ALTERNATIVES ANALYSIS

FORMER HYGRADE POLISHING AND PLATING CO. SITE 22-07 41ST AVENUE, LONG ISLAND CITY, NEW YORK BCP SITE NO. C241148

Prepared for:

STALINGRAD VENTURES LLC
100 FIELD STREET
WEST BABYLON, NY 11704

Prepared by:

AMEC E&E, PC
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Project Number: 3612162331

Revision 1

February 2019

February 27, 2019

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Phone: (718) 482-7541

NYSDEC
Division of Environmental Remediation
1 Hunter's Point Plaza
47-40 21st Street
Long Island City, NY 11101-5407

Attn: Wendi Zheng

Re**:** **Alternatives Analysis Report**
Former Hygrade Polishing and Plating Co.
22-07 41st Avenue
Long Island City, NY 11101
BCP Site No.: C241148

Dear Ms. Zheng;

An Alternatives Analysis Report for the above-referenced facility is attached for your review. This version includes comments provided in your letter of December 21, 2018.

If you have any questions, please do not hesitate to call our Office.

Respectfully,

Amec E&E, PC

Eric A. Weinstock, PG
Principal Scientist

Brent O'Dell, P.E., DEE
Vice President/Principal Engineer

STATE OF NEW YORK
BRENT CURTIS O'DELL
069876
LICENSED PROFESSIONAL ENGINEER

cc: Dawn Hetrick, NYSDOH
Robert Birnbaum, Stalingrad Ventures

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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

AMEC	AMEC Engineering and Environment, P.C.
BGS	Below Ground Surface
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
CCR	Construction Completion Report
DER	Division of Environmental Remediation
EPA	Environmental Protection Agency
Ft^2	Square Feet
IRM	Interim Remedial Measure
IRT	Innovative Recycling Technologies, Inc
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYCDEP	New York City Department of Environmental Protection
MECC	Metro Environmental Contracting Corp.
PCE	Tetrachloroethene
PID	Photo Ionization Detector
PFAS	Poly and Perfluoroalkyl Substances
Site	Former Hygrade Polishing and Plating Co. Site
SSDS	Sub-Slab Depressurization System
TCE	Trichloroethene
VC	Vinyl Chloride
VOC	Volatile Organic Compound

1.0 INTRODUCTION AND SITE BACKGROUND

This document details the alternatives analyzed to address detections of Poly and Perfluoroalkyl Substances (PFAS) compounds in groundwater below the Former Hygrade Polishing and Plating site located at 22-07 41st Avenue, Long Island City, NY (the Site) and shown on Figure 1. This Alternative Analysis was performed on behalf of Stalingrad Ventures, LLC (the Volunteer) through the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP). AMEC E&E, PC is authorized by the Department of Education to perform professional engineering services in NYS under certificate number 0011197.

This Report has been prepared in accordance with Section 4.3 of the NYSDEC DER-10/Technical Guidance (NYSDEC, 2010). Due to the nature of the impacted and limited accessibility, many remedial technologies become not applicable. Therefore we have reduce the number of remedial alternatives evaluated down to the three alternatives that were analyzed as part of this Report are specific to PFAS in groundwater and include:

1. Long-term Monitoring
2. Injection of Liquid Activated Carbon
3. Installing and Operation of a Pump and Treat System

1.1 SITE LOCATION

The Site is currently enrolled in the NYSDEC Brownfield Cleanup Program (BCP) under site number C241148. The Site is located at 22-07 41st Avenue, in a commercial neighborhood in Long Island City, Queens, New York (Fig 1). The Site is approximately 2,500 square feet (ft^2) in size and was last used as a metal polishing and electroplating facility. Current ownership plans to utilize space for commercial use and storage.

1.2 SITE HISTORY

The property was improved with the four-story structure currently occupying the Site since the 1920s. Before the current on-site renovations began, Hygrade Polishing and Plating – also known as Double E

Plating – operated at the property since 1962. The property was previously occupied by Roto Metal Shop from 1939 to 1962 as a tenant at this location.

Hygrade operated at this location as a metal polishing and electroplating facility from 1962 to 2012. The plating operations consisted of numerous tanks and barrels used to plate parts with chromium, brass (copper and zinc), nickel, and zinc on the first floor of the building. Metallic parts were prepared for plating using alkaline cleaners, acid etchant solutions, and/or stripping solutions (depending on the process at that time) and rinsed. Once the metallic parts were prepared, the parts were electroplated in process solutions that contained the required metals in solution followed by a parts rinse. The process generated wastewater was treated in an onsite unit located in the basement before discharging to the New York City combined sewer system under a permit from the NYCDEP.

The new owner (Stalingrad Ventures, LLC) took title to the Site on March 13, 2013 and performed a cleanup of the Hygrade facility under a New York City Department of Environmental Protection (NYCDEP) Commissioner's Order that had been issued to the Site's former owner in 2012. As part of the cleanup, remedial actions were performed by Innovative Recycling Technologies, Inc. (IRT) and Metro Environmental Contracting Corp. (MECC).

On May 9, 2015, Stalingrad Ventures, LLC entered into a Brownfield Cleanup Agreement (BCA) with the NYSDEC as a Volunteer. A Remedial Investigation Work Plan (RIWP) dated June 28, 2016 was submitted to the NYSDEC and approved. The details of their cleanup program performed for the NYCDEP Commissioner's Order are summarized in the RIWP. This included removing the concrete surfacing from all of the walls in the basement and first floor, washing and resurfacing the floors, and removal of approximately 581 tons of soil from the basement and replacing it with sand. The soil was transported by a permitted hauler to permitted facilities including Republic Environmental Systems (PA), Inc.; EQ Detroit, Inc.; Michigan Disposal Waste Treatment Plant; Chemtron Corp.; and Stablex.

A Remedial Investigation was performed at the property while it was being renovated and addressed the soil, soil vapor and groundwater at the site. During the Remedial Investigation, volatile organic compounds in the low part per million range were detected in the shallow groundwater below the basement floor. The property owner agreed to perform an interim remedial measure (IRM). This included: treating the volatile organic compounds (VOC) and metals impacted groundwater underlying the property with the bioremediation products EHC and Metafix manufactured by Peroxychem (i.e. anerobic reductive dichlorination); installing a sub slab depressurization (SSD) system; and, placement of a vapor barrier over the basement floor. Two injection wells were also installed in the event additional bio-remediation products need to be applied after the building renovations were completed. This was, in turn, followed by a new 8-inch thick concrete slab. A drawing illustrating the configuration of the SSD system is included on Figure 2. A drawing displaying the location of the four monitoring wells in the basement and two injection points is included as Figure 3.

As part of the IRM activities, a program of quarterly groundwater monitoring was implemented to monitor the ongoing reductive dichlorination/bioremediation. A drawing displaying the locations of four monitoring wells and two injection wells located in the basement is included as Figure 3. During the initial round of sampling, the NYSDEC requested that analysis for PFAS compounds be added to the list of parameters included in the normal sampling regime. The results of that sampling event revealed the PFAS compound Perfluorooctanesulfonic Acid (PFOS), and to a lesser degree Perfluorooctanoic Acid (PFOA), in the groundwater at concentrations above federal drinking water Health Advisories.

2.0 Nature and Extent of PFAS Contamination

2.1 Groundwater

In addition to the VOCs and metals included in the required quarterly monitoring events, analysis for PFAS was added to the sampling regime at the request of the NYSDEC. The first sampling round to include the analysis of groundwater for PFAS compounds was April 26 and 27, 2018. Presently, there are no applicable New York State standard in which to compare PFAS levels to, however in May 2016, the United States Environmental Protection Agency (EPA) established drinking water Health Advisory of 0.070 ug/l for the combined concentrations of PFOA and PFOS and 400 ppb for Perfluorobutane Sulfonate (PFBS). The concentration of the combined value of PFOA and PFOS exceeded the EPA drinking water advisory in water samples collected from all site monitoring well locations with the exception of the upgradient well. The highest PFAS concentrations were detected below the building in samples collected from basement monitoring wells BMW-3 and BMW-4; the wells that had historically displayed the highest VOC detections. None of the groundwater results exceed the EPA drinking water advisory for PFBS.

The laboratory results for PFAS are tabulated on Table 1. A map depicting the concentrations of PFOA, PFOS, and PFBS at each monitoring well location is included as Figure 4.

3.0 Identification and Development of Alternatives

3.1 Remedial Action Objectives (RAO)

3.1.1 Groundwater

A remedial action focused on VOCs and metals has already been implemented at this site under an IRM. The additional contaminants of concern detected in the groundwater and subject to this Alternatives Analysis include PFAS compounds. The NYSDEC's generic groundwater RAOs for public health are: to prevent the ingestion of contaminated groundwater; and, to prevent contact with, or inhalation of volatiles, from contaminated groundwater.

The generic groundwater RAOs for environmental protection are: to restore groundwater to pre-disposal/pre-release conditions, to the extent practicable; prevent the discharge of contaminants to surface water; and, remove the source of ground or surface water contaminants.

3.2 Development of Alternatives

Currently, there are no state groundwater standards for PFAS in New York. There is a federal Health Advisory of 0.070 ug/l for the PFAS compounds PFOS and PFOA either separately or combined. Using the federal Health Advisory as an RAO, the following alternatives were evaluated.

3.2.1 Alternative A – Long Term Monitoring

The basement of the building is currently sealed with a recently poured 8-inch thick concrete floor followed by a plastic vapor barrier. As such, the pathways for dermal contact and inhalation of vapors have been removed. This area of Queens is serviced by surface water reservoirs for the distribution of potable water. Therefore the pathway for ingestion of groundwater has also been removed.

Alternative A would consist of periodic monitoring of the groundwater in the Site wells for PFAS. The monitoring would initially be performed quarterly, then be modified to annual as presented in the Remedial Action Work Plan for this Site. This is the same monitoring scheme included as part of the bioremediation program already implemented under an IRM with the addition of PFAS analysis and extrapolated over a period of 30 years. After consultation with the NYSDEC, the frequency of sampling may be modified.

3.2.2 Alternative B – Injection of Liquid Activated Carbon

Alternative B is the same as Alternative A with the addition an application of PlumeStop™ liquid activated carbon manufactured by Regenesis to two existing injection wells that were installed in the basement as part of the IRM work performed at the Site. The PFAS compounds would partition out of the aqueous phase and sorb onto the fine particles of activated carbon in PlumeStop™. This process should help to lower the concentration of PFAS in the groundwater and monitoring wells at the site. However, the PFAS will remain adhered to the granular activated carbon within the water bearing soils below the basement floor. Monitoring of the groundwater would continue as described above in Alternative A. A cost estimate was prepared for the application of this product through two existing injection wells located in the basement. These costs are presented in Section 4.8.2.7 Cost Effectiveness.

3.2.3 Alternative C – Pump and Treat

Alternative C is the same as Alternative A with the addition of pumping wells placed in the floor of the basement and trenches installed to extract groundwater containing PFAS and convey the water to a mechanical room located in the rear of the basement. The pumped groundwater would be treated on-site using either aqueous phase granular activated carbon or an anionic ion exchange resin (noting that PFOS/PFOA are cationic). The treated water would, in turn, be discharged either to a plumbing connection connected to the municipal sewer system (along with an appropriate permit) or back to the ground through injection wells. Monitoring of the groundwater would continue as described above in Alternative A.

4.0 Detailed Analysis of Alternatives

The remedial alternatives discussed in Section 3 were individually and comparatively evaluated with respect to the following seven criteria as defined in Section 4.2 of DER-10:

- Overall Protection of Human Health and the Environment
- Compliance with Standards, Criteria, and Guidance
- Long-Term Effectiveness
- Reduction of Toxicity, Mobility and Volume
- Short-Term Effectiveness
- Implementability
- Cost Effectiveness

These criteria are further discussed below.

4.1 Overall Protection of Public Health and the Environment

This criterion is an evaluation of the ability of each alternative or remedy to protect public health and the environment.

4.2 Compliance with Standards, Criteria, and Guidance

The alternative or remedy must conform to officially promulgated standards and criteria that are directly applicable or that are relevant and appropriate.

4.3 Long-term Effectiveness

The criterion is an evaluation of the long-term effectiveness and permanence of an alternative or remedy after implementation.

4.4 Reduction of Toxicity, Mobility, and Volume

This criterion is an evaluation of the ability of an alternative or remedy to reduce the toxicity, mobility and volume of site contamination. Preference should be given to remedies that permanently or significantly reduce the toxicity, mobility or volume of the contamination at the Site.

4.5 Short-term Effectiveness

This criteria is an evaluation of the potential short-term adverse environmental impacts and human exposures during remedial construction and/or implementation of an alternative or remedy.

4.6 Implementability

This criterion is an evaluation of the technical and administrative feasibility of implementing an alternative or remedy. It includes evaluating the permitting requirements, feasibility and schedule for obtaining such permits, if needed.

4.7 Cost Effectiveness

This criterion is an evaluation of the overall cost effectiveness of an alternative or remedy.

4.8 Individual Analysis of Alternatives

4.8.1 Alternative A – Long-term Monitoring

4.8.1.1 Overall Protection of Public Health and the Environment

The basement of the building is currently sealed with a recently poured 8-inch thick concrete floor followed by a plastic vapor barrier. As such, the pathways for dermal contact and inhalation of vapors have been removed. This area of Queens is serviced by surface water reservoirs for the distribution of potable water. Therefore the pathway for ingestion of groundwater has also been removed. However, it does not satisfy the remedy selection criteria outlined in Section 4.2 (b) 1 of DER-10.

4.8.1.2 Compliance with Standards, Criteria, and Guidance

There is a federal Health Advisory of 0.070 ug/l for the PFAS compounds PFOS and PFOA either separately or combined. This alternative is not expected to attain compliance with the Health Advisory with respect to drinking water, as no active remediation is being completed and the persistence of PFOS and PFOA when in groundwater.

4.8.1.3 Long-term Effectiveness

Since the soils below the Site contain a high percentage of silt, the bulk of PFAS contamination should remain below the property. Property use will not change in the foreseeable future and the potential for exposure is low due to building coverage, and groundwater not being used for drinking water purposes. Monitoring will be performed to confirm that.

4.781.4 Reduction of Toxicity, Mobility, and Volume

This alternative will not reduce the toxicity, mobility or volume of the PFAS contamination.

4.8.1.5 Short-term Effectiveness

There are no short-term adverse environmental impacts associated with this alternative. Monitoring activities will be conducted under a Site Specific Health and Safety Plan (HASP), and appropriate PPE will be utilized. The monitoring activities will be reviewed on a regular basis to ensure no changes to site use, or nature and extent of contamination occur.

4.8.1.6 Implementability

Monitoring is currently ongoing at the Site, so minimal action is require to implement this remedy. This alternative is fully implementable. It does not require any modifications to the existing building or permitting.

4.8.1.7 Cost Effectiveness

Since this alternative is not expected to achieve the SCGs, a cost estimate was not prepared.

4.8.2 Alternative B – Injection of Liquid Activated Carbon

4.2.2.1 Overall Protection of Public Health and the Environment

This alternative is protective of Public Health and the Environment. The pathways for occupants to be come in contact with the PFAS have been mitigated.

4.8.2.2 Compliance with Standards, Criteria, and Guidance

Technologies and their effectiveness to address PFAS in-situ are limited, however granular activated carbon (GAC) (PlumeStop) has been shown to treat and reduce PFAS concentrations in-situ in groundwater. The goal of this Alternative will be to apply the product until the measurable decreases in PFAS concentrations are achieved in the on-site monitoring wells. This alternative will likely not achieve the federal Health Advisory of 0.070 ug/l, but should reduce the levels from the current concentration to a lower concentration and enhance the eventual attenuation to below ARARs, faster than the monitoring only option.

4.8.2.3 Long-term Effectiveness

Since the soils below the Site contain a high percentage of silt, the bulk of PFAS contamination should remain below the property. The addition to GAC to the subsurface will only enhance this environment. Monitoring will be performed to confirm that, and to confirm the effectiveness of the remedy. As such this alternative's effectiveness will be evaluated and expected to be effective over the long term.

4.8.2.4 Reduction of Toxicity, Mobility, and Volume

This alternative is expected to reduce the mobility of PFAS below the basement, but not the toxicity or volume. The PFAS currently dissolved in the groundwater would be sorbed to the activated carbon injected below the basement floor. This alternative will lower the concentration of PFAS dissolved in the groundwater below the site, but may not achieve the Health Advisories.

4.8.2.5 Short-term Effectiveness

All work will be completed in accordance with a Site-specific HASP that will address specific risks associated with PlumeStop injections as well as long-=term monitoring. Two injection wells were incorporated into the PFAS-impacted silty formation as part of the IRM. Therefore, by applying the product to these injection wells and to the existing monitoring wells in the basement, the short-term impacts should be minimal. Short circuiting cause by utilities or storm sewers is not anticipated to be an issue, and can be avoided.

4.8.2.6 Implementability

Injections have been conducted to address other contaminants at the Site, indicating in-situ injection technologies are implementable. Since the injection wells are already in place, the application of the product is implementable. However, it is not known how well the PlumeStop will migrate within the silty formation after it is applied. This can only be determined by applying the product and monitoring the groundwater over time.

4.8.2.7 Cost Effectiveness

This is the only alternative that is expected to be effective. Based on the application of two injection rounds, costing was provided by Regenesis to apply PlumeStop. See Appendix A. The estimated cost for one application of PlumeStop to two injection points is presented below:

Preparation of additional procedures in the RAWP, update H&SP and correspondences with product vendor	$10,000
Application of PlumeStop to two existing Injection Points	$50,000
Preparation of additional text and figures in the FER	$10,000
Quarterly monitoring of basement wells for 1 year	$20,000
Subtotal	$90,000

For the purposes of this Alternatives Analysis, it is assumed that post-remediation monitoring would continue annually for a period of 5 years. After 5 years, we would evaluate the data and request permission to terminate the groundwater monitoring program.

Post-remedial monitoring	$18,000 per year
	X 5 years
	$90,000

The total estimated cost for this alternative is $180,000.

4.8.3 Alternative C – Pump and Treat

4.8.3.1 Overall Protection of Public Health and the Environment

Due to technology limitations the protectiveness of Pump and Treat will be limited. It will not create an exposure pathway for occupants of the building to come in contact with the PFAS impacted groundwater below the Site. Groundwater pumping in the area presents difficulties related to groundwater width drawl treatment and discharge. Pumping can draw in contaminants from other sites and can dewater areas that normally are not dewatered causing damage or settlement to adjacent structures or ground. Such things could lead to unnecessary damage to property and structures.

4.8.3.2 Compliance with Standards, Criteria, and Guidance

The goal of this alternative will be to operate the system until the Health Advisories are achieved in the on-site monitoring wells. Given the low permeability of the soils below the basement, it is likely that the Health Advisory of 0.070 ug/l will not be achieved. However, the concentration of PFAS would be expected to decrease over time. In no instance will pump and treat achieve standards any quicker than the previous two alternatives identified due to the technologies limitations at the Site.

4.8.3.3 Long-term Effectiveness

Due to the low permeability of the soils, this alternative is not expected to be effective over the long term. The formation will not yield groundwater at a rate that will allow for this technology to effectively remove the PFAS from the ground. Therefore the remedy will not achieve acceptable compliance with this criterion.

4.8.3.4 Reduction of Toxicity, Mobility, and Volume

This alternative is expected to reduce the volume of PFAS below the basement, but PFAS mass will not be significantly decreased via pumping. It is not expected to achieve the Health Advisories.

4.8.3.5 Short-term Effectiveness

Short-term impacts can be managed thru implementation of a Site-specifc HASP, and appropriate engineering controls. alternative. The newly poured concrete floor in the basement will have to be penetrated for pumping wells to be installed. Trenches will have to be cut in the floor to run the discharge line to the mechanical room in the back of the basement. Of the three alternatives, this alternative would represent the highest risk of short term exposure.

4.8.3.6 Implementability

Based on the low permeability of the soils below the basement, this alternative is not considered to be implementable. Of the alternatives being considered, implementing a pump and treat solution will be hardest to implement and take the longest due to dewatering and discharge permitting that would be required.

4.8.3.7 Cost Effectiveness

This would be the most expensive of the three Alternatives evaluated. However, since it is not considered to be feasible based on the geologic conditions at the site, an estimated cost was not prepared for this alternative.

4.9 Comparison of Alternatives

In accordance with Section 4.2 of DER-10, the three alternatives were evaluated on the basis of both Threshold and Balancing Criteria. If an alternative did not pass the Threshold Criteria, it was not considered further. Similarly, if it did not pass the Balancing Criteria, it was also not considered further.

Criteria	Criteria Type (Thershold or Balancing)	A- Long-term Monitoring	B- Injection of Liquid Activated Carbon	C- Pump and Treat
1.Overall Protection of Public Health and the Environment	Threshold	No	Yes	Yes
2.Compliance with Standards, Criteria, and Guidance	Threshold	No	Yes	Yes
3.Long-term Effectiveness	Balancing	Not considered further	Yes	No
4.Reduction of Toxicity, Mobility, and Volume	Balancing	--	Yes	Yes
5.Short-term Effectiveness	Balancing	--	Yes	No
6.Implementability	Balancing	--	Yes	No
7.Cost Effectiveness (over 5 year period)	Balancing	--	$180,000	Not considered further

5.0 Recommendation

Three Alternatives were evaluated as part of this analysis:

- Long-term Monitoring
- Injection of Liquid Activated Carbon
- Installing and Operation of a Pump and Treat System

One of the three alternatives were found to be protective of Public Health and the Environment. The basement of the building is currently sealed with a recently poured 8-inch thick concrete floor followed by a plastic vapor barrier. As such, the pathways for dermal contact and inhalation of vapors have been removed.

Long-term Monitoring is not expect to achieve the SCGs for PFAS. Criteria 1 and 2 are identified as threshold criteria in accordance with DER-10 Section 4.2 (a) 1. This alternative is not expected to achieve the SCGs. As such, it was not considered beyond criteria number 2.

Installation and Operation of a Pump and Treat System achieves the threshold criteria, criteria 1 and 2, and was evaluated further. It was, however, found to be infeasible due to the inherently low permeability of the silty formation below the site that is impacted by PFAS in groundwater. This alternative did not achieve the balancing criteria in accordance with DER-10 Section 4.2 (a) 1, criteria 3 through 6. It is not expected to be effective in the long term, will have detrimental impacts to the property in the short term and is not implementable due to geologic constraints at the property.

Injection of Liquid Activated Carbon achieves the threshold criteria, criteria 1 and 2, and was evaluated further. Since bioremediation products have already been applied to the underlying soils in the past, this alternative was deemed to be implementable. As two injection points were installed as part of the previous IRM effort, the short-term impacts are expected to be minor. Based on information provided by Regenisis, the product is expected to be effective in lowering the PFAS concentrations in groundwater over the long term, but may never fully achieve the SCGs.

Based on the evaluation provided above, Injection of Liquid Activated Carbon is the recommended alternative for this site.

References

AMEC Engineering and Consulting, Inc. P.C., Remedial Investigation Report, Former Hygrade Polishing and Plating Co. Site, Long Island City, New York, August 7, 2017.

AMEC Engineering and Consulting, Inc. P.C., Interim Remedial Measure Work Plan, Former Hygrade Polishing and Plating Co. Site, Long Island City, New York, May 2017.

AMEC Engineering and Consulting, Inc. P.C., Construction Completion Report, Former Hygrade Polishing and Plating Co. Site, Long Island City, New York, Draft.

Amec Engineering and Consulting, Inc. P.C.018 First Quarterly Groundwater Monitoring Report, Former Hygrade Polishing and Plating Co., 22-07 41st Avenue, Long Island City, NY 11101 June 2018

CA RICH, Remedial Investigation Work Plan, Former Hygrade Polishing and Plating Site, 22-07 41st Avenue, Long Island City, NY BCP Site No.: C241148., June 2016

NYSDEC, DER-10 / Technical Guidance for Site Investigation and Remediation May 3, 2010

FIGURES

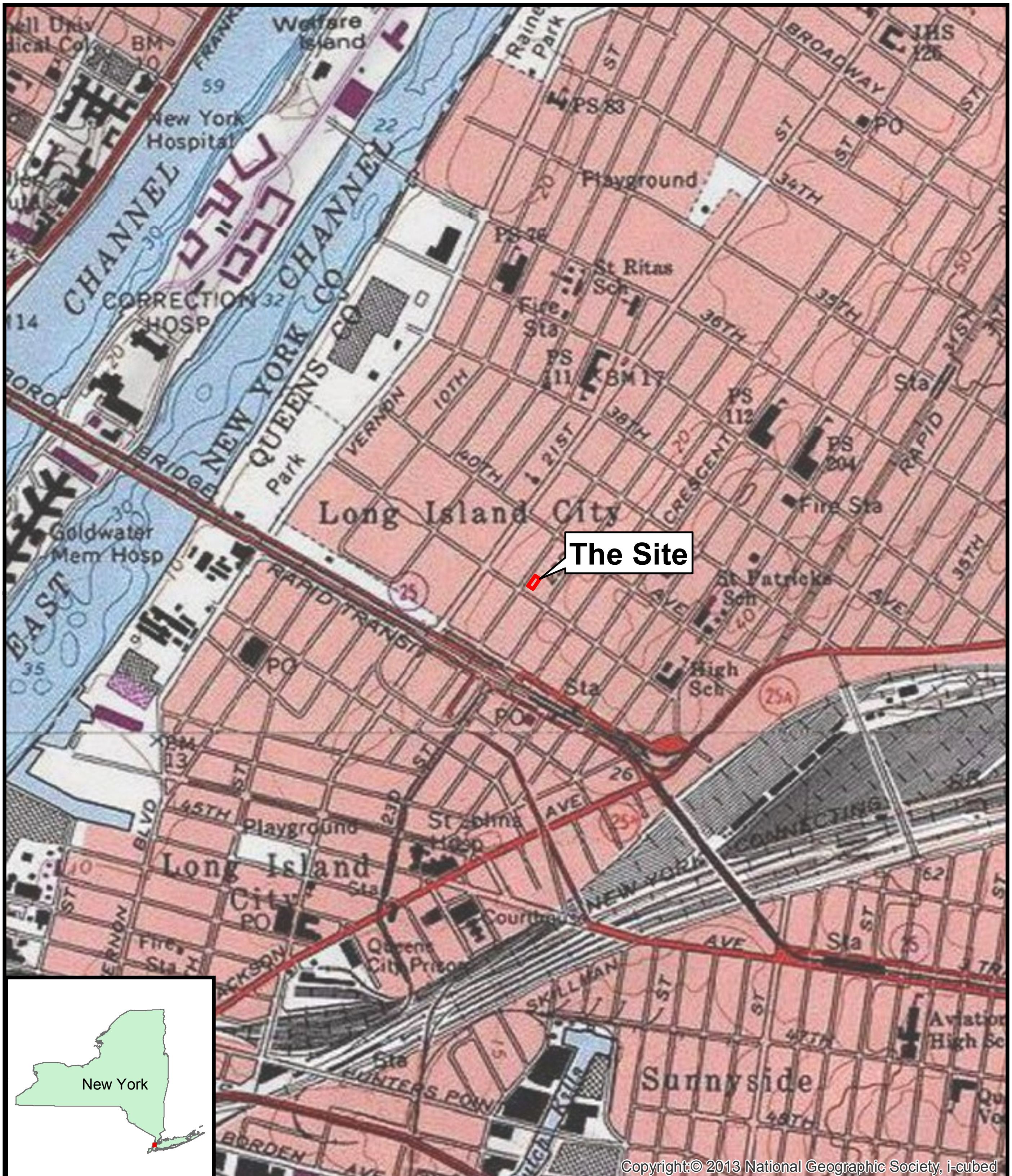

Figure 1
Site Location Map

22-07 41st Avenue
Long Island City, New York

N

0 500 1,000 Feet

Prepared/Date: JCL 12/05/16	Checked/Date: EAW 12/05/16

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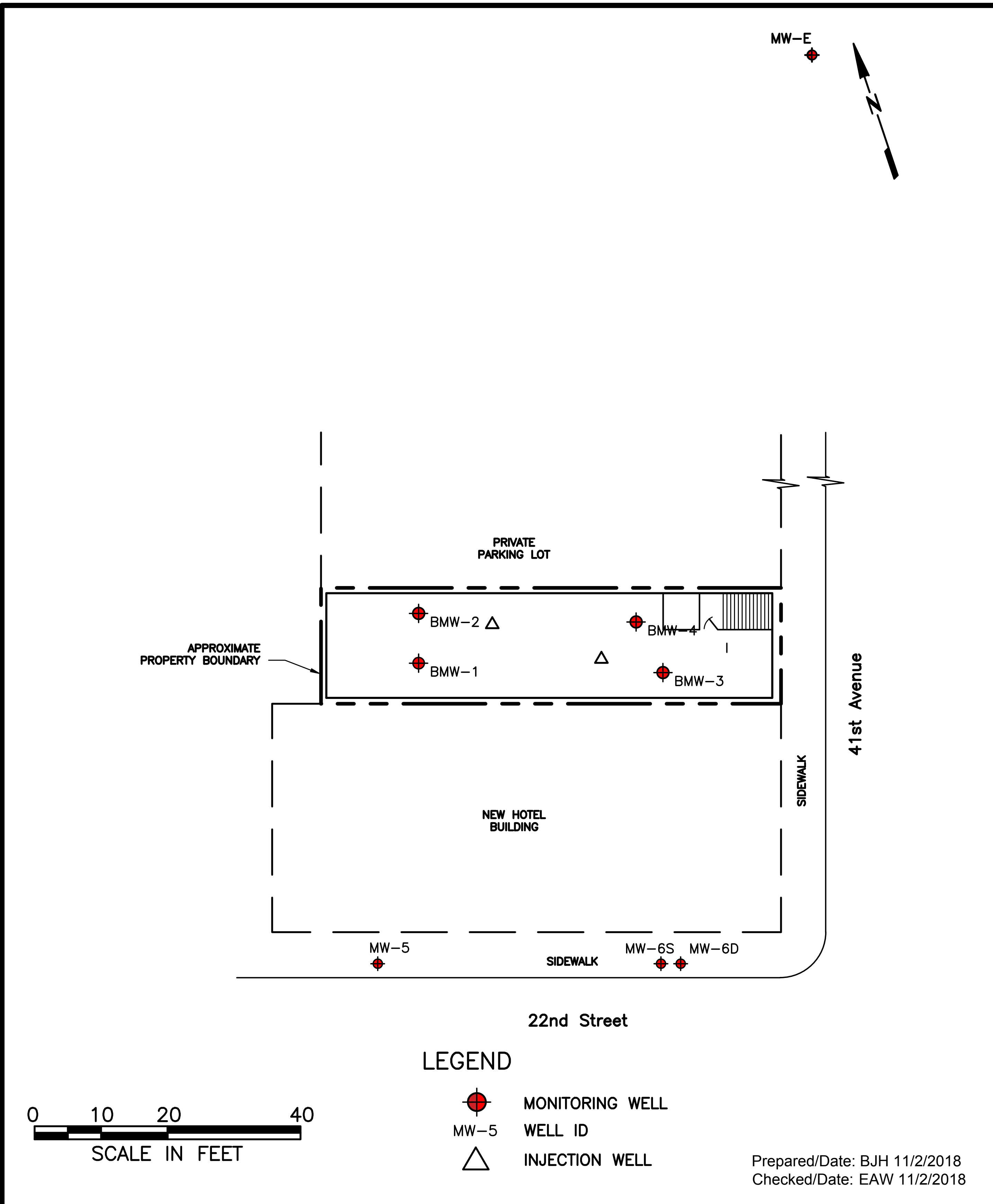
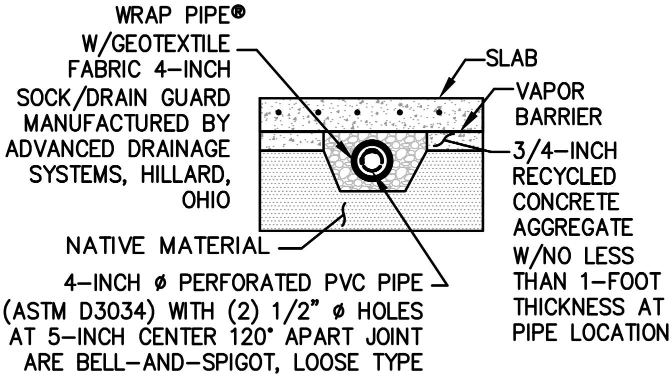
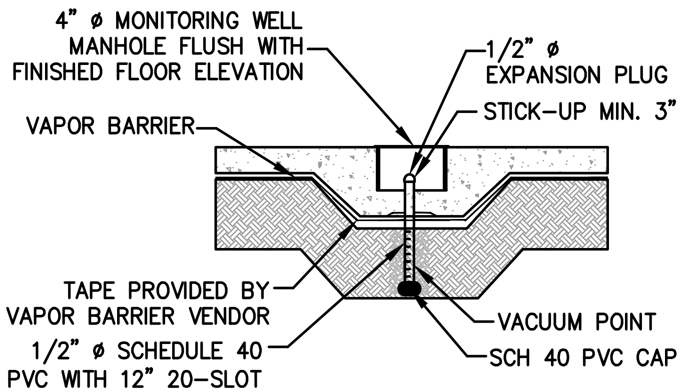


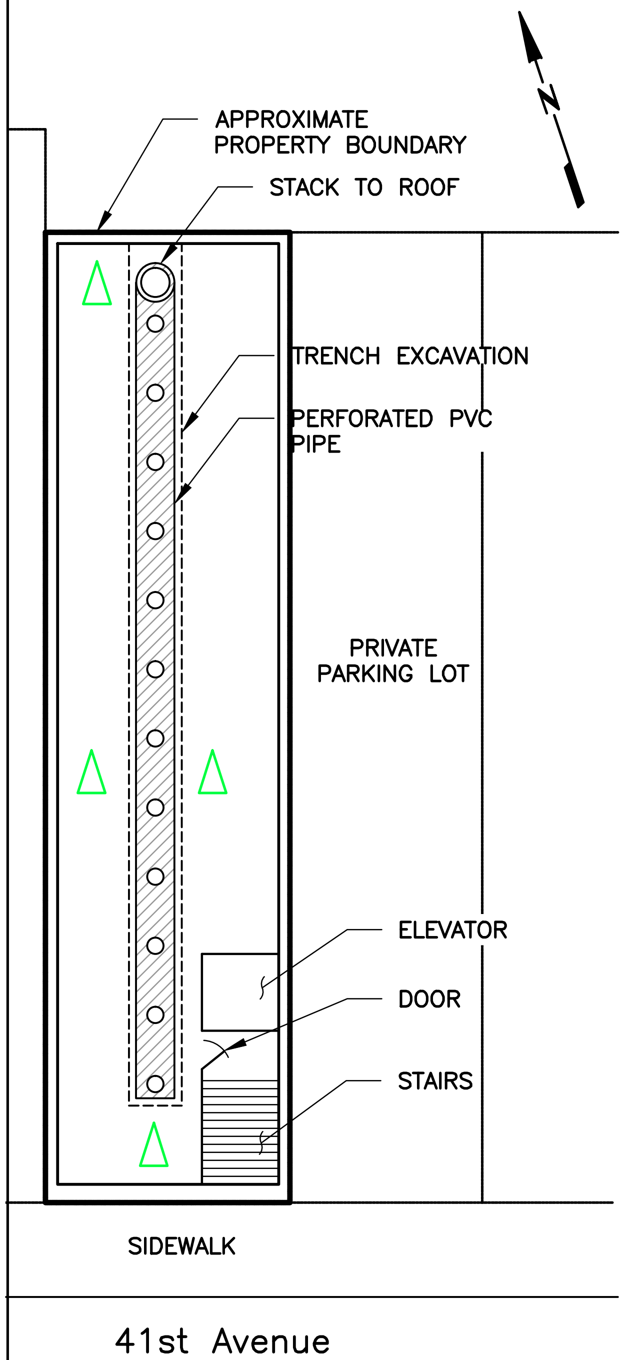
Former Hygrade Plating 22-07 41st Ave Long Island City, NY	Amec E & E, PC 214-25 42nd Avenue, Suite 3R Bayside, New York 11361 (347) 836-4343	Groundwater Monitoring Well and Injection Well Locations Map Project 3612-162-331 Figure 2



TYPICAL VENT PIPE
CROSS-SECTION (NTS)



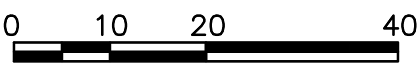
TYPICAL VACUUM MONITORING
POINT (NTS)



LEGEND

VACUUM MONITORING POINT

4"ø PERFORATED PVC PIPE



SCALE IN FEET

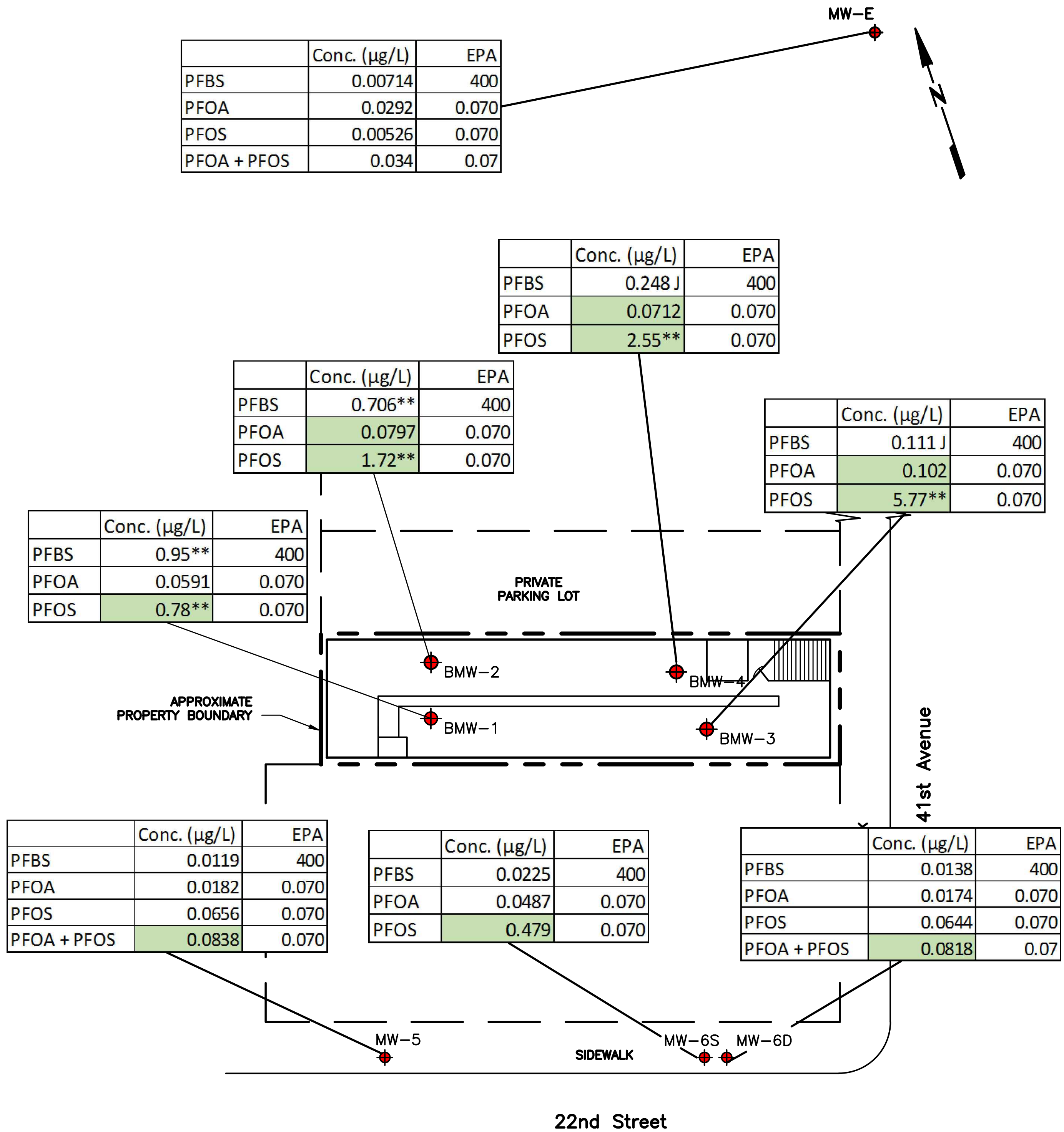
Prepared/Date: WJW 10/24/2016
Checked/Date: JL 10/24/2016

Former Hygrade Plating
22-07 41st Ave
Long Island City, NY

Amec E & E, PC
1979 Marcus Ave., Suite 210
Lake Success, New York 11042
(516) 622-2254
amec

SUB-SLAB
DEPRESSERIZATION PLAN
Project 3612-162-331
Figure 3

Z:\Projects\Clifton Park Misc Proj\Long Island City\5 Fig-RD-05.dwg Wed, 01 Feb 2017 - 10:24am john.french



	Conc. (µg/L)	EPA
PFBS	0.00714	400
PFOA	0.0292	0.070
PFOS	0.00526	0.070
PFOA + PFOS	0.034	0.07

	Conc. (µg/L)	EPA
PFBS	0.248 J	400
PFOA	0.0712	0.070
PFOS	2.55**	0.070

	Conc. (µg/L)	EPA
PFBS	0.706**	400
PFOA	0.0797	0.070
PFOS	1.72**	0.070

	Conc. (µg/L)	EPA
PFBS	0.111 J	400
PFOA	0.102	0.070
PFOS	5.77**	0.070

	Conc. (µg/L)	EPA
PFBS	0.95**	400
PFOA	0.0591	0.070
PFOS	0.78**	0.070

	Conc. (µg/L)	EPA
PFBS	0.0119	400
PFOA	0.0182	0.070
PFOS	0.0656	0.070
PFOA + PFOS	0.0838	0.070

	Conc. (µg/L)	EPA
PFBS	0.0225	400
PFOA	0.0487	0.070
PFOS	0.479	0.070

	Conc. (µg/L)	EPA
PFBS	0.0138	400
PFOA	0.0174	0.070
PFOS	0.0644	0.070
PFOA + PFOS	0.0818	0.07

LEGEND

CONCENTRATION EXCEEDS EPA STANDARDS

** – SECONDARY RUN AFTER 1 TO 10 DILUTION FACTOR

'J' – Designates an estimated value

MONITORING WELL

MW-5 WELL ID

Prepared/Date: BJH 05/24/2018
Checked/Date: EAW 05/24/2018

Former Hygrade Plating
22-07 41st Ave
Long Island City, NY

Amec E & E, PC
214-25 42nd Avenue, Suite 3R
Bayside, New York 11361
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Groundwater Monitoring Well
PFAS Concentrations Map
Project 3612-162-331
Figure 4

C:\Users\benjamin.hess\appdata\local\temp\AcPublish_8704\PFAS Groundwater Map.dwg Mon, 18 Jun 2018 - 1:39pm benjamin.hess

TABLES

TABLE 1: GROUNDWATER PFAS ANALYTICAL RESULTS
22-07 41st Avenue, Long Island City, NY

SAMPLE ID:		BMW-1		BMW-2		BMW-3		BMW-4		MW-5		MW-6S		MW-6D		MW-E		DUPLICATE***	
COLLECTION DATE:		7/27/2018		7/27/2018		7/26/2018		7/26/2018		7/26/2018		7/26/2018		7/26/2018		7/26/2018		7/26/2018	
LOCATION:		BASEMENT		BASEMENT		BASEMENT		BASEMENT		22ND STREET		22ND STREET		22ND STREET		41ST AVENUE		BASEMENT	
DEPTH (ft):		1-6		2.5-7.5		3.5-8.5		3.5-8.5		8-18		8-18		26-31		8-18		3.5-8.5	
SAMPLE MATRIX:		GROUNDWATER		GROUNDWATER		GROUNDWATER		GROUNDWATER		GROUNDWATER		GROUNDWATER		GROUNDWATER		GROUNDWATER		GROUNDWATER	
ANALYTE (ug/L)	EPA	Conc	Qual	Conc	Qual	Conc	Qual	Conc	Qual	Conc	Qual	Conc	Qual	Conc	Qual	Conc	Qual	Conc	Qual
Perfluorinated Alkyl Acids by Isotope Dilution																			
Perfluorobutanoic Acid (PFBA)	NSG	0.031		0.0286		0.0324		0.0235		0.00984		0.0148		0.0139		0.0333		0.0233	
Perfluoropentanoic Acid (PFPeA)	NSG	0.0596		0.0479		0.072		0.0719		0.0133		0.0108		0.012		0.0829		0.0723	
Perfluorobutanesulfonic Acid (PFBS)	400	1.34	**	2.07	**	0.106	J+	0.148		0.0214		0.0227		0.0275		0.0111		0.149	
Perfluorohexanoic Acid (PFHxA)	NSG	0.0612		0.0438		0.15		0.0989		0.011		0.00908		0.0121		0.102		0.0994	
Perfluoroheptanoic Acid (PFHpA)	NSG	0.0278		0.0215		0.0277		0.0211		0.00735		0.00688		0.00655		0.0186		0.0209	
Perfluorohexanesulfonic Acid (PFHxS)	NSG	0.211		0.464		0.0983	J+	0.0926		0.00394		0.0272		0.00241		0.00271		0.095	
Perfluorooctanoic Acid (PFOA)*	0.070	0.0926		0.0914		0.0643		0.0627		0.0305		0.0614		0.0246		0.0641		0.0668	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	NSG	0.0152	U	0.0172	U	0.00257		0.00254		0.00467		0.00363		0.00185	U	0.14		0.00337	
Perfluoroheptanesulfonic Acid (PFHpS)	NSG	0.056		0.124		0.126		0.0621		0.00171	J	0.0111		0.000948	J	0.00192	UJ	0.0601	
Perfluorononanoic Acid (PFNA)	NSG	0.00617		0.00325		0.00331		0.00292		0.000818	J	0.00238		0.00168	J	0.00133	J	0.00265	
Perfluorooctanesulfonic Acid (PFOS)*	0.070	0.739	**	2.95	**	5.97	**	2.56	**	0.112		0.541	**	0.0608		0.00921		2.64	**
Perfluorodecanoic Acid (PFDA)	NSG	0.0024		0.00137	J	0.00192	U	0.00192	U	0.00178	U	0.002	U	0.00185	U	0.00657		0.000838	J
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	NSG	0.00185	U	0.00185	U	0.00192	U	0.00192	U	0.00178	U	0.002	U	0.00185	U	0.00192	U	0.00192	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	NSG	0.00185	U	0.00185	U	0.00192	U	0.00192	U	0.00178	U	0.002	U	0.00185	U	0.00192	U	0.00192	U
Perfluoroundecanoic Acid (PFUnA)	NSG	0.00185	U	0.00185	U	0.00192	U	0.00192	U	0.00178	U	0.002	U	0.00185	U	0.000442	J	0.00192	U
Perfluorodecanesulfonic Acid (PFDS)	NSG	0.00185	U	0.00185	U	0.00192	U	0.00192	U	0.00178	U	0.002	U	0.00185	U	0.00192	U	0.00192	U
Perfluorooctanesulfonamide (FOSA)	NSG	0.00185	U	0.00185	U	0.00192	U	0.00192	U	0.00178	U	0.002	U	0.00185	U	0.00192	U	0.00025	J
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	NSG	0.00185	U	0.00185	U	0.000612	J	0.00192	U	0.00178	U	0.002	U	0.00185	U	0.00192	U	0.00192	U
Perfluorododecanoic Acid (PFDoA)	NSG	0.00185	U	0.00185	U	0.00192	U	0.00192	U	0.00178	U	0.002	U	0.00185	U	0.00192	U	0.00192	U
Perfluorotridecanoic Acid (PFTrDA)	NSG	0.00185	U	0.00185	U	0.00192	U	0.00192	U	0.00178	U	0.002	U	0.00185	U	0.00192	U	0.00192	U
Perfluorotetradecanoic Acid (PFTA)	NSG	0.00185	U	0.00185	U	0.00192	U	0.00192	U	0.00178	U	0.002	U	0.00185	U	0.00192	U	0.00192	U
PFOA + PFOS (combined value)	0.070	0.8316		3.0414		6.0343		2.6227		0.1425		0.6024		0.0854		0.073		2.7068	

Notes:

Bold	Analyte detected for sample
E	Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
NSG	No Standard Given
J	indicates estimated value; concentration is below the reporting limit but above the minimum detection limit
EPA	EPA drinking water guideline, May 2016
*	Guideline value for combined concentrations of PFOS and PFOA
**	Due to analyte exceedance above laboratory instrument, the tabulated value is from second laboratory run after a 1 to 10 dilution factor
***	Duplicate was collected with the BMW-4 sample

Prepared By: JCL | Checked By: EAW

APPENDIX A
COST ESTIMATE

Estimated Costs for Reporting, Application and Monitoring of PlumeStop

1. Preparation of additional procedures in the RAWP, update H&SP and correspondences with product vendor:

Amec labor:			
70 hours @ $140 per hour (average billing rate)		$10,000	
Application of PlumeStop to two existing Injection Points			
Amec Labor:			
80 hours @ $125 per hour (average billing rate)	$10,000		
Regenesis quotation plus taxes and fee	$35,000		
Contingency (10%)	<u>$5,000</u>		
		$50,000	
Preparation of additional text and figures in the FER			
Amec labor:			
70 hours @ $140 per hour (average billing rate)		<u>$10,000</u>	
Subtotal			**$70,000**

2. Quarterly monitoring of four basement wells for PFAS for 1 year:

Amec labor:			
26 hours @ $125 per hour (average billing rate)		$3,300	
Laboratory fees:			
4 samples @ $425		<u>$1,700</u>	
	4 quarters @	$5,000	**$20,000**

3. Post-remediation monitoring and reporting would continue annually for a period of 5 years. After 5 years, we would evaluate the data and request permission to terminate the groundwater monitoring program.

Amec labor:			
100 hours @ $130 per hour (average billing rate)		$13,000	
Laboratory fees:			
12 samples @ $425		<u>$5,000</u>	
	5 years @	$18,000	**<u>$90,000</u>**
			$180,000