP), have been measured during previous sampling events. The purged groundwater was containerized in properly labeled DOT-approved 55-gallon drums for future off-site disposal at a permitted facility. The groundwater monitoring well sampling logs are presented in **Appendix A**.

The groundwater samples from monitoring wells MW-11 and MW-13 were placed in laboratory-supplied containers with a chain-of-custody protocol, and cooled to a temperature of four degrees Centigrade (4°C) between their acquisition and delivery to Microbial Insights laboratory in Knoxville, Tennessee for analysis.

3.0 Groundwater Chemistry

3.1 Background

Previous groundwater sampling events were conducted at the Site on: May 14, 2018; September 6, 2018; January 31 and February 1, 2019; June 13, 2019; August 20, 2019; October 15, 2019; January 14 and 15, 2020; June 25, 2020; September 23, 2020; December 18, 2020; March 17, 2021; June 2, 2021; August 12 and 13, 2021; October 28, 2021, March 23, 2022, June 23, 2022 and September 28, 2022. A summary of all of the historical analytical data is provided in **Table 2.** Compounds that exceed the NYSDEC Division of Water Technical Operational Guidance Series (1.1.1) (TOGS 1.1.1) are highlighted in yellow.

Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, October 22, 1993 and reissued June 1998 for the groundwater samples collected in 2021 and 2022 are presented below:

March 17, 2021

- C12-DCE exceedances were present in the groundwater samples collected from monitoring wells MW-11, MW-13, and in the blind duplicate sample.
- PCE exceedances were present in the groundwater samples collected from monitoring wells MW-10, MW-11, MW-13, and in the blind duplicate sample.
- TCE exceedances were present in the groundwater sample collected from monitoring well MW-13, and the blind duplicate sample.
- Vinyl chloride exceedance was present in the groundwater sample collected from monitoring well MW-11 only.

June 2, 2021

- C12-DCE exceedances were present in the groundwater samples collected from monitoring wells MW-11 and MW-13.
- PCE exceedances were present in the groundwater samples collected from monitoring wells MW-10 and MW-13.
- TCE exceedance was present in the groundwater sample collected from monitoring well MW-13, only.
- Vinyl chloride exceedance was present in the groundwater sample collected from monitoring well MW-11 only.

August 12–13, 2021

- C12-DCE exceedances were present in the groundwater samples collected from monitoring wells MW-11 and MW-13.
- PCE exceedances were present in the groundwater samples collected from monitoring wells MW-10 and MW-13.
- TCE exceedance was present in the groundwater sample collected from monitoring well MW-13, only.
- Vinyl chloride exceedance was present in the groundwater sample collected from monitoring well MW-11 only.

October 28, 2021

- C12-DCE exceedances were present in the groundwater samples collected from monitoring wells MW-11 and MW-13.
- PCE exceedances were present in the groundwater samples collected from monitoring wells MW-10 and MW-13.
- TCE exceedance was present in the groundwater sample collected from monitoring well MW-13, only.
- Vinyl chloride exceedance was present in the groundwater sample collected from monitoring well MW-11 only.
- T12-DCE exceedance was present in the groundwater sample collected from monitoring well MW-11 only.
- Methylene chloride exceedance was present in the field blank sample.

March 22–23, 2022

- C12-DCE exceedance was present in the groundwater sample collected from groundwater monitoring well MW-13 only.
- PCE exceedances were present in the groundwater samples collected from groundwater monitoring wells MW-10 and MW-13.
- TCE exceedance was present in the groundwater sample collected from groundwater monitoring well MW-13 only.
- Vinyl chloride exceedance was present in the groundwater sample collected from groundwater monitoring well MW-11 only.

June 23, 2022

- C12-DCE: Exceedances were present in the groundwater samples collected from groundwater monitoring wells MW-11 and MW-12.
- PCE: Exceedances were present in the groundwater samples collected from groundwater monitoring wells MW-10 and MW-12
- TCE: Exceedances was present in the groundwater sample collected from groundwater monitoring well MW-12 only.
- T12-DCE: Exceedance was present in the groundwater sample collected groundwater monitoring well MW-11 only.
- Vinyl Chloride: Exceedance was present in the groundwater sample collected from groundwater monitoring well MW-11 only.

September 28, 2022

- C12-DCE: Exceedances were present in the groundwater sample collected from groundwater monitoring well MW-11 and MW-13
- PCE: Exceedances were present in the groundwater samples collected from groundwater monitoring wells MW-10, MW-12 and MW-13
- T12-DCE: Exceedances were present in the groundwater sample collected from groundwater monitoring wells MW-11.
- TCE: Exceedances were present in groundwater sample collected from groundwater monitoring well MW-13.
- Vinyl Chloride: Exceedances were present in the groundwater sample collected from groundwater monitoring well MW-11.
- Generally, the concentrations of all of the detected compounds have increased in the groundwater samples collected from the groundwater monitoring wells MW-10, MW-11, and MW-13, from the previous groundwater sampling on June 23. 2022.
- The concentrations of all detected compounds had decreased from the previous groundwater sampling conducted on June 23, 2022 for the groundwater samples collected from MW-12.

3.2 Biological Sampling and Analytical Results

After the initial ISCO treatment that was instituted in 2018 and four years of quarterly groundwater monitoring, there still remains concentrations of c12-DEC, PCE, TCE, t12-DCE and vinyl chloride that exceed the NYSDEC Title 6 New York Codes, Rules, and Regulations (6NYCRR) Part 703.5 Class GA groundwater standards. These compounds are bound up in the groundwater bearing formation beneath the site and the concentrations of the CVOCs tend to vary with each quarterly groundwater sampling event.

The DHC bacteria along with other halorespiring bacteria are capable of complete dechlorination of PCE and TCE, along with the other COVCs to ethene.

The analytical results of the groundwater samples collected on March 1, 2023 from groundwater monitoring wells MW-11 and MW-13 indicate that the DHC bacteria was present in the subsurface. The concentration of the DHC bacteria detected in the groundwater samples collected from the two groundwater monitoring wells are as shown in **Table 1.**

TABLE 1

CONCENTRATION OF DEHALOCCOIDES BACTERIA IN GROUNDWATER

GROUNDWATER SAMPLING LOCATION	SAMPLE DATE	CONCENTRATION (cells/mL)
MW-11	3/1/2023	**179**
MW-13	3/1/2023	**16.5**

NOTE: concentrations are in cells per milliliter

Groundwater samples collected confirmed that DHC bacteria is present in the groundwater at the Site at concentration of 10^1 to 10^2 cells per milliliter (cells/mL), with detection limits that range from 1.00×10^{-1} (for MW-13) to 9.70×10^{-2} (for MW-11). An effective rate of reductive dechlorination by DHC bacteria occurs when its presence is measured in 10^4 cells/mL (100,000 cells per milliliter) or above. While the requisite dechlorinating bacteria were present demonstrating that a bioremediation approach was feasible, the data indicated that biostimulation could be a useful strategy to increase the availability of fermentable substrates and promote geochemical conditions favorable for sustained in situ bioremediation through reductive dechlorination.

4.0 Bioremediation Plan

Bioremediation is the use of organisms, particularly microorganisms, to convert contaminants to less harmful compounds in order to clean up contaminated sites. The remediation process may involve monitoring intrinsic biodegradation, or deliberately altering the subsurface environment to enhance the desired biological processes. Such enhancement generally involves adding nutrients or energy sources to increase the activity of the organisms already present in the subsurface, in some cases it may also involve adding selected organisms to improve the biodegradation capacity or its rate. Bioremediation is possible because organisms have developed an ability to survive under a wide variety of conditions. Even through scientists have assumed that the subsurface and groundwaters below the soil profile were near sterile, in fact, the genetic diversity, physiological versatility and sheer numbers of microorganisms naturally present in the environment are overwhelming. Groundwater may have 1 million (10^6) total recoverable cells in each milliliter (mL), though numbers in the range of 10^4/mL are more common.

There are several competing in situ technologies for containing and treating contaminated groundwater, including chemical oxidation and reduction, air sparging, etc. Each technology is well suited for use in specific instances.

The success of bioremediation is largely based on the fact that bacteria will literally work for food, such as vegetable oil. Energetically, these materials serve as electron donor (and carbon) sources. Fermentation ultimately produces hydrogen, which the microbes responsible for reductive dechlorination of chlorinated compounds use as the source for electrons for the reduction of chlorinated compounds.

In order to promote favorable conditions for the biostimulation of the DHC bacteria and to promote dechlorination of the chlorinated solvents present in the groundwater, a solution of potable water and EOS Pro, an emulsified vegetable oil, enriched to optimize anaerobic bioremediation of chlorinated solvents in groundwater is proposed for use at the Site. A product brochure is provided in **Appendix C.** A 10% solution of EOS pro and potable water will be mixed together in the following ratio: 52 gallons of EOS Pro to 517 gallons of potable water. This solution will be injected into each groundwater monitoring well. To flush the EOS Pro solution into the groundwater bearing subsurface beneath the site, 900 gallons of potable water will be pumped into each of monitoring wells MW-10 and MW-13. Only 165 gallons of potable water will be pumped into monitoring wells MW-11 and MW-12 due to the shallow depth of these two wells.

To determine the effectiveness of the bioremediation, performance monitoring will continue on a quarterly basis. The concentrations of chlorinated Volatile Organic Compounds along with the following geochemical indicator parameters, nitrite, manganese, dissolved manganese, total iron, dissolved ferrous iron, sodium, sulfate, alkalinity and methane.

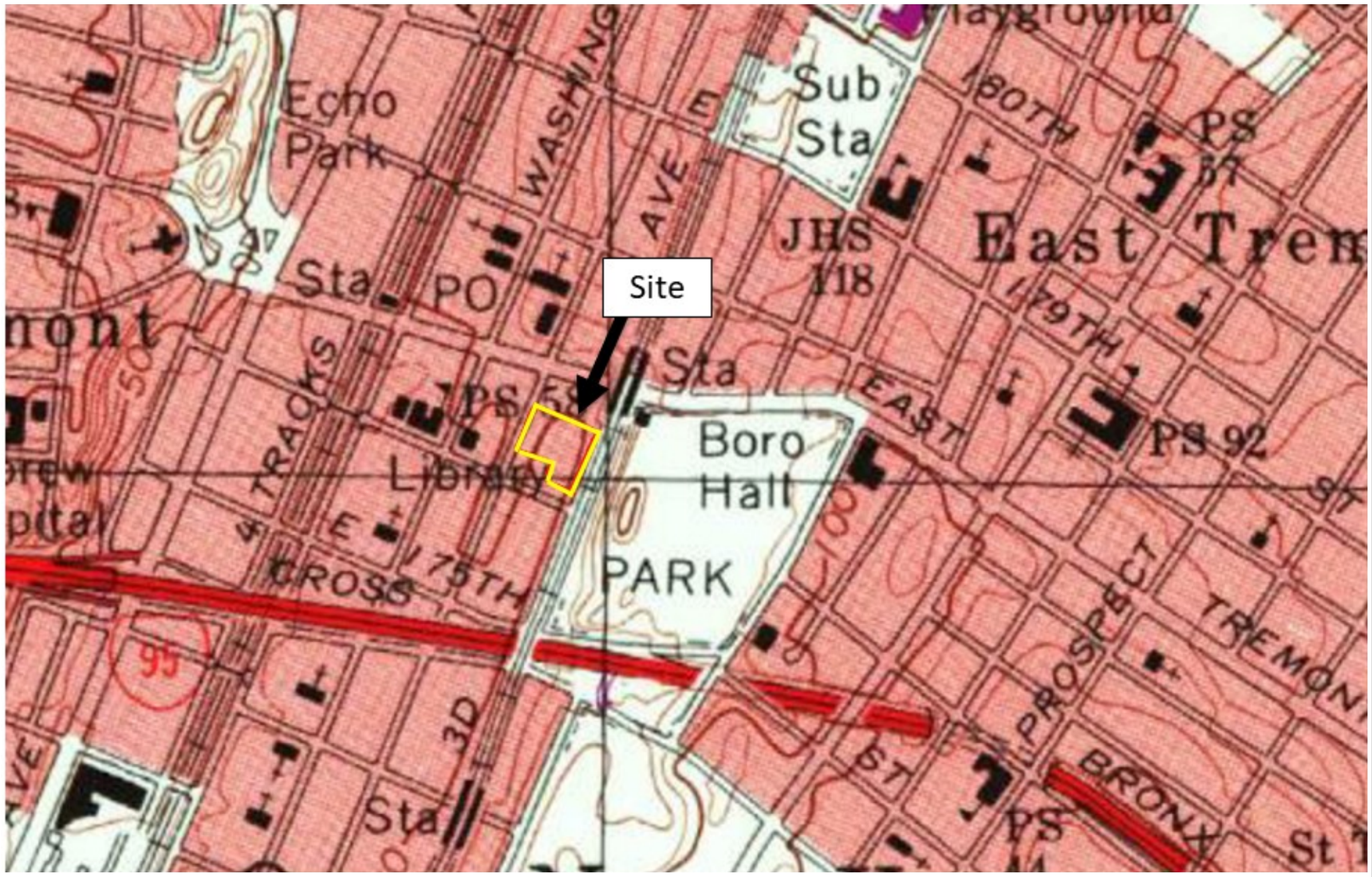
5.0 Conclusions and Recommendations

While the bulk of the CVOC contamination has been demonstrated to have been remediated by the prior ISCO injections and the overall concentrations of CVOCs in groundwater have been asymptotically approaching the remedial standards, residual concentrations remain at or slightly above the standards.

Bioremediation is a proven technology that allows the natural bacteria found in the groundwater reduce the concentrations of chlorinated solvents to ethene. Accordingly, we are proposing enhanced bioremediation at the Site, utilizing and enhancing the existing bacteria in the groundwater. This will allow for the timely treatment and application of the necessary nutrients without compromising the integrity of the existing vapor barrier that has been placed under and around the building foundation.

Upon approval of this groundwater bioremediation plan by the NYSDEC, we will secure four drums of EOS Pro from the supplier, EOS Remediation. One drum of EOS Pro per each onsite groundwater monitoring well. The drums of product will be staged at a secure location at the Site prior to the injection of the EOS Pro into each monitoring well. After a period of approximately four months, quarterly groundwater sampling will resume to determine the concentration of the chlorinated solvents in the groundwater and gauge the effectiveness of this bioremediation program.

FIGURES



ALC ENVIRONMENTAL
CONSULTING | MANAGEMENT | TRAINING

info@alcenvironmental.com

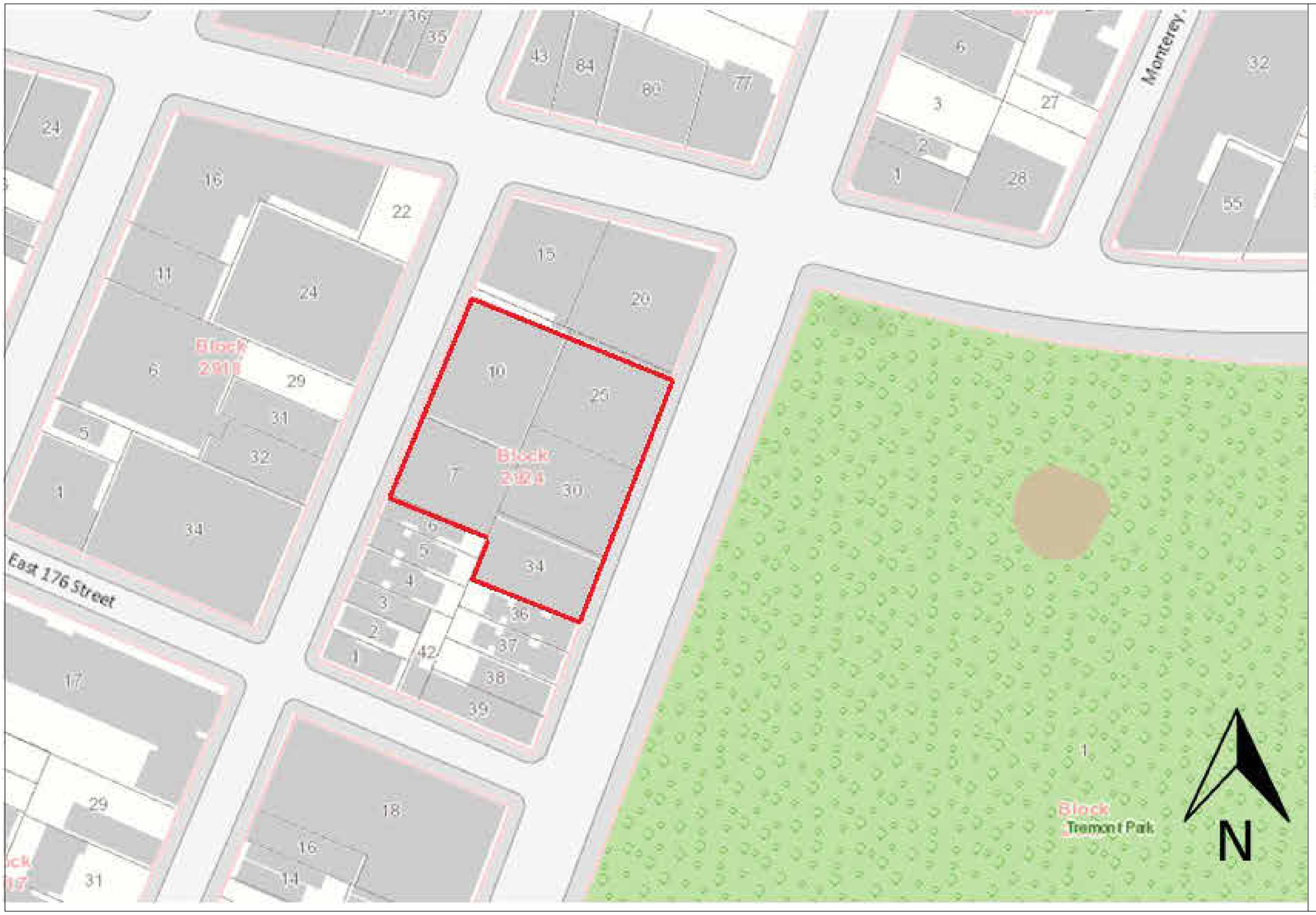
U.S.G.S Topographical Map, Central Park, NY- 1997

ALC Environmental 1888 Bathgate Avenue

Figure 1 Topogrpahic Map

Project Number	503-1001
Date	April 13, 2021
Drawn by	Joshua Medeiros
Checked by	Jeff Diamond

101



ALC ENVIRONMENTAL
CONSULTING | MANAGEMENT | TRAINING

info@alcenvironmental.com

Oasis Map NYC

ALC Environmental 1888 Bathgate Avenue

Figure 2 Site Location Map

Project Number	503-1001
Date	April 13, 2022
Drawn By	Joshua Medeiros
Checked By	Jeff Diamond

102

4/13/2022 12:55:14 PM

LEGEND

- Project Site Location
- Groundwater Monitoring Wells (Approximate Locations)

N

ALC ENVIRONMENTAL
CONSULTING | MANAGEMENT | TRAINING

info@alcenvironmental.com

ALC Environmental 1888 Bathgate Avenue

Figure 3 Locations of Groundwater Monitoring Wells

Project Number	503-1001
Date	April 13, 2022
Drawn By	Joshua Medeiros
Checked By	Jeff Diamond

103

4/13/2022 2:19:26 PM

LEGEND

- Project Site Location
- Groundwater Monitoring Wells (Approximate Locations)
- 48.86 - Groundwater Elevation (FT. REL. MSL) (VAVD 1988 Data)
- 48.00 — 48.00 - Groundwater Contour Line
- Projected Groundwater Flow Direction

Well ID	Top of Casing Elevation (FT. REL. MSL)	Depth to Groundwater (FT)	Groundwater Elevation (FT. REL. MSL)
MW-10	58.64	19.38	46.61
MW-11	49.75	0.89	48.86
MW-12	53.70	4.79	48.91
MW-13	53.95	4.66	48.69

N

ALC ENVIRONMENTAL
CONSULTING | MANAGEMENT | TRAINING
info@alcenvironmental.com

1888 Bathgate Avenue, Bronx, NY 10457

Figure 4
Groundwater Elevation and Projected Flow Direction

Project Number	503-1001
Date	October 31, 2022
Drawn by	Joshua Medeiros
Checked by	Jeff Diamond

104

TABLE

Table 2
Summary of Historical Groundwater Data
1888 Bathgate Avenue
Bronx, NY 10457

MW-10

COMPOUND	1,1,1-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethylene	1,2-Dichlorobenzene	1,2-Dichloroethane	Carbon tetrachloride	Chloroform	cis-1,2-Dichloroethylene	Methylene chloride	Tetrachloroethylene	trans-1,2-Dichloroethylene	Trichloroethylene	Vinyl Chloride
NYSDEC Class GA TOGS (µg/L)	5	5	5	3	0.6	5	7	5	5	5	5	5	2
Sampling Date	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)
5/14/2018	0.25 U	0.21 UJ	0.47 U	0.5 U	0.2 U	0.34 U	0.39 U	0.5 U	1 U	3.70	0.4 U	0.27 U	0.62 U
9/6/2018	0.54 U	0.57 U	0.59 U	0.53 U	0.6 U	0.55 U	1.4 U	0.51 U	1 U	**12.5**	0.54 U	0.66 U	0.79 U
1/31/2019 & 2/1/2019	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
6/13/2019	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.52	0.43	1 U	**22.10**	0.2 U	2.140	0.2 U
8/20/2019	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.63	0.57	2 U	**31.00**	0.2 U	2.320	0.2 U
10/15/2019	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.43 J	0.45 J	1 U	**27.20**	0.2 U	1.390	0.2 U
1/14/2020	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.76	1.00	1 U	**30.10**	0.2 U	2.390	0.2 U
6/25/2020	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	4.07	0.62	1 U	**33.60**	0.2 U	1.880	0.2 U
9/23/2020	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.51	0.59	1 U	**12.60**	0.2 U	1.340	0.2 U
12/18/2020	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.89	0.54	1 U	**32.30**	0.200	0.200	0.200
3/17/2021	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.93	0.83	1 U	**35.20**	0.200	2.570	0.200
6/2/2021	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.32	0.86	1 U	**36.00**	0.200	2.380	0.200
8/12/2021	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2.06	0.51	1 U	**23.80**	0.200	1.600	0.200
10/28/2021	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.00	1.10	1 U	**44.00**	0.200	3.000	0.200
03/22/2022	0.2 U	0.2U	0.2 U	0.2 U	0.2 U	0.2 U	1.05	1.48	0.2 U	**62.20**	0.2 U	3.880	0.2U
06/23/2022	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	1.06	0.84	0.2U	**39.40**	0.2U	2.900	0.2U
9/28/2022	0.7 U	0.7 U	0.17 U	0.7 U	0.13 U	0.7 U	1.2 J	2.20	0.7 U	**77.00**	0.7 U	3.500	0.7 U

MW-11

COMPOUND	1,1,1-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethylene	1,2-Dichlorobenzene	1,2-Dichloroethane	Carbon tetrachloride	Chloroform	cis-1,2-Dichloroethylene	Methylene chloride	Tetrachloroethylene	trans-1,2-Dichloroethylene	Trichloroethylene	Vinyl Chloride
NYSDEC Class GA TOGS (µg/L)	5	5	5	3	0.6	5	7	5	5	5	5	5	2
Sampling Date	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)
5/14/2018	0.25 U	0.21 U	0.47 U	0.5 U	0.2 U	0.34 U	0.29 U	2	1 U	**102**	0.4 U	3	0.62 U
9/6/2018	0.54 U	0.57 U	0.59 U	0.53 U	0.6 U	0.55 U	0.5 U	5	1 U	0.9 U	0.54 U	0.53 U	0.79 U
2/1/2019	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.38 J	**7.50**	1 U	**100**	0.37 J	**16**	0.2 U
6/13/2019	0.2 U	0.2 U	0.64	0.2 U	0.2 U	0.2 U	0.38 J	**68.20**	1 U	**37**	1.42	**11.10**	**2.96**
8/20/2019	0.2 U	0.2 U	0.27 J	0.2 U	0.2 U	0.2 U	0.2 U	**28.20**	1 U	3	1.57	1.42	**50.20**
10/15/2019	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**9.88**	1 U	2.75	2.09	1.64	**80.40**
1/15/2020	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**12.50**	1 U	4.17	1.70	2.06	**60.90**
6/25/2020	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.42 J	1 U	0.2 U	3.38	0.2 U	**115**
9/23/2020	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.62	1 U	0.26	3.70	0.31	**62**
12/18/2020	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**11.50**	1 U	**11.60**	3.86	0.2 U	**55.50**
3/17/2021	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**9.25**	1 U	**7.81**	3.57	3.05	**49.70**
6/2/2021	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**10.50**	1 U	3.13	3.960	2.05	**43.70**
8/13/2021	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**10.40**	1 U	3.82	**5.385**	1.99	**74.30**
10/28/2021	0.2U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**7.90**	1 U	0.75	**6.80**	1.10	**59.00**
03/22/2022	0.2 U	1.21	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.74	1 U	1.50	4.64	0.29	**30.70**
06/23/2022	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**5.44**	1U	1.90	**6.21**	1.02	**44.20**
9/28/2022	0.7 U	0.7 U	0.17 U	0.7 U	0.13 U	0.7 U	0.7 U	**15.00**	0.7 U	3.30	**7.90**	1.40	**68.00**

MW-12

COMPOUND	1,1,1-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethylene	1,2-Dichlorobenzene	1,2-Dichloroethane	Carbon tetrachloride	Chloroform	cis-1,2-Dichloroethylene	Methylene chloride	Tetrachloroethylene	trans-1,2-Dichloroethylene	Trichloroethylene	Vinyl Chloride
NYSDEC Class GA TOGS (µg/L)	5	5	5	3	0.6	5	7	5	5	5	5	5	2
Sampling Date	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)
5/14/2018	0.25 U	0.21 U	0.47 U	0.5 U	0.2 U	0.34 U	0.29 U	3.6	1 U	**10.7**	0.4 U	3.5	0.62 U
9/6/2018	0.54 U	0.57 U	0.59 U	0.53 U	0.6 U	0.55 U	0.5 U	4.5	1 U	**19.5**	0.54 U	4.4	0.62 U
1/31/2019	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.40	1 U	**5.10**	0.2 U	1.30	0.2 U
6/13/2019	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.89	1 U	3.20	0.2 U	1.19	0.2 U
8/20/2019	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.21 J	1.37	1 U	4.86	0.2 U	1.79	0.2 U
10/15/2019	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.52	1.83	1 U	**7.18**	0.2 U	2.69	0.2 U
1/15/2020	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.64	1.32	1 U	**6.23**	0.2 U	2.41	0.2 U
6/25/2020	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.79	1.62	1 U	**7.52**	0.2 U	2.59	0.2 U
9/23/2020	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.01	1.62	1 U	**10.70**	0.2 U	3.65	0.2 U
12/18/2020	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.09	1.47	1 U	**9.73**	0.2 U	0.20	0.20
3/17/2021	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.54	1.09	1 U	3.68	0.2 U	2.05	0.20
6/2/2021	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.46	1.39	0.2 U	3.53	0.2 U	2.12	0.2 U
8/13/2021	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.39	1.31	0.2 U	4.39	0.2 U	2.53	0.2 U
10/28/2021	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.20	1.31	0.2 U	3.90	0.2 U	2.30	0.2 U
03/22/2022	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.05	1.48	1 U	4.23	0.2 U	2.12	0.2 U
06/23/2022	0.2U	0.40	0.2U	0.2U	0.2U	0.2U	0.2U	**13.30**	1U	**18.60**	0.38	**24.60**	0.2U
9/28/2022	0.7U	0.7 U	0.17 U	0.7 U	0.13 U	0.7 U	0.7 U	1.50	0.7 U	**6.20**	0.70 U	2.30	0.07 U

MW-13

COMPOUND	1,1,1-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethylene	1,2-Dichlorobenzene	1,2-Dichloroethane	Carbon tetrachloride	Chloroform	cis-1,2-Dichloroethylene	Methylene chloride	Tetrachloroethylene	trans-1,2-Dichloroethylene	Trichloroethylene	Vinyl Chloride
NYSDEC Class GA TOGS (µg/L)	5	5	5	3	0.6	5	7	5	5	5	5	5	2
Sampling Date	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)	Result (ug/L)
5/14/2018	0.25 U	0.64 U	0.47 U	0.5 U	0.2 U	0.34 U	0.29 U	**22.40**	1 U	**29.1**	0.4 U	**24**	0.62 U
9/6/2018	0.54 U	0.77 U	0.59 U	0.53 U	0.6 U	0.55 U	0.5 U	**28.80**	1 U	**61.7**	0.54 U	**34**	0.79 U
1/31/2019	0.2 U	0.33 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**15.00**	1 U	**14**	0.2 U	**11**	0.2 U
6/13/2019	0.2 U	0.57	0.2 U	0.2 U	0.2 U	0.2 U	0.35	**16.50**	1 U	**50.90**	0.26	**27.90**	0.2 U
8/20/2019	0.2 U	0.57	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**15.30**	1 U	**46.90**	0.29 J	**23.20**	0.2 U
10/15/2019	0.2 U	0.52	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**14.60**	1 U	**43.90**	0.29 J	**21.50**	0.2 U
1/15/2020	0.2 U	0.49 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**13.80**	1 U	**43.70**	0.27 J	**24.70**	0.2 U
6/25/2020	0.2 U	0.55	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**14.20**	1 U	**22.30**	0.42 J	**15.70**	0.2 U
9/23/2020	0.2 U	0.39 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**12.90**	1 U	**31.30**	0.46	**20.50**	0.2 U
12/18/2020	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.23	**13.50**	1 U	**23.00**	0.51	**17.90**	0.2 U
3/17/2021	0.2 U	0.2 U	0.390	0.2 U	0.2 U	0.2 U	0.23	**11.50**	1 U	**11.80**	0.37	**14.50**	0.2 U
6/2/2021	0.2 U	0.340	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**10.60**	0.2 U	**11.40**	0.2 U	**14.20**	0.2 U
8/13/2021	0.2 U	0.360	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**12.00**	0.2 U	**14.60**	0.2 U	**17.10**	0.2 U
10/28/2021	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**12.00**	0.2 U	**14.00**	0.2 U	**21.00**	0.2 U
03/23/2022	0.2 U	0.390	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**11.40**	1 U	**9.04**	0.380	**15.40**	0.2 U
06/23/2022	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.47	0.83	1U	1.83	0.2U	1.15	0.2U
9/28/2022	0.70 U	0.70 U	0.17 U	0.70 U	0.70 U	0.13 U	0.70 U	**16.00**	0.70 U	**22.00**	0.17 U	**16.00**	0.70 U

NOTES:
NYSDEC - New York State Department of Environmental Conservation
TOGS - Technical Operational Guidance Series 1.1.1- Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (June 1998)
µg/L - micrograms per liter (parts per billion ppb)
NS - Sample was not collected for analysis
U - this analyte was not detected at the Limit of Quantitation/ Reporting Limit (LoQ/RL) or Limit of Detection/ Method Detection Limit (LoD/MDL)
J - this analyte was detected below the reporting limit but greater than or equal to the Method Detection Limit
Highlighted denotes concentration above NYSDEC TOGS

APPENDIX – A

Groundwater Monitoring well Sampling Logs

ALC ENVIRONMENTAL
CONSULTING | MANAGEMENT | TRAINING

39 West 29th Street , 8th floor,
New York, NY 10001

LOW FLOW FIELD SAMPLING LOG

GROUNDWATER QUALITY PARAMETERS

QUARTERLY GROUNDWATER MONITORING - 1st Quarter 2023- March, 2023

Project:	1888 Bathgate Avenue Redevelopment Site	Weather:	Mostly Cloudy, Av. Temp: 37ºF, Wind S-SSE @ 8-12 mph, pressure 30.30 in. Hg.
Project Location:	4181 Third Avenue Bronx, NY 10457	Personnel:	C. Eckhardt
Project No.:	503-1001	Date:	March 1, 2023
NYSDEC Site No.:	C203088		

WELL DATA

Well Number:	**MW-11**	Well Diameter	2.0 in.	Groundwater Elevation (rel. msl)	48.65
Reported Total Depth ofWell (ft. below TOC):	6.50	Measuring Point Elevation (rel. msl.)	49.75	Average Pumping Rate:	0.19 gpm
Measured Total Depth of well (ft. below TOC):	5.51	Pump Intake Depth (below TOC):	4.50	Final Depth to Groundwater (below TOC)	
Screened Interval (bgs):	1.50-6.50	Purge Start Time:	12:42 PM	Total Volume Purged:	2.31 gallons
GroundWater Level (ft.below TOC):	1.10	Purge End Time	12:54 PM	Purge Method:	Solnist Peristaltic Pump
Product Thickness:	0.00	Sample Collection Time:	12:58 PM		
Standing water in well (ft.)	4.41	Sample Analysis:	dehalococcoides bacteria	Sample Method:	Same.
PID Reading at the well head (ppm)	1.90				

PURGE DATA

Time of Measurement	pH (SU)	Specific Conductivity (mS/cm)	Disolved Oxygen (ppm)	Turbidity (NTU)	Temperature (ºC)	ORP (mv)	Volume Purged (Liters)	Flow Rate (gpm) or (L/m)	Groundwater Level (ft. below TOC)	COMMENTS

Stability:	± 0.10 units	± 3%	± 10%	± 10%	± 3%		0.1-0.5 L/m or 0.026-0.13 gpm	drawdown = ≤ 0.3 ft.

Well Diameter	1"	1¼"	1½"	2"	3"	4"	6"
Volume (gal/ft)	0.04	0.075	0.103	0.171	0.378	0.652	1.48

ALC ENVIRONMENTAL
CONSULTING | MANAGEMENT | TRAINING

ALC
ENVIRONMENTAL

39 West 29th Street , 8th floor,
New York, NY 10001

LOW FLOW FIELD SAMPLING LOG

GROUNDWATER QUALITY PARAMETERS

QUARTERLY GROUNDWATER MONITORING -1st Quarter 2023 - March, 2023

Project:	1888 Bathgate Avenue Redevelopment Site	Weather:	Mostly Cloudy, Av. Temp: 37ºF, Wind S-SSE @ 8-12 mph, pressure 30.30 in. Hg.
Project Location:	4181 Third Avenue Bronx, NY 10457	Personnel:	C. Eckhardt
Project No.:	503-1001	Date:	March 1, 2023
NYSDEC Site No.:	C203088		

WELL DATA

Well Number:	**MW-13**	Well Diameter	2.0 in.	Groundwater Elevation (rel. msl)	47.72
Reported Total Depth ofWell (ft. below TOC):	34.00	Measuring Point Elevation (rel. msl.)	53.35	Average Pumping Rate:	0.69 gpm
Measured Total Depth of Well (ft. below TOC):	33.64	Pump Intake Depth (below TOC):	20.00	Final Depth to Groundwater (below TOC)	
Screened Interval (ft. bgs)	24.00-34.00	Purge Start Time:	1:51 PM	Total Volume Purged:	13.9 gallons
GroundWater Level (ft.below TOC):	5.63	Purge End Time	2:21 PM	Purge Method:	Solnist peristaltic pump
Product Thickness	0.00	Sample Collection Time:	2:24 PM		
Standing water in well (ft.):	28.01	Sample Analysis:	dehalococcoides bacteria	Sample Method:	Same.
PID reading at the well head (ppm)	0.2				

PURGE DATA

Time of Measurement	pH (SU)	Specific Conductivity (mS/cm)	Disolved Oxygen (mg/l)	Turbidity (NTU)	Temperature (ºC)	ORP (mv)	Volume Purged (gallons)	Flow Rate (gpm) or (L/m)	Groundwater Level (ft. below TOC)	COMMENTS

Stability:	± 0.10 units	± 3%	± 10%	± 10%	± 3%		0.1-0.5 L/m or 0.026-0.13 gpm	drawdown = ≤ 0.3 ft.

Well Diameter	1"	1¼"	1½"	2"	3"	4"	6"
Volume (gal/ft)	0.04	0.075	0.103	0.171	0.378	0.652	1.48

APPENDIX – B

Laboratory Analytical REPORT

10515 Research Drive
Knoxville, TN 37932
Phone: (865) 573-8188
Fax: (865) 573-8133

Client:	Jeff Diamond ALC Environmental 39 West 29th Street 8th Floor New York, NY 10001	**Phone:**	516-521-5627 **Fax:**

Identifier: 013UC **Date Rec:** 03/02/2023 **Report Date:** 03/06/2023

Client Project #: 503-1001 **Client Project Name:** 1888 Bathgate Avenue

Purchase Order #: 503-1001

Test results provided for: CENSUS

Reviewed By:

Results relate only to the items tested and the sample(s) as received by the laboratory.

MICROBIAL INSIGHTS, INC.

10515 Research Dr., Knoxville, TN 37932
Tel. (865) 573-8188 Fax. (865) 573-8133

CENSUS

Client: **ALC Environmental**
Project: 1888 Bathgate Avenue

MI Project Number: **013UC**
Date Received: 03/02/2023

Sample Information

Client Sample ID:		**MW-11**	**MW-13**
Sample Date:		03/01/2023	03/01/2023
Units:		cells/mL	cells/mL
Analyst/Reviewer:		AR/CS	AR/CS
Dechlorinating Bacteria			
Dehalococcoides	*DHC*	**1.79E+02**	**1.65E+01**

Legend:
NA = Not Analyzed NS = Not Sampled J = Estimated gene copies below PQL but above LQL I = Inhibited
< = Result not detected

Quality Assurance/Quality Control Data

Samples Received **3/2/2023**

Component	Date Prepared	Date Analyzed	Arrival Temperature	Positive Control	Extraction Blank	Negative Control
DHC	03/02/2023	03/06/2023	0 °C	105%	non-detect	non-detect

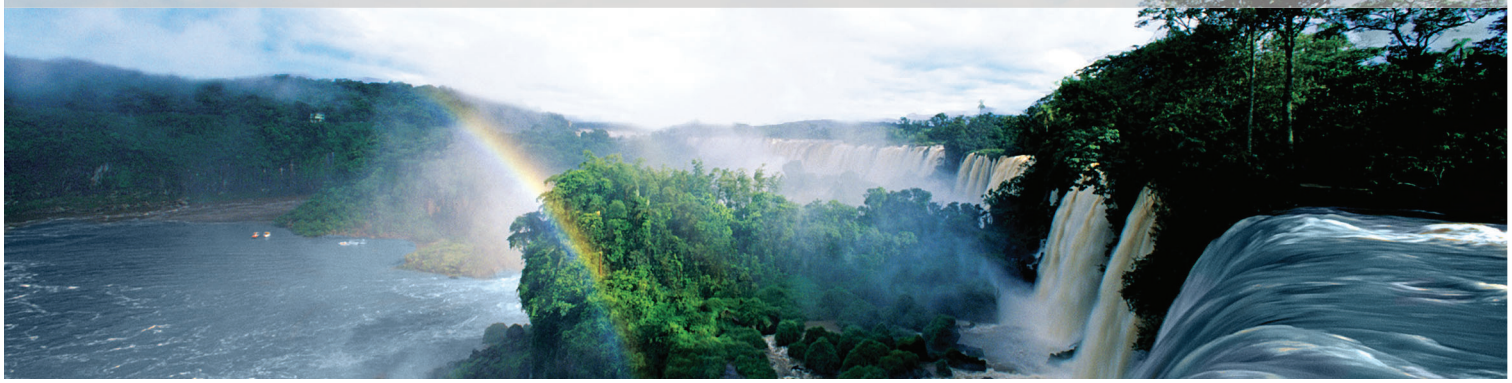
APPENDIX – C

EOS Pro – Product Information

NEW & IMPROVED

EOS PRO

The best EVO just got better: EOS PRO.



Emulsified vegetable oil (EVO) enriched to optimize anaerobic bioremediation of chlorinated solvents and other recalcitrant chemicals in contaminated groundwater.

USDA CERTIFIED BIOBASED PRODUCT
PRODUCT 95%

Product Advantages

- New and improved nutrient package for optimal *Dehalococcoides (Dhc) mccartyi* growth
- Slow and fast release substrates
- Engineered for effective transport
- Third party validated
- Food-grade and USDA certified
- 74% fermentable carbon
- Regulatory acceptance

Experience you can rely on,
Products you can trust™

EOS Remediation

+1 919.873.2204
www.eosremediation.com

Brad Elkins
BElkins@eosremediation.com

NEW & IMPROVED

EOSPRO

Description

EOSPRO is a nutrient-enriched, DoD-validated, emulsified vegetable oil (EVO). EOSPRO is engineered to quickly stimulate microbial activity while providing long-term nourishment to enhance anaerobic bioremediation of chlorinated solvents, nitrates, perchlorate, energetics, acid mine drainage, and other recalcitrant chemicals in contaminated groundwater. EOSPRO can also be used to reduce redox sensitive metals and radionuclides. The negative surface charges on the droplets combined with small droplet size promote effective transport in the subsurface.

EOSPRO benefits include:

- New and improved nutrient package for optimal *Dehalococcoides (Dhc) mccartyi* growth
- Rapidly-biodegradable substrates to "jump start" bacterial growth
- Slow release biodegradable substrates to promote long-term biological activity
- Engineered for effective transport in the subsurface
    - Small oil droplet size
    - Negative surface charge
- Extensive third-party validation

EOSPRO incorporates the patented EOS® technologies that clients have trusted for more than a decade. Domestic supply made in the USA with US farmed soybeans.

Chemical & Physical Properties

Oil Emulsion Concentrate: EOSPRO	Typical
Refined and Bleached US Soybean Oil (% by wt.)	59.8
Rapidly Biodegradable Soluble Substrate (% by wt.)	4
Other Organics (emulsifiers, nutrients, etc.) (% by wt.)	10
Specific Gravity	0.96 - 0.98
pH (Standard Units)	6 - 7
Median Oil Droplet Size (microns)	1.0
Organic Carbon (% by wt.)	74
Mass of Hydrogen Produced (lbs. H_2 per lbs. EOSPRO)	0.25

Packaging

Shipped in 55-gallon drums, 275-gallon IBC totes or bulk tankers (40,000 lbs.)

Handling & Storage

EOSPRO is shipped as a ready-to-use concentrated emulsion that can be diluted with water in the field to prepare a high quality suspension for easy injection. EOSPRO has a low viscosity and can be distributed with commonly available pumps or by continuous metering with a diluter (e.g., Dosatron™). Dilution ratios for EOSPRO typically range from 4:1 to 20:1 (water: EOSPRO) depending on site conditions. EOSPRO injections should be followed with additional chase water to maximize distribution of EOSPRO into the formation.

EOSPRO can be injected with EOSQR, CoBupHMg or BAC-9. Call us for more details.

For best performance, use EOSPRO as shipped, within 60 days of delivery and store at a temperature between 40°F (4°C) to 100°F (38°C).

+1 919.873.2204
www.eosremediation.com