William J. Ryan
Manager-DNY MGP Program
Site Investigation and Remediation

nationalgrid

September 4, 2018

Mr. George W. Heitzman
Assistant Director
Division of Environmental Remediation
625 Broadway, 11th Floor
Albany, NY 12233-7010

RE: Emerging Contaminant Groundwater Sampling Work Plan
National Grid Downstate and Upstate New York MGP Sites

Dear Mr. Heitzman:

GEI Consultants, Inc., P.C. (GEI) prepared this Emerging Contaminant Groundwater Sampling Work Plan (Work Plan) on behalf of National Grid for their downstate and upstate former Manufactured Gas Plant (MGP) sites as required by the New York State Department of Environmental Conservation (NYSDEC) in letters dated May 30, 2018. This workplan has been revised based on NYSDEC comments provided in a letter dated August 20, 2018. Upstate New York Sites that were listed as missing in the August 20, 2018 letter will be submitted under a separate cover and reference this work plan.

This Work Plan provides the means and methods for sampling groundwater and analyzing for 1,4-dioxane and per- and polyfluoroalkyl substances (PFAS) and reporting in accordance with the requirements provided in the NYSDEC May 30, 2018 letters. The rationale for selecting monitoring wells for sampling, the location of the wells proposed for sampling at each of the sites and the sampling schedule are also provided.

1.0 Introduction

PFAS and 1,4-dioxane have historically not been evaluated at remediation sites. This sampling initiative is being undertaken as a result of these “emerging contaminants” having been found in a number of drinking water supplies in New York. Accordingly, the NYSDEC is requiring that site groundwater is tested for these chemicals. An overview of emerging contaminants is provided in Section 2 and the scope of work is provided in Section 3.

2.0 Overview

PFAS are emerging contaminants that have recently become a target of concern for NYSDEC and other regulatory agencies due to their ubiquitous presence in the environment, persistence, and bio accumulative properties. PFAS are a large group of highly soluble man-made chemicals that have been widely used since the 1940s to make fluoropolymer coatings and everyday products more resistant to stains, grease, heat, and water (EPA, 2018a and 2018b). Fluoropolymer coatings are blends of resins and lubricants used in products such as water-repellent clothing, furniture, adhesives, paint and varnish, food packaging, heat-resistant non-stick cooking surfaces and insulation of electrical wires (NYSDEC, 2018). Although the use of perfluorooctanoic acid (PFOA) is being phased out, the chemical is still used to make household and commercial products that resist heat and repel stains. Perfluorooctane sulfonic acid (PFOS) is used in fire-fighting foam and is a newly listed hazardous substance (as is PFOA). Since PFAS were not manufactured prior to the 1940s, it is unlikely that these chemicals were used at MGP sites.

PFAS are highly soluble, stable, and have low volatility. They are dispersed by air emissions into the atmosphere or deposited directly to surface water or the land surface. PFAS present in unsaturated soils leach downward through the subsurface with precipitation and are transported via groundwater flow.

1,4-Dioxane is used primarily as a solvent in paints, varnishes, lacquers, cosmetics, deodorants, cleaning and detergent preparations, and in scintillating fluids. 1,4-Dioxane often has been used with chlorinated solvents, particularly 1,1,1-trichloroethane (TCA), as a stabilizer and corrosion inhibitor (EPA, 2018c). Commercial production of 1,4-dioxane in the United States was first reported in 1951 (NCI, 1985). Since 1,4-dioxane was not manufactured prior to 1951, it is unlikely that this chemical was used at MGP sites.

3.0 Scope of Work

This Work Plan provides the sample location selection, sample collection, and reporting procedures. Activities performed under this work plan will follow the:

- Quality Assurance Project Plan (QAPP) – Attachment A, and
- Field Sampling Plan (FSP) – Attachment B.

3.1 Sample Locations

As described in Section 2, if present, emerging contaminants will be dissolved and traveling with groundwater. A review of groundwater conditions at each site has been completed and monitoring wells representative of groundwater at each site have been selected for sampling using the following rationale:

- One or two upgradient wells located closest to the upgradient site boundary;
- One or two on-site wells in a central location in an area of lowest MGP site impacts;
- One or two downgradient well located closest to the downgradient site boundary;
- No monitoring wells will be sampled in areas of the site that contain MGP source material due to the low detection limits required for the emerging contaminant analysis and the emerging contaminants are not associated with MGP impacts; and
- Wells screened across the shallow or intermediate aquifer zones because priority is given to wells screened across zones of low MGP impacts and hydraulically representative of site conditions based on groundwater flow gradients.

Tables and figures identifying the wells selected for sampling at each site are provided in Attachment C for the downstate sites and Attachment D for the upstate sites.

3.2 Waiver Request

The May 30, 2018 NYSDEC letter provides guidance for when sampling for emerging contaminants may be waived. Language from the guidance document is as follows:

If sampling is not feasible (e.g., the site no longer has any monitoring wells in place), sampling may be waived on a site-specific basis after first considering potential sources of these chemicals and whether there are water supplies nearby.

While assessing the rationale at each site for sampling it was determined that six downstate sites qualify for a sampling waiver because they do not have permanent monitoring wells and therefore, groundwater sampling is not feasible:

- Belmont Station
- Brooklyn Gas Light
- Dangman Park
- Front St. Station
- Plymouth Station
- Scholes St. Station

Furthermore, these sites are not near public water supplies. Therefore, these sites will not be included in the sampling work plan. Waivers for these six sites were approved in the August 20, 2018 letter.

3.3 Sample Collection

Groundwater samples will be collected from selected wells at each of the MGP sites using low flow methods according to the FSP (Attachment B). A peristaltic pump will be used with high density polyethylene (HDPE) and silicone tubing to collect each groundwater sample. If the depth to water is deeper than can be sampled with a peristaltic pump, an inertial pump will be used. Sampling equipment components and sample containers will not come in contact with aluminum foil, low density polyethylene (LDPE), glass or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer. Each groundwater sample will be placed in laboratory-provided, pre-cleaned 500-ml HDPE or polypropylene bottles for PFAS and 500-ml amber glass bottles for 1,4-dioxane.

Equipment will be decontaminated using detergent and a clean water rinse. All clothing worn by sampling personnel must have been laundered multiple times and must not contain waterproofed material. The sampler must wear nitrile gloves while filling and sealing the sample bottles. Pre-cleaned sample bottles with closures, coolers, ice, sample labels and a chain of custody form will be provided by the laboratory. No waterproof notebooks, food, drinks, or plumbers thread seal tape will be used during sample collection.

3.4 Laboratory Procedures

Each groundwater sample will be analyzed for the full PFAS Target Analyte List provided in the NYSDEC May 30, 2018 letter by Modified United States Environmental Protection Agency (EPA) Method 537 and 1,4-dioxane by EPA Method SIM 8270D. As required by NYSDEC, the reporting limit for PFAS will not exceed 2 ng/l (ppt) and the method detection limit (MDL) for 1,4-dioxane will not exceed 0.35 µg/l (ppb).

QA/QC samples will include one blind duplicate sample, one matrix spike/matrix spike duplicate (MS/MSD) sample, and one equipment blank sample at each site per 20 samples collected. At a minimum, one equipment blank sample will be collected each day at each site.

The samples will be analyzed by a NYSDOH environmental lab approval program (ELAP) laboratory certified for PFOA and PFOS in drinking water by EPA Method 537 selected from the list presented in the NYSDEC May 30, 2018 letter. Analytical results will be provided in a full New York State Category B data deliverable format. The data will be validated in accordance with New York State Analytical Service Protocols, and a data usability summary report (DUSR) will be prepared documenting the adequacy of the analytical data obtained from the laboratory and discussing any quality control non-compliance issues or limitations on the use of the data.

3.5 Waste Management

Investigation derived waste (IDW) generated during the field program will be disposed of by National Grid. Liquids will be temporarily stored on site in new New York State Department of Transportation (NYSDOT)-approved 55-gallon steel drums. Solid IDW will be segregated in trash bags and stored in NYSDOT-approved 55-gallon sealed steel drums. IDW will be removed from each site following sampling activities. National Grid will be the listed generator of the waste.

3.6 Data Interpretation and Reporting

National Grid will submit the emerging contaminant data to NYSDEC within 90 days of completing the sampling. The following information will be provided:

- Description of groundwater sampling activities;
- A figure showing water supply wells within a ½ mile radius;
- A figure showing the general groundwater flow direction;
- Validated analytical data compared to screening levels provided in the August 20, 2018 letter;
- Category B laboratory reports;
- DUSRs; and
- Observations and interpretation of the analytical results.

National Grid will also submit electronic data as described at: https://www.dec.ny.gov/chemical/62440.html.

3.7 Schedule

Sampling will be conducted following NYSDEC approval of the work plan. The schedule for each site will depend on property access.

If you have any questions or comments, please contact me at (516) 545-2586.

Sincerely,

Kathleen F. Slimon, P.E. for:
William J. Ryan
Manager – DNY MGP Program

cc: B. Stearns, National Grid
T. Leissing, National Grid

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References

EPA 2018a Contaminated Site Clean-Up Information, Per- and Polyfluoroalkly Substances (PFASs) retrieved from https://clu-in.org/contaminantfocus/default.focus/sec/Per-_and_Polyfluoroalkyl_Substances_(PFASs)/cat/Overview/

EPA 2018b Research on Per- and Polyfluoroalkly Substances (PFAS) retrieved from https://www.epa.gov/chemical-research/research-and-polyfluoroalkyl-substances-pfas

EPA 2018c Contaminated Site Clean-Up Information, 1,4-Dioxane retrieved from https://clu-in.org/contaminantfocus/default.focus/sec/1,4-Dioxane/cat/Overview/

NYSDEC 2018 Per- and Polyfluoroalkyl Substances (PFAS) retrieved from https://www.dec.ny.gov/chemical/108831.html

NCI. 1985. Monograph on Human Exposure to Chemicals in the Workplace: 1,4-Dioxane. Technical Report No. 86-131414. Bethesda, MD: Department of Health and Human Services. 31 pp

ATTACHMENT A

Quality Assurance Project Plan

GEI Consultants

Consulting
Engineers and
Scientists

Quality Assurance Project Plan
Emerging Contaminant Sampling

Manufactured Gas Plant Sites
New York

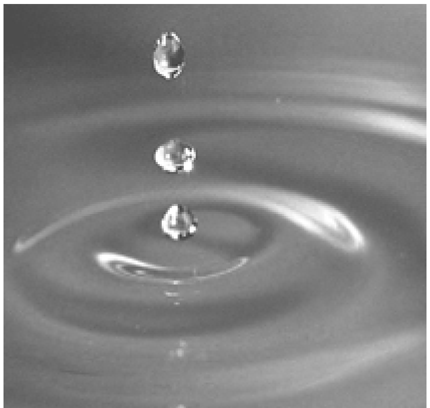
Prepared For:
National Grid
175 Old Country Road
Hicksville, NY 11801

And

National Grid
300 Erie Blvd. West
Syracuse, NY 13202

Submitted by:
GEI Consultants, Inc., P.C.
455 Winding Brook Drive
Glastonbury, CT 06033
860.368.5300

September 2018
Project 1802728



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Tables

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Abbreviations and Acronyms

%R	Percent Recovery
ASP	Analytical Service Protocol
CAS	Chemical Abstract Service
CLP	Contract Laboratory Protocol
COC	Chain Of Custody
DQO	Data Quality Objective
DO	Dissolved Oxygen
DUSR	Data Usability Summary Report
ELAP	Environmental Laboratory Approval Program
EPA	United States Environmental Protection Agency
FSP	Field Sampling Plan
GC/MS	Gas Chromatography/Mass Spectroscopy
GEI	GEI Consultants, Inc., P.C.
LCS	Laboratory Control Sample
MDL	Method Detection Limit
MGP	Manufactured Gas Plant
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NAPL	Non-Aqueous Phase Liquids
NYSDEC	New York State Department of Environmental Conservation
PAH	Polycyclic Aromatic Hydrocarbon
PFAS	Per- and polyfluoroalkyl substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanessulfonic acid
PM	Project Manager
PQL	Practical Quantification Limit
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RL	Reporting Limit
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
SD	Standard Deviation
SOP	Standard Operating Procedures
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TIC	Tentatively Identified Compounds
USDOT	United States Department of Transporation
VOC	Volatile Organic Compound

MEASUREMENTS

µg /L	micrograms per liter
µg /m^3	micrograms per cubic meter

Quality Assurance Glossary

“Alteration” means altering a sample collected for analysis in any way other than by adding a preservative, such as nitric acid to lower pH. Examples of alteration include, but are not limited to: filtering, settling and decanting, centrifuging and decanting and acid extracting.

“Analytical Services Protocol” or “ASP” means the New York State Department of Environmental Conservation (NYSDEC’s) compendium of approved United States Environmental Protection Agency (EPA) and NYSDEC laboratory methods for sample preparation and analysis and data handling procedures.

“Correlation Sample” means a sample taken, when using a field-testing technology, to be analyzed by an ELAP-certified laboratory to determine the correlation between the laboratory and field analytical results.

“Confirmatory Sample” means a sample taken after remedial action is expected to be complete to verify that the cleanup requirements have been met. This term has the same meaning as “post remediation sample.”

“Contract laboratory program” or “CLP” means a program of chemical analytical services developed by the EPA to support CERCLA.

“Data Usability Summary Report, (DUSR)” is a document that provides a thorough evaluation of the analytical data to determine whether or not the data, as presented, meets the site/project specific criteria for data quality and use.

“Effective solubility” means the theoretical aqueous solubility of an organic constituent in groundwater that is in chemical equilibrium with a separate phase mixed product (product containing several organic chemicals). The effective solubility of a particular organic chemical can be estimated by multiplying its mole fraction in the product mixture by its pure phase solubility.

“Environmental Laboratory Accreditation Program” or “ELAP” means a program conducted by the New York State Department of Health, which certifies environmental laboratories through on-site inspections and evaluation of principles of credentials and proficiency testing.

“Filtration” means the filtering of a groundwater or surface water sample, collected for metals analysis, at the time of collection and prior to preservation. Filtering includes, but is not limited to, the use of any membrane, fabric, paper or other filter medium, irrespective of pore size, to remove particulates from suspension.

"**Final delineation sample**" means a sample taken as an endpoint sample, used to make a decision regarding the extent of contamination at a site, which is to be analyzed by an ELAP-certified laboratory.

"Intermediate Sample" means a sample taken during the investigation process that will be followed by another sampling event to confirm that remediation was successful or to confirm that the extent of contamination has been defined to below a level of concern.

"Method detection limit" or "MDL" means the minimum concentration of a substance that can be measured and reported with a 99-percent confidence that the analyte concentration is greater than zero and is determined from the analysis of a sample in a given matrix containing the analyte.

"Minimum reporting limit" means the lowest concentration at which an analyte can be detected and which can be reported with a reasonable degree of accuracy. It is the lowest concentration that can be measured, a lab-specific number, developed from minimum detection limits, and is also referred to as the practical quantitation limit (PQL).

"Non-targeted compound" means a compound detected in a sample using a specific analytical method that is not a targeted compound, a surrogate compound, a system monitoring compound or an internal standard compound.

"Nephelometric Turbidity Unit" or "NTU" is the unit by which turbidity in a sample is measured.

"Practical quantitation level" or "PQL" means the lowest quantitation level of a given analyte that can be reliably achieved among laboratories within the specified limits of precision and accuracy of a given analytical method during routine laboratory operating conditions.

"Preservation" means preventing the degradation of a sample due to precipitation, biological action, or other physical/chemical processes between the time of sample collection and analysis. The most common examples involve refrigeration at 4 degrees Celsius and lowering sample pH by the addition of acid to keep dissolved metals in solution or to reduce the biodegradation of dissolved organic analytes.

"PAH" means polycyclic aromatic hydrocarbon as defined by EPA Method 8270.

“Quality assurance” or “QA” means the total integrated program for assuring the reliability of monitoring and measurement data, which includes a system for integrating the quality planning, quality assessment and quality improvement efforts to meet data end-use requirements.

“Quality assurance project plan” or “QAPP” means a document, which presents in specific terms the policies, organization, objectives, functional activities, and specific quality assurance/quality control activities designed to achieve the data quality goals or objectives of a specific project or operation.

“Quality control” or “QC” means the routine application of procedures for attaining prescribed standards of performance in the monitoring and measurement process.

“Semivolatile organic compound” or “SVOC” means compounds amenable to analysis by extraction of the sample with an organic solvent. For the purposes of this section, semivolatiles are those target compound list compounds identified in the statement of work in the current version of the 2005 ASP.

“Target analyte list” or “TAL” means the list of inorganic compounds/elements designated for analysis as contained in the version of the EPA Contract Laboratory Program Statement of Work for Inorganics Analysis, Multi-Media, Multi-Concentration in effect as of the date on which the laboratory is performing the analysis. For the purpose of this chapter, a Target Analyte List scan means the analysis of a sample for Target Analyte List compounds/elements.

“Targeted compound” means a hazardous substance, hazardous waste, or pollutant for which a specific analytical method is designed to detect that potential contaminant both qualitatively and quantitatively.

“Target compound list plus 30” or “TCL+30” means the list of organic compounds designated for analysis (TCL) as contained in the version of the EPA “Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration” in effect as of the date on which the laboratory is performing the analysis, and up to 30 non-targeted organic compounds (plus 30) as detected by gas chromatography/mass spectroscopy (GC/MS) analysis. For the purposes of this chapter, a TCL+30 scan means the analysis of a sample for TCL compounds and up to 10 non-targeted volatile organic compounds and up to 20 non-targeted SVOCs using GC/MS analytical methods. Non-targeted compound criteria should be pursuant to the version of the EPA “Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration” in effect as of the date on which the laboratory is performing the analysis.

“Tentatively identified compound or TIC” means a chemical compound that is not on the target compound list but is detected in a sample analyzed by a GC/MS analytical method. TICs are only possible with methods using mass spectrometry as the detection technique. The compound is tentatively identified using a mass spectral instrumental electronic library search and the concentration of the compound estimated.

“Unknown compound” means a non-targeted compound which cannot be tentatively identified. Based on the analytical method used, the estimated concentration of the unknown compound may or may not be determined.

“Volatile organics” or “VOC” means organic compounds amenable to analysis by the purge and trap technique. For the purposes of this chapter, analysis of VOCs means the analysis of a sample for either those priority pollutants listed as amenable for analysis using EPA method 8260B or those target compounds identified as volatiles in the version of the EPA “Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration” in effect as of the date on which the laboratory is performing the analysis.

“**Waste oil”** means used and/or reprocessed engine lubricating oil and/or any other used oil, including but not limited to: fuel oil, engine oil, gear oil, cutting oil, transmission fluid, oil storage tank residue, animal oil, and vegetable oil, which has not subsequently been refined.

“Well development” means the application of energy to a newly installed well to establish a good hydraulic connection between the well and the surrounding formation. During development, fine-grained formation material that may have infiltrated the sand pack and/or well during installation is removed, allowing water from the formation to enter the well without becoming turbid and unrepresentative of groundwater in the formation.

1. Purpose

GEI Consultants, Inc., P.C. (GEI) has prepared this Quality Assurance Project Plan (QAPP) to address sampling for emerging contaminants at National Grid's manufactured gas plant (MGP) sites. The QAPP is a companion document to the *Emerging Contaminant Sampling Work Plan* dated September 2018 (Work Plan). The QAPP presents the project scope and goals, organization, objectives, sample handling procedures and quality assurance/quality control (QA/QC) procedures.

Furthermore, this QAPP identifies project responsibilities, prescribes guidance and specifications to make certain that:

- Samples are identified and controlled through sample tracking systems and chain-of-custody (COC) protocols
- Field and laboratory analytical results are valid and usable by adherence to established protocols and procedures
- Laboratory data are validated, as necessary, so they can be applied to developing a conceptual understanding of the nature and extent of contamination of groundwater
- All aspects of investigation, from field to laboratory, are documented to provide data that are technically sound and legally defensible

The requirements of this QAPP apply to all contractor activities as appropriate for their respective tasks.

This QAPP was prepared based upon guidance provided by the United States Environmental Protection Agency (EPA) and New York State Department of Environmental Conservation (NYSDEC) including:

- *DER-10, Technical Guidance for Site Investigation and Remediation.* NYSDEC. *May 3, 2010;*
- *Analytical Service Protocol,* NYSDEC. *July 2005;*
- *US EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations (EPA QA/R-5, March 2001); and*
- *Guidance for Quality Assurance Project Plans (EPA QA/G-5, December 2002).*

2. Project Goals and Objectives

Per- and polyfluoroalkyl substances (PFAS) have historically not been evaluated at remediation sites, and 1,4-dioxane has not been evaluated at the levels that are now thought to represent a health concern. This initiative is being undertaken as a result of these “emerging contaminants” having been found in a number of drinking water supplies in New York. Accordingly, the NYSDEC is requiring that site groundwater is tested for these chemicals.

3. Project Organization and Responsibility

The consultant is responsible for the implementation of the scope of work, and associated performance monitoring tasks including the supervision of contractors, field activities, and the evaluation and interpretation of data. The consultant will perform the sampling activities and coordinate submittal of samples to testing laboratories.

The primary responsibilities of each of these personnel are described in the following table.

Key Project Personnel and Responsibilities

Position	Areas of Responsibilities
In-House Consultant	• Provide strategic guidance of project activities • Client contact regarding strategic issues • Review of project deliverables
Program Manager	• Overall program oversight • Project management • Project schedule • Client contact regarding project-related issues • Personnel and resource management • Review of project submittals • Budgeting
Project Manager	• Client contact regarding project related issues • Coordination of contractors • Technical development and implementation of Work Plan and Field Sampling Plan • Personnel and resource management • Preparation and review of project submittals • Preparation of project submittals • Budgeting
Field Team Leader	• Client contact regarding project related issues on day to day basis as part of field operations • Coordination of contractors • Implementation of Site Management Plan, Work Plan and Field Sampling • Plan Personnel and resource management • Preparation of project submittals
Data Validators	• Perform data validation activities • Prepare data usability summary reports • Evaluate data with regards to quality objectives
Quality Assurance Officer/Data Manager	• Manage raw data from the laboratory • Maintain copies of COCs in the project file • QA/QC for sampling, validation and laboratory performance

The selected laboratory will be Environmental Laboratory Approval Program (ELAP)-certified in New York State for Perfluorooctanoic acid (PFOA) and Perfluorooctanessulfonic acid (PFOS) in water by Modified EPA Method 537. Analytical chemistry parameters for groundwater samples include:

- 1,4-Dioxane according to EPA Method 8270D SIM
- Target Analyte List (TAL) PFAS according to Modified EPA Method 537

Table 1 provides a summary of quality assurance samples, holding times and analysis for each media. The PFAS Target Analyte List is shown below.

Group	Chemical Name	Abbreviation	CAS Number
Perfluoroalkyl sulfonates	Perfluorobutanesulfonic acid	PFBS	375-73-5
	Perfluorohexanesulfonic acid	PFHxS	355-46-4
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanessulfonic acid	PFOS	1763-23-1
	Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluoroalkyl carboxylates	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	PFHpA	375-85-9
	Perfluorooctanoic acid	PFOA	335-67-1
	Perfluorononanoic acid	PFNA	375-95-1
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUA/PFUdA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTriA/PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTA/PFTeDA	376-06-7
Fluorinated Telomer Sulfonates	6:2 Fluorotelomer sulfonate	6:2 FTS	27619-97-2
	8:2 Fluorotelomer sulfonate	8:2 FTS	39108-34-4
Perfluorooctane-sulfonamides	Perfluroroctanesulfonamide	FOSA	754-91-6
Perfluorooctane-sulfonamidoacetic acids	N-methyl perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethyl perfluorooctanesulfonamidoacetic acid	N-EtFOSAA	2991-50-6

4. Quality Assurance Objectives

This section establishes the QA objectives for measurements that are critical to the project. The QA objectives are developed for relevant data quality indicators. These indicators include the method detection limit (MDL), reporting limit (RL), precision, accuracy, completeness, representativeness, and comparability. The data quality objectives (DQOs) are based on project requirements and ensure: (1) that the data generated during the project are of known quality, and (2) that the quality is acceptable to achieve the project’s technical objectives.

Quantitation Limits are laboratory-specific and reflect those values achievable by the laboratory performing the analyses. However, in order to ensure that the analytical methodologies are capable of achieving the DQOs, measurement performance criteria have been set for the analytical measurements in terms of accuracy, precision, and completeness. The analytical methods to be used at this site will provide a level of data quality and can be used to evaluate potential impacts to groundwater at the former MGP site, compared to New York State Standards, Criteria and Guidance values, and for purposes of risk assessment.

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting, which will provide results that are scientifically valid and the levels of which are sufficient to meet DQOs. Specific procedures for sampling, chain of custody, laboratory instruments calibration, laboratory analysis, reporting of data, internal quality control, and corrective action are described in other sections of the QAPP and the Field Sampling Plan (FSP).

The data quality indicators are presented in subsections 4.1 through 4.6. Procedures to assess the data quality indicators are given below in Section 13.

Table 2 provides the RLs, MDLs and the DQOs for groundwater samples. The DQOs for groundwater samples for this project include minimum RLs specified within the NYSDECs May 30, 2018 letter.

Table 3 provides the precision and accuracy DQOs for water samples.

4.1 Required Quantification Limit

The required quantification limit is the quantitative analytical level for individual analytes needed to make decisions relative to the objectives of the project. Quantitative limits may be expressed as the MDL or some quantitative level defined in terms relative to the program. It should be noted that there is some ambiguity in the definitions and use of terms that define quantification limits. The MDL presented herein is a well-defined and accepted entity, although attainable only under ideal laboratory conditions.

Method Detection Limit: The MDL is the minimum concentration of a substance that can be measured and reported with 99-percent confidence that the analyte concentration is greater than zero. The MDL is determined from analysis of a sample in a given matrix-type containing the analyte.

Practical Quantitation Limit: The practical quantitation limit (PQL) [also referred to as the reporting limit (RL)] is the concentration in the sample that corresponds to the lowest concentration standard of the calibration curve.

Table 2 provides the reporting limits and the DQOs for groundwater samples as specified in NYSDEC's May 30, 2018 letter.

4.2 Accuracy

Accuracy is the closeness of agreement between an observed value and an accepted reference value. The difference between the observed value and the reference value includes components of both systematic error (bias) and random error.

Accuracy in the field is assessed through the adherence to all field instrument calibration procedures, sample handling, preservation, and holding time requirements, and through the collection of equipment blanks prior to the collection of samples for each type of equipment being used (e.g., sample liners, drilling shoe, or stainless–steel sampling implements).

The laboratory will assess the overall accuracy of their instruments and analytical methods (independent of sample or matrix effects) through the measurement of "standards," materials of accepted reference value. Accuracy will vary from analysis to analysis because of individual sample and matrix effects. In an individual analysis, accuracy will be measured in terms of blank results, the percent recovery (%R) of surrogate compounds in organic analyses, or %R of spiked compounds in matrix spikes (MSs), matrix spike duplicates (MSDs) and/or laboratory control samples (LCSs). This gives an indication of expected recovery for analytes tending to behave chemically like the spiked or surrogate compounds. The laboratory accuracy will be evaluated in accordance with laboratory quality assurance plan and standard operating procedures.

4.3 Precision

Precision is the agreement among a set of replicate measurements without consideration of the "true" or accurate value: i.e., variability between measurements of the same material for the same analyte. In environmental sampling, precision is the result of field sampling and analytical factors. Precision in the laboratory is easier to measure and control than precision in the field. Replicate laboratory analyses of the same sample provide information on analytical precision; replicate field samples provide data on overall measurement precision. The difference between the overall measurement precision and the analytical precision is attributed to sampling precision. Precision is measured in a variety of ways including statistically, such as calculating variance or standard deviation. The difference between the overall measurement precision and the analytical precision is attributed to sampling precision.

Precision in the field is assessed through the collection and measurement of field duplicates. Field duplicates will be collected at a frequency of one per twenty samples per matrix per analytical parameter, with the exception of the waste characterization parameters. Precision will be measured through the calculation of relative percent differences (RPDs) as described below in subsection 13.2. The resulting information will be used to assess sampling and analytical variability. Duplicate samples are described below in subsection 5.1.2. **Table 1** summarizes the number of duplicates per media sampled.

Precision in the laboratory is assessed through the calculation of RPD for duplicate samples. For organic analyses, laboratory precision will be assessed through the analysis of MS/MSD samples and field duplicates. MS/MSD samples or matrix duplicate pairs will be performed at a frequency of one per twenty primary samples per matrix. Duplicate samples are described below in subsection 5.1.2. **Table 1** summarizes the number of duplicates per media sampled.

4.4 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. “Normal conditions” are defined as the conditions expected if the sampling plan was implemented as planned. The objective for completeness is a sufficient amount of valid data to achieve a predetermined statistical level of confidence. Critical samples must be identified and plans must be formulated to secure requisite valid data for these samples.

Field completeness is a measure of the amount of (1) valid measurements obtained from all the measurements taken in the project, and (2) valid samples collected. The field completeness objective is greater than 90-percent.

Laboratory completeness is a measure of the amount of valid measurements obtained from all valid samples submitted to the laboratory. The laboratory completeness objective is greater than 95-percent.

4.5 Representativeness

Representativeness is a qualitative parameter that expresses the degree to which data accurately and precisely represents either a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary. To ensure representativeness, the sampling locations have been selected to provide coverage over a wide area and to highlight potential trends in the data.

Representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that work plans are followed and that proper sampling, sample handling, and sample preservation techniques are used.

Representativeness in the laboratory is ensured by using the proper analytical procedures, appropriate methods, and meeting sample-holding times.

4.6 Comparability

Comparability is a qualitative parameter that expresses the confidence with which one data set can be compared to another. Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the work plan is followed and that proper sampling techniques are used. Maximization of comparability with previous data sets is expected because the sampling design and field protocols are consistent with those previously used.

Comparability is dependent on the use of recognized EPA or equivalent analytical methods and the reporting of data in standardized units. To facilitate data comparison, the data-reporting format as presented below will be used:

- Conventions (units reported as): for liquids (weight/unit volume [i.e., micrograms per liter (µg/L)]); for air (weight/unit volume [i.e., micrograms per cubic meter (µg/m^3)]);
- Use common chemical name with corresponding chemical abstract system (Chemical Abstracts Service [CAS]) code.

5. Sampling Plan

Environmental sampling will include groundwater sampling. Groundwater samples will be collected utilizing low-flow sampling methods with peristaltic pumps. Sampling methods and procedures are presented in the FSP.

5.1 Sample Type, Location, and Frequency

5.1.1 Groundwater samples

Groundwater samples will be collected and submitted for laboratory analysis in accordance with the Work Plan. Water quality parameters including temperature, pH, turbidity, salinity, dissolved oxygen (DO) oxidation reduction potential, and specific conductance, will be collected prior to laboratory analysis. Groundwater samples will be analyzed for 1,4-Dioxane according to EPA Method 8270D SIM and TAL PFAS according to Modified EPA Method 537.

5.1.2 Field QC Sample Collection

Field QC samples are used to monitor the reproducibility and representativeness of field sampling activities. The field QC samples are handled, transported and analyzed in the same manner as the associated field samples. Field QC samples will include equipment blanks, field duplicates, and MS/MSDs. The quantity, field QC sample type, and analysis is detailed in **Table 1**.

Equipment Blank Samples are used to monitor the adequacy of decontamination procedures and possible sources of contamination such as potential laboratory methodologies. Equipment blanks will consist of laboratory-supplied, distilled or de-ionized water and will be used to check for potential contamination of the equipment which may cause sample contamination. Equipment blanks will be collected by routing the distilled water through a decontaminated piece of sampling equipment or disposable sampling equipment into laboratory supplied bottles. Non-dedicated field equipment will be decontaminated as specified below in subsection 4.3. Equipment blanks will be submitted to the laboratory at a frequency of one per day per parameter.

Field Duplicate Samples, also referred to as blind duplicate samples, are two samples that are submitted from the same interval using the same sample procedures. Field duplicates will be used to assess the sampling and analytical reproducibility. Both samples are collected utilizing the same methods and are submitted for the same laboratory analysis; however, different sample identification numbers are used. Field duplicates will be submitted at a frequency of one-per-20 samples for all matrices and all parameters.

MS/MSD Samples are two additional aliquots of the same sample submitted for the same parameters as the original sample. However, the additional aliquots are spiked with the compounds of concern. Matrix spikes provide information about the effect of the sample matrix on the measurement methodology. MS/MSDs will be submitted at a frequency of one-per-20 investigative samples per matrix for organic parameters.

Refer to **Table 1** for a summary of QC sample preservation and container requirements.

5.2 Sample Preservation and Containerization

The analytical laboratory will supply the sample containers for the chemical samples. These containers will be cleaned by the manufacturer to meet or exceed all analyte specifications established in the latest EPA's Specifications and Guidance for Contaminant-Free Sample Containers. Certificates of analysis are provided with each bottle lot and maintained on file to document conformance to EPA specifications. The containers will be pre-preserved, where appropriate. Sample preservation and containerization details are outlined in **Table 1**.

5.3 Equipment Decontamination

All non-dedicated sampling equipment shall be cleaned between each use in the following manner:

- Wash and scrub with Alconox (or non-phosphate soap) and water mixture
- Tap water rinse
- Decontamination fluids will be containerized into United States Department of Transportation (USDOT)/UN-approved 55-gallon drums or containment vessels and will be characterized and disposed of by National Grid at an approved disposal facility.

6. Documentation and COC

6.1 Sample Collection Documentation

6.1.1 Field Notes

Field notes documenting field activities will be maintained daily field sampling sheets in general accordance with the FSP. No erasures or obliterations of field notes will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark, which is signed and dated by the sampler. The correction shall be written adjacent to the error.

Field sampling sheets will be reviewed at regular intervals by the field team leader, site manager and project manager for completeness and representativeness. When necessary, field sampling sheets will be supported by daily activity reports.

6.1.2 COC Records

Sample custody is discussed in detail below in subsection 6.2. COC records are initiated by the samplers in the field. The field portion of the custody documentation should include:

- The project name
- The project number
- Signature(s) of sampler (s) responsible for sample custody
- Sample Name/ID number
- Date and time of collection
- Whether the sample is grab or composite
- Names of individuals involved in sampling
- Required analytical methods
- Air bill or other shipping number (if applicable)

On a regular basis (daily or on such a basis that all holding times will be met), samples will be transferred to the custody of the respective laboratories, via third-party commercial carriers or via laboratory courier service. Sample packaging and shipping procedures, and field COC procedures are described below in subsection 6.2.1 of this Plan. Sample receipt and log-in procedures at the laboratory are described below in subsection 6.2.2 of this Plan.

6.1.3 Sample Labeling

Each sample will be labeled with an adhesive label using indelible ink. The label should include the date and time of collection, sampler's initials, tests to be performed, preservative (if applicable), and a unique identification. The following identification scheme will be used:

PRIMARY SAMPLE TYPES	QA/QC SAMPLE TYPES
GROUNDWATER SAMPLES Monitoring Well-ID	**EQUIPMENT BLANKS** SAMPLE-ID – [DATE] **MATRIX SPIKE/DUP** SAMPLE [ID] [DEPTH] [EITHER MS OR MSD] **BLIND DUPLICATES** SAMPLE-ID[XX][DATE]

This sample label contains the authoritative information for the sample. Inconsistencies with other documents will be settled in favor of the vial or container label unless otherwise corrected in writing from the field personnel collecting samples or the Data Manager and/or the Project QA Officer.

6.1.4 Sample Handling

Samples will be handled in general accordance with the FSP.

6.2 Sample Custody

The COC provides a record of the custody of any environmental field sample from the time of collection to the delivery to the laboratory. Custody is one of several factors that are necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in three parts: field sample collection, laboratory analysis, and final evidence files.

A sample is considered to be under a person's custody if:

- The item is in the actual possession of a person
- The item is in the view of the person after being in actual possession of the person
- The item was in the actual physical possession of the person but is locked up to prevent tampering
- The item is in a designated and identified secure area

6.2.1 Field Custody Procedures

Samples will be collected following the sampling procedures indicated in the FSP. A summary of samples and collection methods are provided above in Section 5 of this QAPP.

Documentation of sample collection is described above in subsection 6.1. Sample COC and packaging procedures are summarized below. These procedures will ensure that the samples will arrive at the laboratory with the COC intact.

- The field sampler is personally responsible for the care and custody of the samples until they are transferred or dispatched properly. Field procedures have been designed such that as few people as possible will handle the samples.
- All bottles will be identified by the use of sample labels with sample numbers, sampling locations, date/time of collection, and type of analysis. The sample naming system is presented above in subsection 6.1.3.
- Sample labels will be completed for each sample using waterproof ink.
- Samples will be accompanied by a completed COC form. The sample numbers and locations will be listed on the COC form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents the transfer of custody of samples from the sampler to another person, to a mobile laboratory, and to the laboratory facility.
- All shipments will be accompanied by the COC record identifying the contents. The original record will accompany the shipment, and copies will be retained by the sampler and provided to the data manager and placed in the project files.
- Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in and secured to the inside top of each sample box or cooler. Shipping containers will be secured with strapping tape and custody seals for shipment to the laboratory. The custody seals will be attached to the cooler and covered with clear plastic tape after being signed by field personnel.
- If the samples are sent by common carrier, the air bill will be used. Air bills will be retained as part of the permanent documentation. Commercial carriers are not required to sign off on the custody forms since the custody forms will be sealed inside the sample cooler and the custody seals will remain intact.
- Samples remain in the custody of the sampler until transfer of custody is completed. This consists of delivery of samples to the laboratory sample custodian, and signature of the laboratory sample custodian on COC document as receiving the samples and signature of sampler as relinquishing samples.

6.2.2 Laboratory Custody Procedures

After accepting custody of the shipping containers, the laboratory will document the receipt of the shipping containers by signing the COC record. The laboratory will:

- Examine the shipping containers to verify that the custody tape is intact
- Examine all sample containers for damage

- Determine if the temperature required for the requested testing program has been maintained during shipment and document the temperature on the COC records
- Compare samples received against those listed on the COC
- Verify that sample holding times have not been exceeded
- Examine all shipping records for accuracy and completeness
- Determine sample pH (if applicable) and record on COC forms
- Sign and date the COC immediately (if shipment is accepted) and attach the air bill
- Note any problems associated with the coolers and/or samples on the cooler receipt form and notify the laboratory project manager, who will be responsible for contacting the GEI data manager
- Attach laboratory sample container labels with unique laboratory identification and test
- Place the samples in the proper laboratory storage.

Following receipt, samples will be logged in according to the following procedure:

- The samples will be entered into the laboratory tracking system. At a minimum, the following information will be entered: project name or identification, unique sample numbers (both client and internal laboratory), type of sample, required tests, date and time of laboratory receipt of samples, and field ID provided by field personnel.
- The completed COC, air bills, and any additional documentation will be placed in the project file.

7. Calibration Procedure

7.1 Field Instruments

Field instruments will be calibrated according to the manufacturer’s specifications. Water quality meters will be calibrated with known reference solutions. All calibration procedures performed will be documented on the field sampling sheets and will include the date/time of calibration, name of person performing the calibration, reference standard used, and the readings.

7.2 Laboratory Instruments

Calibration procedures for a specific laboratory instrument will consist of initial calibrations, initial calibration verifications, and/or continuing calibration verification. Detailed descriptions of the calibration procedures for a specific laboratory instrument are included in the laboratory’s quality assurance plan, which describe the calibration procedures, their frequency, acceptance criteria, and the conditions that will require recalibration.

8. Sample Preparation and Procedures

Analytical samples will be collected in general accordance with the FSP and as specified in a job-specific Work Plan. Groundwater samples will be analyzed for 1,4-Dioxane according to EPA Method 8270D SIM and TAL PFAS according to Modified EPA Method 537. Analytical samples will be collected into laboratory-preserved sample containers and will be preserved as indicated in **Table 1**.

9. Data Reduction, Validation, and Reporting

Appropriate QC measures will be used to ensure the generation of reliable data from sampling and analysis activities. Proper collection and organization of accurate information followed by clear and concise reporting of the data is a primary goal in this project. Complete data packages suitable for data validation to support the generation of a Data Usability Summary Report (DUSR) according to NYSDEC requirements will be provided by the analytical laboratory. Complete data packages suitable for data validation to support the generation of a DUSR according to NYSDEC requirements will be provided by the project data validator.

9.1 Field Data Evaluation

Measurements and sample collection information will be transcribed directly onto standardized forms. If errors are made, results will be legibly crossed out, initialed and dated by the person recording the data, and corrected in a space adjacent to the original (erroneous) entry. Reviews of the field records by the field team leader, site manager, and project manager will ensure that:

- Standardized forms have been filled out completely and that the information recorded accurately reflects the activities that were performed.
- Records are legible and in accordance with good record keeping procedures, i.e., entries are signed and dated, data are not obliterated, changes are initialed, dated, and explained.
- Sample collection, handling, preservation, and storage procedures were conducted in accordance with the protocols described in the FSP and Work Plan, and that any deviations were documented and approved by the appropriate personnel.

9.2 Analytical Data Validation

An independent validation of the analytical data will be completed. Project-specific procedures will be used to validate analytical laboratory data. The basis for the validation will be the USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic Data Review (January 2005) and the USEPA CLP National Functional Guidelines for Inorganic Data Review (October 2004), modified to accommodate the criteria in the analytical methods used in this program, and Region II Standard Operating Procedures (SOPs) for CLP Organic Data review (Revision 11, June 1996) and Evaluation of Metals for the CLP Program (Revision 11, January 1992). Critical functions for determining the validity of generated data are: (1) strict adherence to the analytical methods, (2) assurance that the instrumentation employed was operated in accordance with defined operating procedures, (3) assurance that quality parameters built into the analytical procedures have been adhered to, and (4) confirmation that the DQOs have been met.

Table 2 highlights the QC criteria and holding time requirements for all analyses conducted under this program. These criteria will be used to evaluate and qualify the data during validation.

Laboratory deliverables will consist of an original hard copy data package that is in general accordance with NYSDEC Analytical Service Protocol (ASP) Category B data deliverable requirements. Data validation is required for all data.

Data validation will be completed by the consultants' data validators or qualified contracted personnel. Validation will include all technical holding times, as well as QC sample results (blanks, surrogate spikes, laboratory duplicates, MS/MSDs, and LCSs), tunes, internal standards, calibrations, target compound identification, and results calculations.

For all analyses, the laboratory will report results which are between the laboratory's RL and the MDL; these results will be qualified as estimated (J) by the laboratory.

The overall completeness of the data package will also be evaluated by the data validator. Completeness checks will be administered on all data to determine whether full data deliverables were provided. The reviewer will determine whether all required items are present and request copies of missing deliverables.

Upon completion of the validation, a report will be prepared. This report will summarize the samples reviewed, elements reviewed, any nonconformance with the established criteria, and validation actions. Data qualifiers will be consistent with EPA National Functional Guidelines. This report will be in a format consistent with NYSDEC's DUSR.

9.3 Analytical Data Deliverable

Laboratory deliverables will consist of an original hard copy data package that is in general accordance with NYSDEC ASP Category B data deliverable requirements.

10. Internal Quality Control

Laboratory and field quality internal control checks will be used to ensure the data quality objectives are achieved. At a minimum, this will include:

- MS and/or MS/MSDs samples
- Matrix duplicate analyses
- Laboratory control spike samples
- Instrument calibrations
- Instrument tunes for semivolatile organic compound (SVOC) 8270D analyses
- Method and/or instrument blanks
- Surrogate spikes for organic analyses
- Internal standard spikes for SVOC 8270D analyses
- Detection limit determination and confirmation by analysis of low-level calibration standard

Field quality control samples will include:

- Equipment blanks as outlined in **Table 1**
- Field duplicate samples as outlined in **Table 1**
- MS/MSDs as outlined in **Table 1**

11. Performance and System Audits

Audits are an independent means of: 1) evaluating the operation or capability of a measurement system, and 2) documenting the use of QC procedures designed to generate data of know and acceptable quality.

Field audits may be completed to assess sample collection protocols, determine the integrity of COC procedures, and evaluate sample documentation and data handling procedures. Field audits may be scheduled by the QA officer, Project Manager (PM), site manager or in-house consultant, at their discretion. Written records of audits and any recommendations for corrective action will be submitted to the PM.

The QA officer is the interface between management and project activities in matters of project quality. The QA officer will review the implementation of the QAPP. Reviews will be conducted at the completion of field activities and will include the results of any audits and an evaluation of the data quality.

12. Preventative Maintenance

Preventative maintenance will be performed on field equipment in accordance with the manufacturer’s recommendations. Preventative maintenance to field equipment will be provided by equipment vendors.

Laboratory equipment calibration and maintenance procedures are specified in Test America’s laboratory quality manual.

13. Specific Procedures to Assess Data Quality Indicators

QC analyses conducted as a part of the testing program will provide a quantitative quality assessment of the data generated and their adherence to the data quality indicators. The data quality indicators ensure that the quality assurance objectives for the project are met.

13.1 Detection Limits

13.1.1 Method Detection Limit

The MDL is defined as follows for all measurements:

MDL = (t[n-1,1-a=0.99]) x (s)

where: s = standard deviation of the replicate analysis,
t(n-1, 1-a=0.99) = student’s t-value for a one-sided, 99-percent confidence level and a standard deviation estimate with n-1 degrees of freedom

The MDLs calculated by the laboratory are determined under ideal conditions. MDLs for environmental samples are dependent on the sample aliquot, the matrix, the concentration of analyte, and interference present in the matrix, the percent of moisture, dilution factor, etc. The MDL for each sample analysis will be adjusted accordingly.

13.1.2 *Reporting Limit*

The RL is the concentration of an analyte in the sample that corresponds to the lowest concentration standard of the calibration curve. As with the MDLs, the RLs are dependent on the sample aliquot, the final sample volume, the percent of moisture, dilution factor, etc.

The RL is determined as follows:

$$PQL = \frac{Lowest\ conc.\ std\ (ng)}{Volume\ injected\ (uL)}\ x\ \frac{Sample\ aliquot\ (mL\ or\ g)}{Final\ volume\ (mL)}\ x\ DF\ x\ \frac{100}{(100\ \text{-}\ PM)}$$

where: DF = dilution factor, including all dilutions or lost samples not accounted for in a sample aliquot/final volume ratio

%M = percent moisture for solid samples

13.2 Precision

Variability will be expressed in terms of the RPD when only two data points exist. The RPD is calculated as:

$$RPD = \frac{(Larger\ Value\ \text{-}\ Smaller\ Value)}{[(Larger\ Value + Smaller\ Value)/2]}\ x\ 100\%$$

For data sets greater than two points, the percent relative standard deviation (percent Relative Standard Deviation [RSD]) is used as the precision measurement. It is defined by the equation:

$$Percent\ RSD = \frac{Standard\ Deviation}{Mean}\ x\ 100\%$$

Standard deviation (SD) is calculated as follows:

$$SD = \sqrt{\sum_{i=1}^{n} \frac{(y_i - y)^2}{n - 1}}$$

where: SD = standard deviation
yi = measured value of the ith replicate
y = mean of replicate measurements
n = number of replicates

For measurements such as pH, where the absolute variation is more appropriate, precision is usually reported as the absolute range (D) of duplicate measurements:

$$D = \left| \text{first measurement - second measurement} \right|$$

or as the absolute standard deviation previously given. RPD, %RSD, and D are independent of the error of the analyses and reflect only the degree to which the measurements agree with each other, not the degree to which they agree with the true value for the parameter measured.

13.3 Accuracy

Accuracy is related to the bias in a measurement system. Accuracy describes the degree of agreement of a measurement with a true value. Accuracy will be expressed as percent recovery for each matrix spike analyte by using the following equation:

$$\%\ Recovery = \frac{Css - Cus}{Csa}\ X\ 100\%$$

where: Css = measured concentration in spiked sample
Cus = measured concentration in unspiked sample
Csa = known concentration added to the sample

Accuracy for a measurement such as pH is expressed as bias in the analysis of a standard reference sample according to the equation:

$$\text{Bias} = pH_m - pH_t$$

where: pH_m = measured pH
pH_t = the true pH of the standard reference sample

13.4 Completeness

Data completeness is a measure of the amount of usable data resulting from a measurement effort. For this program, completeness will be defined as the percentage of valid data obtained compared to the total number of measurements necessary to achieve our required statistical level of confidence for each test. The confidence level is based on the total number of samples.

Data completeness is calculated as:

$$Completeness = \frac{Number\ of\ valid\ data\ points}{Number\ of\ data\ points\ necessary\ for\ confidence\ level}\ x\ 100\%$$

The completeness goal is to generate a sufficient amount of valid data. It is anticipated that 95-percent of the data will be complete. Data validation criteria discussed in Section 10 of this QAPP will be used to determine data completeness. Any data deficiencies and their effect on project goals will be evaluated in the DUSR.

13.5 Representativeness

Representativeness is a qualitative statement that expresses the extent to which the sample accurately and precisely represents the characteristics of interest of the study. Representativeness is primarily concerned with the proper design of the sampling program and is best ensured by proper selection of sampling locations and the taking of a sufficient number of samples. It is addressed by describing the sampling techniques, the matrices sampled, and the rationale for the selection of sampling locations, which are discussed in the FSP and job-specific Work Plan.

13.6 Comparability

Comparability is a qualitative parameter expressing the confidence that one set of data can be compared to another. Comparability is possible only when standardized sampling and analytical procedures are used.

14. Corrective Action

If unacceptable conditions are identified as a result of audits or are observed during field sampling and analysis, the PM, Field Team Leader, and QA officer will document the condition and initiate corrective procedures. The specific condition or problem will be identified, its cause will be determined, and appropriate action will be implemented.

The entire sampling program will be under the direction of the PM and QA officer. The emphasis in this program is on preventing problems by identifying potential errors, discrepancies, and gaps in the data collection and the laboratory analysis and interpretation process. Any problems identified will be promptly resolved. Likewise, follow-up corrective action is always an option in the event that preventative corrective actions are not effective.

The acceptance limits for the sampling and analyses to be conducted in this program will be those stated in the method or defined by other means in the Work Plan and FSP. Corrective actions are likely to be immediate in nature and most often will be implemented by the contracted laboratory analyst or the PM. The corrective action will usually involve recalculation, reanalysis, or repeating a sample run.

14.1 Immediate Corrective Action

Corrective action in the field may be needed when the sample requirements are changed (i.e., more/less samples, sampling locations other than those specified in the Work Plan), or when sampling procedures and/or field analytical procedures require modification, etc. due to unexpected conditions. The field team may identify the need for corrective action. The Field Team Leader, Site Manager, and PM will approve the corrective action and notify the QA officer. The PM and QA officer will approve the corrective measure. The Field Team Leader and Project Manager will ensure that the corrective measure is implemented by the field team.

Corrective actions will be implemented and documented in the field record book. Documentation will include:

- A description of the circumstances that initiated the corrective action
- The action taken in response
- The final resolution
- Any necessary approvals

Corrective action in the laboratory will be completed in accordance with the quality assurance procedures. Any corrective actions completed by the laboratory will be documented in both the laboratory's corrective action files, and the narrative data report sent from the laboratory to the PM. If the corrective action does not rectify the situation, the laboratory will contact the PM, who will determine the action to be taken and inform the appropriate personnel.

If potential problems are not solved as an immediate corrective action, the contractor will apply formalized long-term corrective action if necessary.

Tables

Table 1. Analytical Methods/Quality Assurance Summary Table
MGP Sites
New York

Media	Number of Primary Samples	QA/QC Samples			Total Number of Samples	Analytical Parameters	Method	Preservative	Holding Time	Container
		Equipment Blank	Duplicate	MS/MSD						
Ground Water	TBD	1/20, at least daily	1/20	1/20	TBD	1,4-Dioxane	8270D SIM	Cool to 4°C	7 days	(1) 500 mL amber glass bottle
	TBD	1/20, at least daily	1/20	1/20	TBD	PFAS	Modified 537	Cool to 4°C	14 days	(2) 500 mL HDPE or polypropylene bottles, no bottle cap liners

Notes:

Waste Characterization disposal sample analysis will meet the requirements of the selected disposal facility.

TBD - To Be Determined

PFAS - Per- and Polyfluoroalkyl Substances

SIM - Selective Ion Monitoring

TAL - Target Analyte List

°C- Degrees Celsius

oz. - ounce

mL - Milliliter

Table 2. Chemical Parameters, Reporting Limits and Data Quality Objectives for Groundwater Samples
MGP Sites
New York

CAS Number	Analyte	DQO's	RL^2	MDL^2
Per- and Polyfluoroalkyl Substances Method 537 (ng/L)				
375-73-5	Perfluorobutanesulfonic acid	2	≤ 2	TBD
355-46-4	Perfluorohexanesulfonic acid	2	≤ 2	TBD
375-92-8	Perfluoroheptanesulfonic acid	2	≤ 2	TBD
1763-23-1	Perfluorooctanessulfonic acid	2	≤ 2	TBD
335-77-3	Perfluorodecanesulfonic acid	2	≤ 2	TBD
375-22-4	Perfluorobutanoic acid	2	≤ 2	TBD
2706-90-3	Perfluoropentanoic acid	2	≤ 2	TBD
307-24-4	Perfluorohexanoic acid	2	≤ 2	TBD
375-85-9	Perfluoroheptanoic acid	2	≤ 2	TBD
335-67-1	Perfluorooctanoic acid	2	≤ 2	TBD
375-95-1	Perfluorononanoic acid	2	≤ 2	TBD
335-76-2	Perfluorodecanoic acid	2	≤ 2	TBD
2058-94-8	Perfluoroundecanoic acid	2	≤ 2	TBD
307-55-1	Perfluorododecanoic acid	2	≤ 2	TBD
72629-94-8	Perfluorotridecanoic acid	2	≤ 2	TBD
376-06-7	Perfluorotetradecanoic acid	2	≤ 2	TBD
27619-97-2	6:2 Fluorotelomer sulfonate	2	≤ 2	TBD
39108-34-4	8:2 Fluorotelomer sulfonate	2	≤ 2	TBD
754-91-6	Perfluroroctanesulfonamide	2	≤ 2	TBD
2355-31-9	N-methyl perfluorooctanesulfonamidoacetic acid	2	≤ 2	TBD
2991-50-6	N-ethyl perfluorooctanesulfonamidoacetic acid	2	≤ 2	TBD
Semivolatile Organic Compounds (ug/L) via Method 8270D SIM				
123-91-1	1,4-Dioxane	0.35	TBD	≤ 0.35

Notes:

ug/L - milligrams per Liter
ng/L - nanograms per Liter
RL - Reporting Limit
MDL - Method Detection Limit
DQO - Data Quality Objectives
1 - DQOs are based on NYSDECs letter dated May 30, 2018.
2 - RLs and MDLs will be based on the selected laboratory's Reporting Limits and Method Detection limits.

Table 3. Quality Control Limits Precision and Accuracy for Groundwater Samples
MGP Sites
New York

			MS/MSD % Recovery			LCS % Recovery			Surrogate % Recovery	
Analytical	**Analytical Method**	**MS/MSD Compound**	Low	High	RPD	Low	High	**Surrogate**	Low	High
SVOCs	8270D SIM	1,4-Dioxane	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
PFAS	Modified 537	Perfluorobutanesulfonic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 538	Perfluorohexanesulfonic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 539	Perfluoroheptanesulfonic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 540	Perfluorooctanessulfonic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 541	Perfluorodecanesulfonic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 542	Perfluorobutanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 543	Perfluoropentanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 544	Perfluorohexanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 545	Perfluoroheptanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 546	Perfluorooctanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 547	Perfluorononanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 548	Perfluorodecanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 549	Perfluoroundecanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 550	Perfluorododecanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 551	Perfluorotridecanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 552	Perfluorotetradecanoic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 553	6:2 Fluorotelomer sulfonate	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 554	8:2 Fluorotelomer sulfonate	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 555	Perfluroroctanesulfonamide	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 556	N-methyl perfluorooctanesulfonamidoacetic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Modified 557	N-ethyl perfluorooctanesulfonamidoacetic acid	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Notes:

TBD - To Be Determined
MS - Matrix Spike
MSD - Matrix Spike Duplicate
LCS - Laboratory Control Sample
(a) Matrix spike only
(b) Laboratory duplicate RPD
NA - Not Applicable
SVOCs - semivolatile organic compounds
RPD - Relative Percent Difference

ATTACHMENT B

Field Sampling Plan

Consulting
Engineers and
Scientists

Field Sampling Plan
Emerging Contaminant Sampling

Manufactured Gas Plant Sites
New York

Prepared For:
National Grid
175 Old Country Road
Hicksville, NY 11801

And

National Grid
300 Erie Blvd. West
Syracuse, NY 13202

Submitted by:
GEI Consultants, Inc.
455 Winding Brook Drive
Glastonbury, CT 06033
860.368.5300

September 2018
Project 1802631

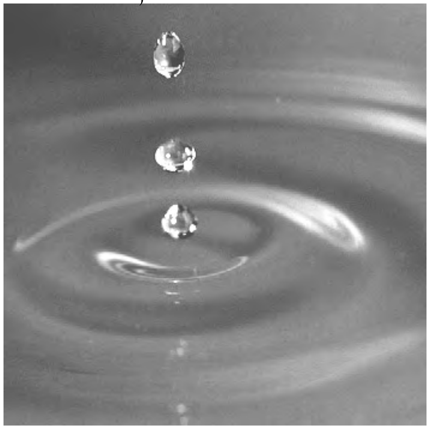

Table of Contents

Section 1 – Groundwater Sampling Activities (GW)

STANDARD OPERATING PROCEDURE

GW-015 Groundwater Sampling for PFAS

---

1. Objective

This Standard Operating Procedure (SOP) was developed to describe the methods for screening for poly and perfluoroalkyl substances (PFAS) in groundwater. Given the extremely low detection limits associated with PFAS analysis and the many potential sources of trace levels of PFAS, field personnel will follow the protocols described in this SOP to minimize the potential for false detections of PFAS. Specific precautions to be taken during field sampling are discussed in detail below.

2. Execution

- Materials acceptable for sampling include: stainless steel, high density polyethylene (HDPE), PVC, silicone, acetate and polypropylene. Grundfos pumps and bladder pumps are known to contain PFAS materials and will not be used to collect groundwater samples.
- Decontamination will include two steps; detergent and a clean water rinse.
- Place plastic sheeting adjacent to the monitoring well for use as a clean work area. Prevent sampling equipment from contacting the ground or other surface that could compromise sample integrity.
- Prior to collection of samples, field personnel must wash their hands and don a new set of nitrile gloves. Gloved hands must not be used to subsequently handle papers, pens, clothes, etc., prior to the collection of PFAS samples.
- The PFAS samples bottle caps must remain on the bottle until immediately prior to sample collection and the bottle immediately sealed after sample collection. This will minimize potential loss of PFAS, through volatilization. The bottle cap must remain in the other hand of the sampler, until replaced on the bottle. PFAS sample bottles will not be rinsed during sampling.
- Samples should be collected from the sample tubing directly into pre-labelled water sample containers – HDPE bottles fitted with an HDPE lined screw cap only.
- Do not filter samples.
- Collect the groundwater sample (up to the brim leaving no head-space) from the tubing into the pre-labelled 500 mL HDPE bottles and tightly screw on the HDPE lined cap (snug, but not too tight).
- Container labels will be completed using pen/pencil (i.e. NO MARKERS) after the caps have been placed back on each bottle.
- During PFAS sampling, water turbulence should be minimized to avoid potential volatilization from aqueous solution; this could include: adjusting discharge rates prior to sampling and inclining the sample bottle neck,

during filling of the bottle. Ensure the rim of the bottle does not come into direct contact with the equipment or tubing.

- Groundwater samples will be collected in pre-labelled, laboratory-supplied "PFAS free" HDPE sample bottles.
- Labelling information and time of sampling should be recorded on the Field Reports. Avoid using markers. All sampling materials should be treated as single use and disposed following completion of sampling at each monitoring well.
- Keep samples as dry as possible. Ensure that sample bottles are securely closed.
- Samples should be placed in coolers and kept at a cool temperature until transportation to the lab. Samples must be kept at between 0–4 ºC in an insulated, durable transport container.

3. Limitations/Preparation

- Packaged food:
    - Field personnel should avoid the use of paper bags and should not bring food onsite in any paper packaging (i.e., do not bring any fast food to the site that uses any form of paper wrapping such as sandwiches, coffee in paper cups, etc.).
    - Avoid products such as aluminum foil, coated papers, and coated textiles onsite.
    - Avoid foods that have been fried on a frying pan onsite as the Teflon coating on most frying surfaces is made of a fluorinated coating and could represent a potential source of PFAS.
    - Snacks and meals (lunch) are not to be eaten in the field vehicle or in the immediate vicinity of sampling activities (i.e., within 30 feet). When field personnel require a break to eat or drink, they should remove their gloves and coveralls and move to an appropriate location (preferably downwind). When finished, field personnel should then tidy up and put their coveralls and gloves back on prior to returning to the work area.
- Field Gear:
    - Water resistant, water proof or stain-treated clothing will not be worn during the field program.
    - Field clothing to be worn on site should be restricted to natural fibers (preferably cotton) and not synthetic.
    - Field clothing should be laundered with minimal use of soap (multiple washings since purchase), no fabric softener or scented products and after they have been cleaned, the clothing should be rinsed again with water only before drying (no fabric softener, etc.).
    - Preferably, field gear should be cotton construction, old and well laundered. New cotton clothing may contain PFAS related treatments. The use of new clothing while sampling or sample

    handling shall be avoided. Gore-Tex™ consists of a PFAS membrane. Gore-Tex™ clothing shall not be worn during the sampling program.
  - Avoid plastic coating or glue materials. Waterproof field books are not to be used. Field reports should be on loose paper on masonite or aluminum clip boards (i.e. plastic clip boards, binders or spiral hard cover notebooks are not acceptable) using a pencil. Sharpies should not be used.
  - Most safety footwear are made from leather and synthetic fibers that have been treated to provide some degree of waterproofing/increased durability and represent a source of trace PFAS. For the health and safety of field personnel, the protection for footwear must be maintained. As such, contact with safety footwear will take place after field personnel remove themselves from immediate vicinity of the sample port (i.e. 30 feet).
  - Disposable nitrile gloves must be worn at all times. Further, a new pair of nitrile gloves shall be donned prior to the following activities at each sample location:
    - Decontamination of re-usable sampling equipment;
    - Prior to contact with sample bottles;
    - Insertion of anything into the monitoring well (e.g. HDPE tubing);
    - Handling of any QA/QC samples including equipment blanks; and
    - After the handling of any non-dedicated sampling equipment, contact with non-decontaminated surfaces, or when judged necessary by field personnel.
- Field vehicle:
  - The field vehicle seats may be treated with stain resistant products by the manufacturer. The seats of the vehicle shall be covered with a well laundered cotton blanket for the duration of the field program in order to avoid direct contact between field clothing and the seats of the vehicle.
- Personnel Hygiene:
  - Field personnel will not use shampoo, conditioner, body gel, cosmetic or hand cream as part of their personal cleaning/showering routine on the day of a sampling event, as these products may contain surfactants and represent a potential source of PFAS. It is strongly recommended that field personnel shower as per normal routine the night before and then rinse with water only on the morning of sampling event. Use of bar soap is considered acceptable, although soap containing moisturizing lotions should be avoided.

  - Moisturizers, cosmetics and dental floss may contain PFAS and shall not be used throughout the duration of the field program, either on or off-site. Sunscreen and insect repellent also cannot be used.
  - For washroom breaks, field personnel will remove themselves from the immediate vicinity of the sampling location (i.e., 30 feet) and then remove gloves and overalls. Field personnel should wash as normal with extra time for rinsing with water after soap use. When finished washing, the use of air dryer is preferred and the use of paper towel for drying is to be avoided (if possible).
- Visitors:
  - Visitors to the site are asked to remain at least 30 feet from sampling areas.

4. Contacts

Melissa Felter

ATTACHMENT C

Proposed Sampling Locations
Emerging Contaminant Sampling
Downstate New York Sites

Summary of Downstate Sites
Wells Selected for Emerging Contaminanant Groundwater Sampling

Site Name	Recommended Wells	Screened Interval (ft)	Depth to Water (ft)	Rationale	Notes
Babylon MGP	MW-1	8 - 18	7.09	on site upgradient	Pending Access
	MW-2	8 - 18	7.92	on site	
	MW-3	8 - 18	8.57	on site downgradient	
Bay Ridge A Station	MW-112	68 - 78	71.53	on site upgradient	No wells on Holder Station A, wells listed are at Holder Station B. Sampling methods to be evaluated. Peristaltic pumps can't be used.
	NA	NA	NA	NA	
	MW-105	73 - 83	77.38	Downgradient	
Bayshore MGP	MW-09I	30 - 40	~5	Upgradient	
	BBMW-41I	25 - 30	~5	on site	
	MW-29S	5 - 10	~5	Upgradient	
	OU3MW-11S	2 - 12	~5	on site downgradient	
	OU2MW-57I	20 - 30	~5	Downgradient	
Belmont Station	Sampling Waiver Approved				
Brooklyn Gas Light	Sampling Waiver Approved				
Citizens MGP - Carroll Garden	CGMW-01S	28 - 38	28.03	on site upgradient	Most intermediate wells have NAPL or were abandoned, so shallow wells were selected.
	CGMW-36	4 - 14	10.66	on site	
	CGMW-06S	10 - 20	6.34	Downgradient	
Clifton MGP - Staten Island	RW-210S	15 - 25	~5	on site upgradient	
	RW-202S	10 - 20	~5	on site	
	RW-23	3 - 13	~5	on site downgradient Edgewater Plaza	
Dangman Park MGP	Sampling Waiver Approved				
Equity Works	MW-6B	30 - 40	11.48	Upgradient	
	MW-8B	30 - 40	11.98	on site	
	MW-11B	33 - 43	10.48	Downgradient	
Far Rockaway MGP	MW-116D	29.9 - 39.9	6.98	Upgradient	
	MW-118DR	29 - 39	5.47	Near site	
	MW-119D	26.5 - 36.5	3.83	Downgradient	
Flatbush Station A&B	MW-2	47 - 57	46.08	on site upgradient	Sampling methods to be evaluated. Peristaltic pumps can't be used.
	MW-4	47 - 57	47.43	on site	
	MW-7	47 - 57	49.17	on site downgradient	
Former Brooklyn Borough Gas Works (Coney Island)	MW-18	10 - 21	13.21	on site upgradient	
	MW-2	9 - 22	10.5	on site	
	MW-16	9 - 21	14.88	on site downgradient	
Front St. Station	Sampling Waiver Approved				
Fulton Works	FW-MW-19	5 - 15	6.33	Upgradient	
	FW-MW-5R	10 - 20	13.45	on site	
	FW-MW-4R	6 - 16	6.55	Downgradient	
	FW-MW-17	8 - 18	6.75	Downgradient	

Summary of Downstate Sites
Wells Selected for Emerging Contaminanant Groundwater Sampling

Site Name	Recommended Wells	Screened Interval (ft)	Depth to Water (ft)	Rationale	Notes
Glen Cove MGP	PZ06	7 - 17	5.03	on site upgradient	
	GCRW03	15 - 25	10.41	on site	
	GCMW14S-R	10 - 20	9.83	on site downgradient	
Greenpoint MGP - Energy Center	MW-220I	40 - 50	22.92	on site upgradient	
	MW-11	33 - 48	15.01	on site	
	GPEC-MW-3S	25 - 40	9.1	on site downgradient	
Inwood Holder	MW-52S	1 - 11	1.86	on site upgradient	
	MW-19S	2 - 9	6.1	on site	
	GW-8*	1 - 11	12.4	on site downgradient	
Jamaica Gas Light MGP	MW-6	21 - 31	~24.5	on site upgradient	Pending Access
	MW-3	20 - 30	~24.5	on site	
	MW-2	17 - 27	~20	on site downgradient	
Kings County Works	KC-MW-01	22 -32	~23	Upgradient	
	KC-MW-04	4 - 14	~10	on site	
	KC-MW-09	5 - 15	NA	Downgradient	
Metropolitan MGP	MW-1I	30 - 40	7.24	Upgradient	Intermediate wells selected because of downward gradients except near Canal Pending Access
	MW-7I	30 - 40	7.33	on site	
	MW-6I	30 - 40	7.66	Downgradient	
Patchogue MGP	MW-1	7 - 12	5.81	on site upgradient	
	MW-7S	4 - 9	4.52	on site	
	MW-4S	5 - 10	5.07	on site downgradient	
Peoples Works	PWMW-01	8 - 18	7.18	on site upgradient	
	MW-11	6 - 16	~9.5	on site	
	MW-9	5 - 15	~8	on site downgradient	
Plymouth Station	Sampling Waiver Approved				
Rockaway Park MGP	MW-26S	3 - 13	5.91	Upgradient	
	RW-05A	10 - 20	9.01	on site	
	MW-02S	5 - 15	NA	Downgradient	
Sag Harbor MGP	SHMW-13I	35 - 45	1.46	Upgradient	
	SHMW-01I	35 - 45	2.4	on site	
	SHMW-03I	35 - 45	2.05	Downgradient	
Scholes St. Station	Sampling Waiver Approved				
Skillman St. Station	SSMW-03	12 - 22	9.72	Upgradient	Only 7 wells, none on site
	SSMW-05	11 - 21	16.07	Downgradient	
	NA	NA	NA	NA	
Union Station Holder	US-MW-01S	25 - 35	26.1	on site upgradient	Pending Access. Sampling methods to be evaluated. Peristaltic pumps can't be used.
	US-MW-04S	27 - 37	28.37	on site	
	US-MW-09S	30 - 40	29.9	Downgradient	
Williamsburg Works	WW-MW-03	4 - 14	5.84	Upgradient	All on site wells were abandoned for the IRM.
	WW-MW-06[+]	0.3 - 10.3	3.65	Near site	
	WW-MW-14	4 - 14	1.22	Downgradient	
Wythe Ave. Station	WA-MW-04	9 - 19	10.02	Upgradient	
	WA-MW-05	10 - 20	No data yet	Downgradient	Unsure of concentrations, not sampled yet. Has potential for high dissolved concentrations.
	NA	NA	NA	NA	Only 6 wells, none on site.

* - If GW-8 is dry, or does not have enough water to sample, GW-7 will be sampled.

[+] - If WW-MW-06 cannot be located, WW-MW-08 will be sampled. If WW-MW-08 cannot be located, WW-MW-12 will be sampled.

SOURCES:

1. AERIAL IMAGERY DATE: 02/26/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. *FIGURE 2-3, GROUNDWATER CONTOUR MAP*, BABYLON FORMER MGP SITE, WEST BABYLON, NEW YORK. PREPARED BY AECOM, DATE: 6/19/18.

0 40 80

SCALE: 1" = 40'

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GROUNDWATER SAMPLE LOCATIONS - BABYLON MGP SITE

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Fig. 1

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SOURCES:

1. AERIAL IMAGERY DATE: 02/26/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. *FIGURE 2: LOCATION OF MONITORING WELLS, FORMER BAY RIDGE HOLDER STATION A & B SITE, OPERABLE UNIT 2,* PREPARED BY AECOM, DATE: 12/30/15.
3. *FIGURE 1-6: GROUNDWATER CONTOURS,* PREPARED BY AECOM, DATE: 9/26/14 (GROUNDWATER CONTOURS DATED 10/10/13).

0 80 160

SCALE: 1" = 80'

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GROUNDWATER SAMPLE LOCATIONS -
BAY RIDGE HOLDER STATIONS A & B

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Fig. 2

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SOURCE:

1. AERIAL IMAGERY DATE: 02/26/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. *FIG. 8 SHALLOW GROUNDWATER CONTOUR MAP*, PREPARED BY GEI CONSULTANTS, INC., DATE: SEPTEMBER 2017.

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GROUNDWATER SAMPLE LOCATIONS - BAY SHORE MGP SITE

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Fig. 3

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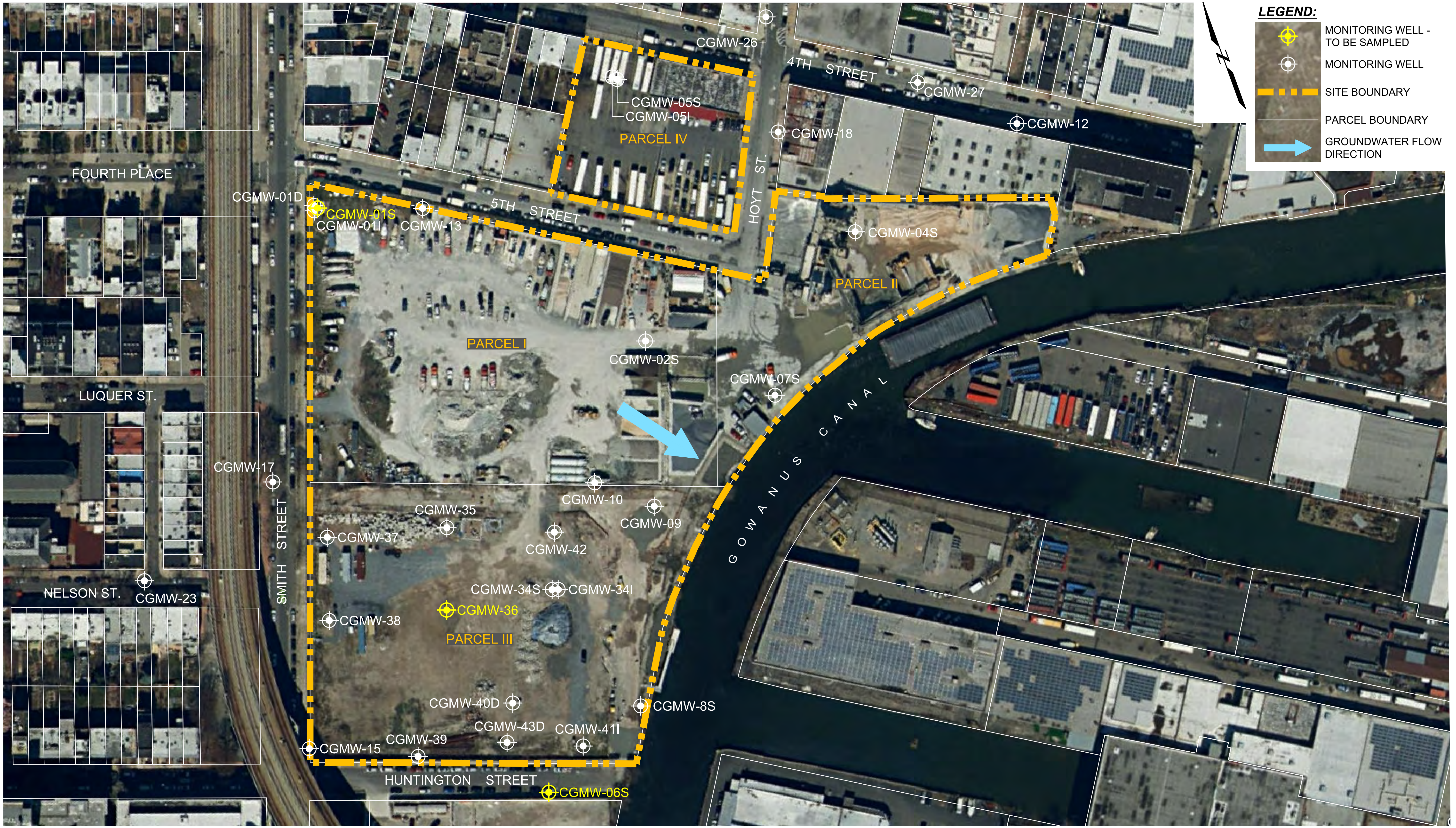

SOURCES:

1. AERIAL IMAGERY DATE: 03/29/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. *DATA REPORT, PLATE 8: LOW-TIDE SHALLOW GROUNDWATER CONTOURS AND HISTORIC DISSOLVED PHASE GROUNDWATER ANALYTICAL SUMMARY (ug/L) - APRIL 28, 2010,* PREPARED BY GEI, DATE: OCTOBER 2011.

0 120 240

SCALE: 1" = 120'

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GROUNDWATER SAMPLE LOCATIONS - CITIZENS MGP - CARROLL GARDENS SITE

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Fig. 4

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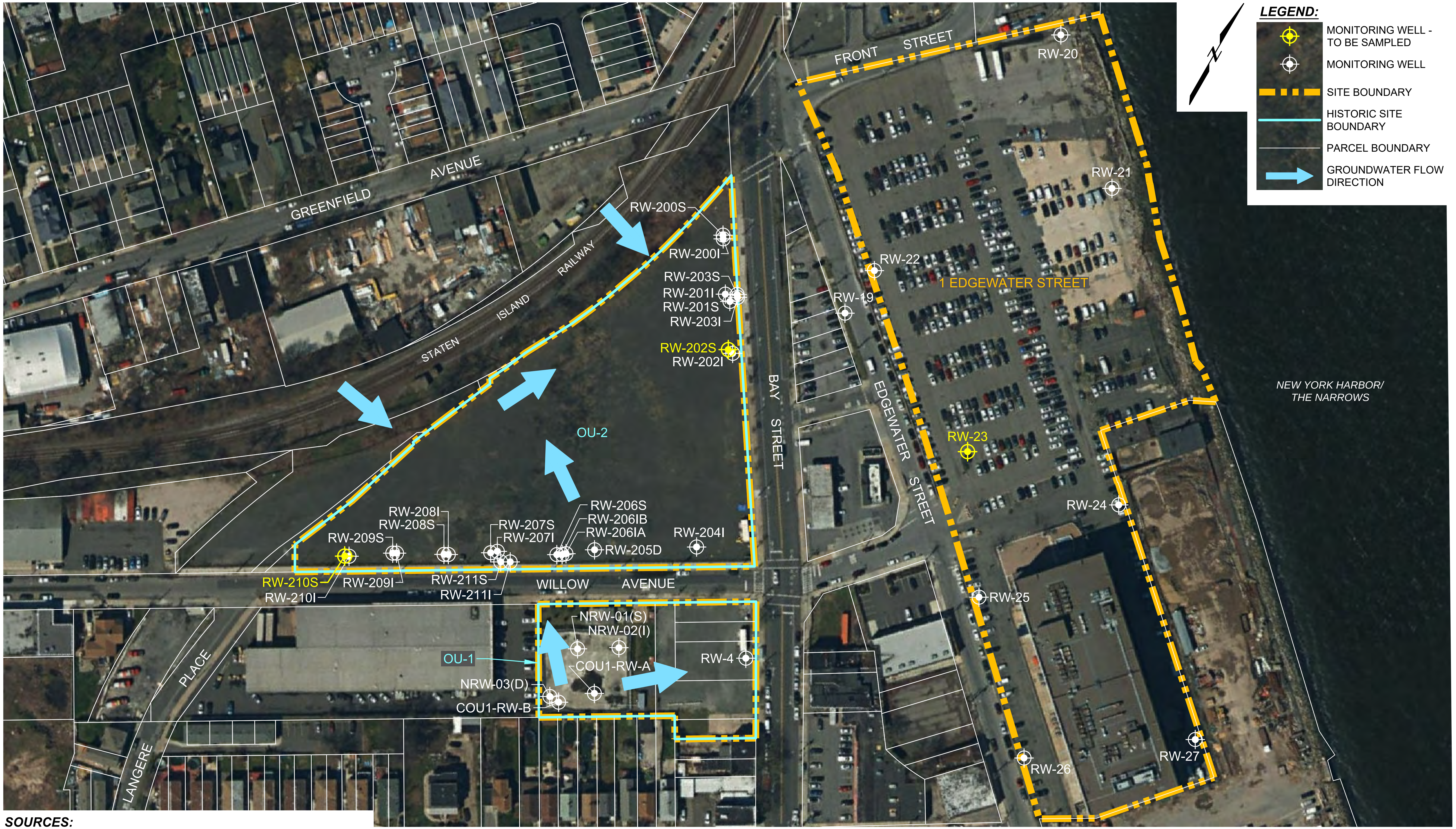

SOURCES:

1. AERIAL IMAGERY DATE: 02/26/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. *INTERIM STATUS REPORT, FIGURE 2: SITE LAYOUT,* PREPARED BY AECOM, DATE: 01/23/15.
3. *SITE MANAGEMENT PLAN, FIGURE 1-5: GROUNDWATER CONTOURS AND ANALYTICAL RESULTS,* PREPARE BY AECOM, DATE: 1/31/14.

0 120 240

SCALE: 1" = 120'

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GROUNDWATER SAMPLE LOCATIONS - CLIFTON MGP SITE

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Fig. 5

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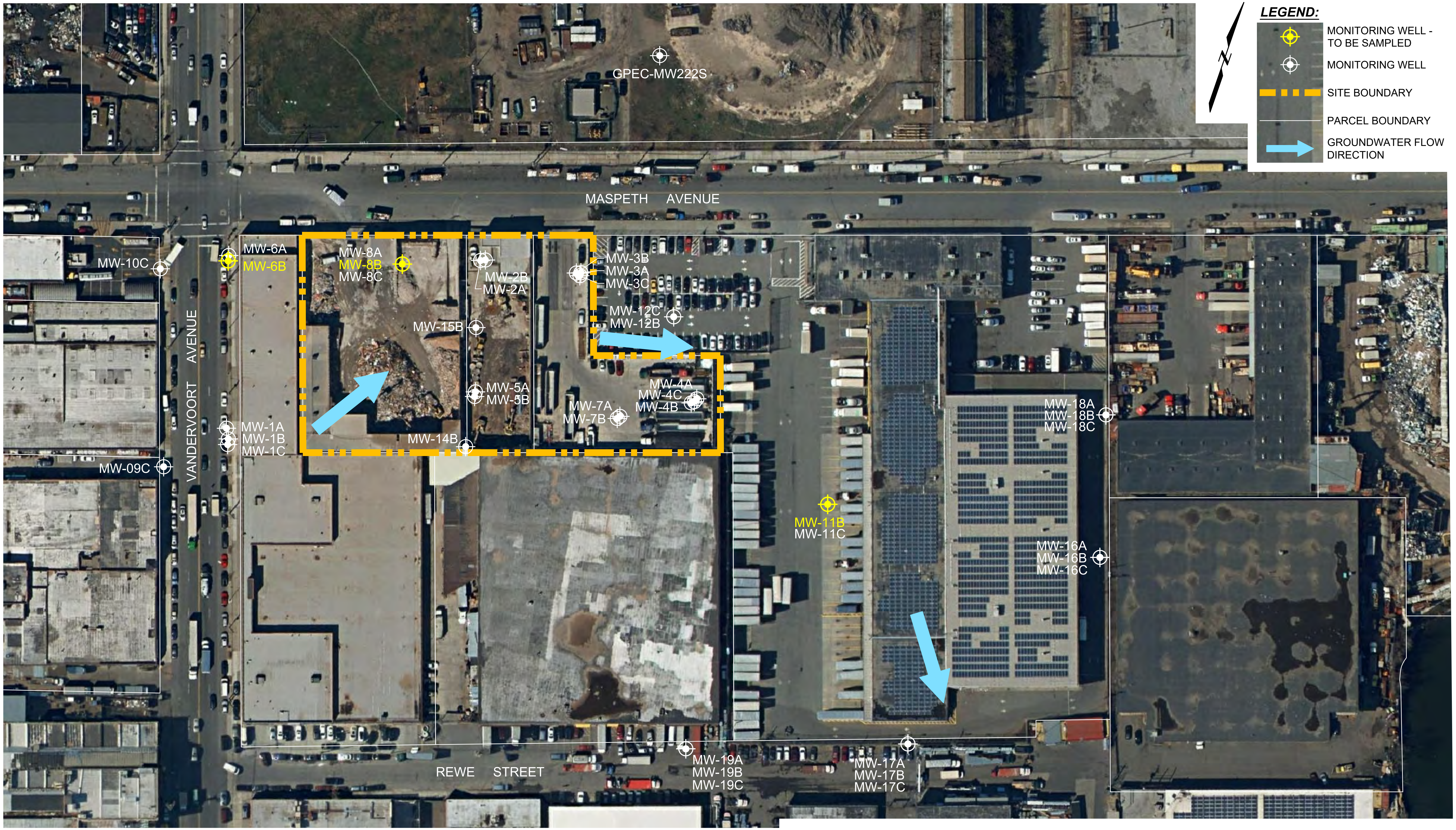

SOURCES:
1. AERIAL IMAGERY DATE: 03/29/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. *REMEDIAL INVESTIGATION REPORT* FIGURES, PREPARED BY AECOM, DATE: 3/20/2016 (GROUNDWATER FLOW DATE 12/4/15).

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GROUNDWATER SAMPLE LOCATIONS - EQUITY WORKS MGP SITE

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Fig. 6

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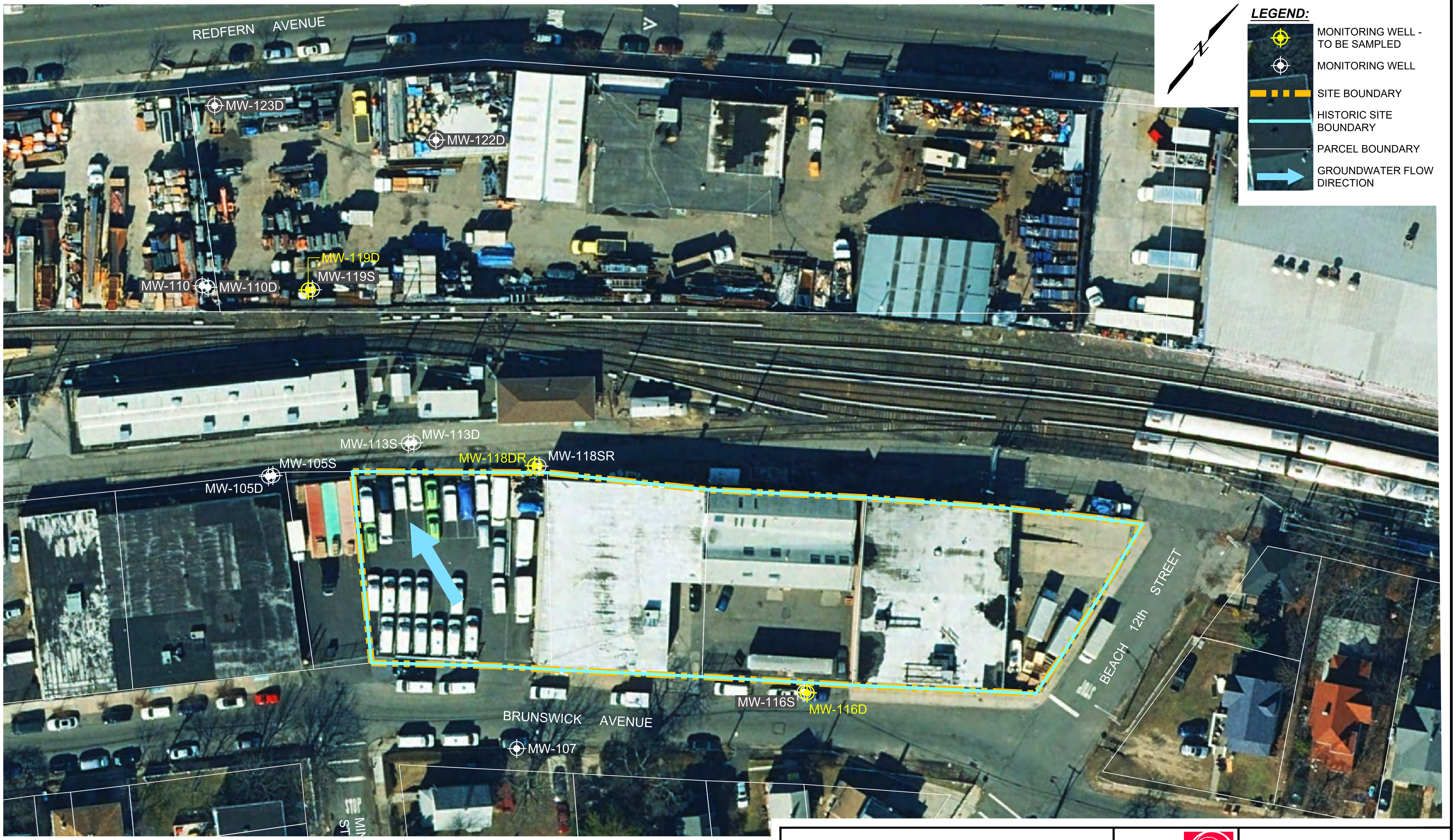

SOURCE:

1. AERIAL IMAGERY DATE: 02/26/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. *FINAL ENGINEERING REPORT, FIGURE 4-6: GROUNDWATER MONITORING NETWORK*, PREPARED BY AECOM, DATE: 1/24/15.

0 50 100

SCALE: 1" = 50'

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GROUNDWATER SAMPLE LOCATIONS - FAR ROCKAWAY MGP SITE

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\\gtb1v-fs01\ I:\Project\National Grid\EC Sampling\1802728\CAD\Figures\ECSWP\1802728_ECSWP_FARROCK.dwg - 9/4/2018

SOURCES:

1. AERIAL IMAGERY DATE: 03/29/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. *SITE MANAGEMENT PLAN, FIGURE 1-7: GROUNDWATER ELEVATION CONTOUR MAP,* PREPARED BY AECOM, DATE: 01/10/12 (GROUNDWATER CONTOURS DATED 7/28/2011).

0 80 160

SCALE: 1" = 80'

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GROUNDWATER SAMPLE LOCATIONS - FLATBUSH STATIONS A & B SITE

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Fig. 8

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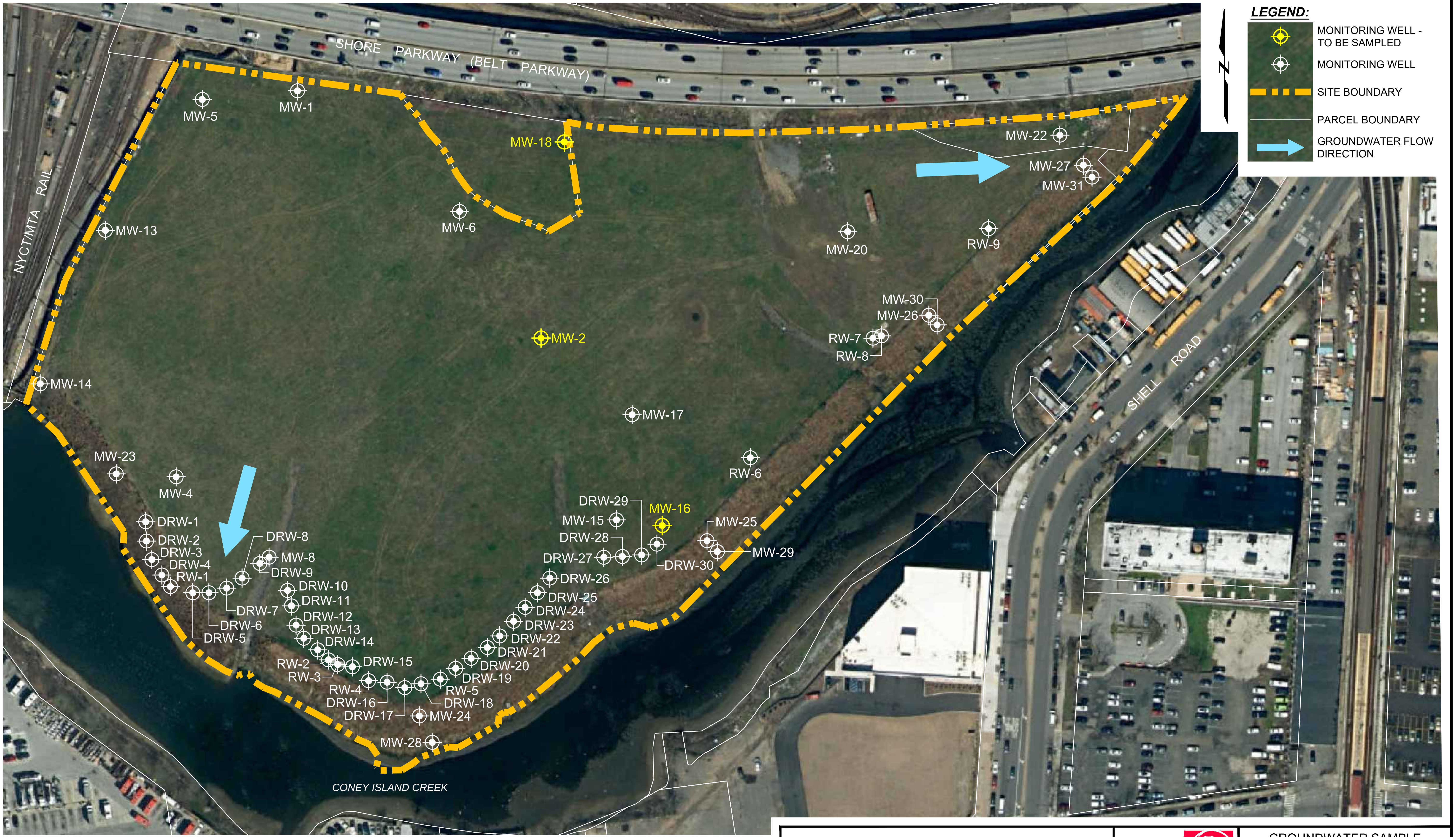

SOURCE:

1. AERIAL IMAGERY DATE: 05/29/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. FIGURES 2 & 4 FROM *PERIODIC REVIEW REPORT*, PREPARED BY ARCADIS, DATE: JANUARY 31 2014 (GROUNDWATER CONTOURS FROM 9/21/16).

0 120 240

SCALE: 1" = 120'

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GROUNDWATER SAMPLE LOCATIONS - FORMER BROOKLYN BOROUGH GAS WORKS (CONEY ISLAND) MGP SITE

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Fig. 9

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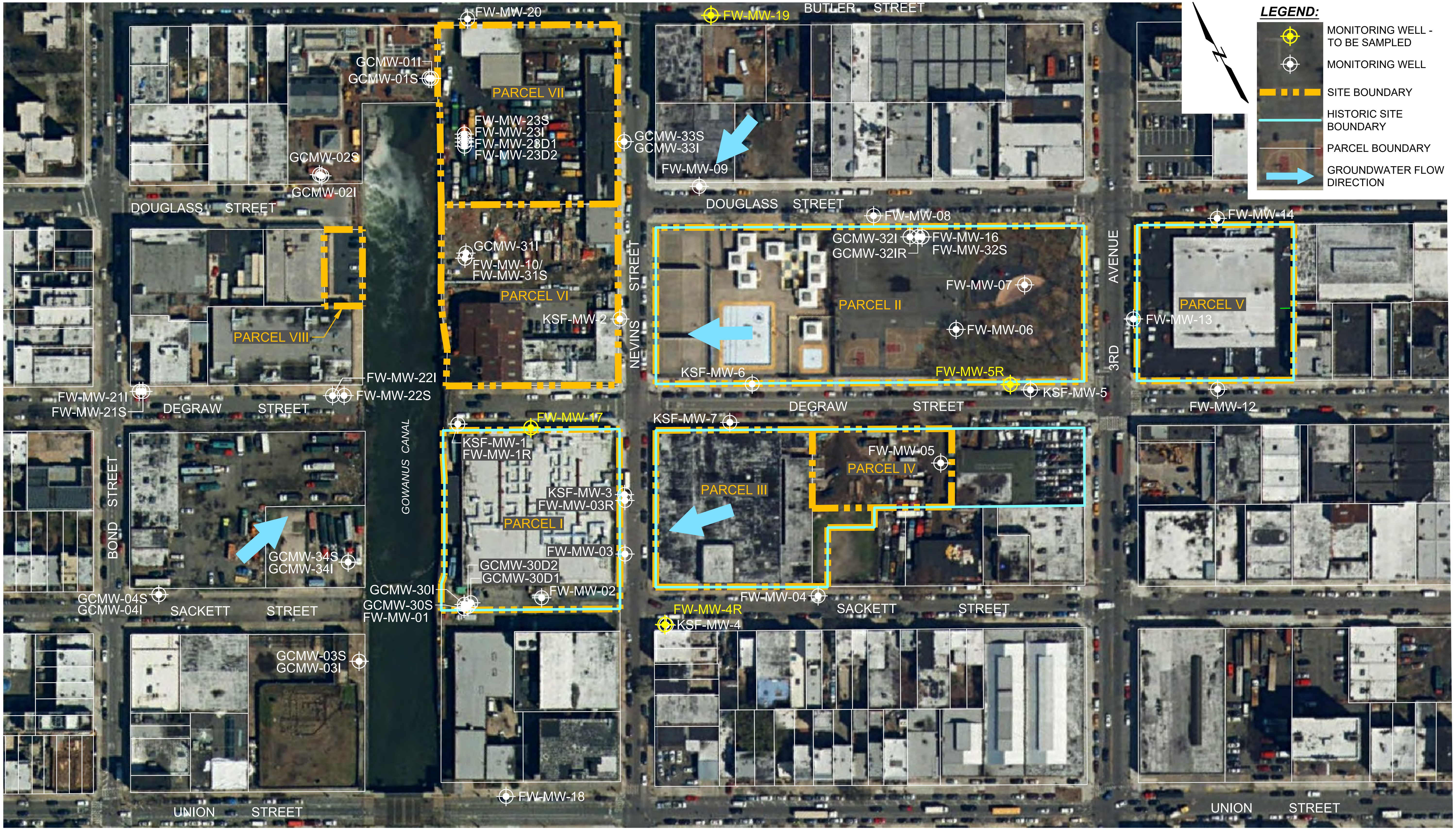

SOURCES:

1. AERIAL IMAGERY DATE: 03/29/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. *REMEDIAL INVESTIGATION REPORT, FIGURE 14: SHALLOW GROUNDWATER CONTOURS AT HIGH TIDE AND DISSOLVED-PHASE GROUNDWATER ANALYTICAL SUMMARY - MAY 19, 2011,* PREPARED BY GEI, DATE: JULY 2012.

0 120 240

SCALE: 1" = 120'

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GROUNDWATER SAMPLE LOCATIONS - FULTON WORKS MGP SITE

September 2018

Fig. 10

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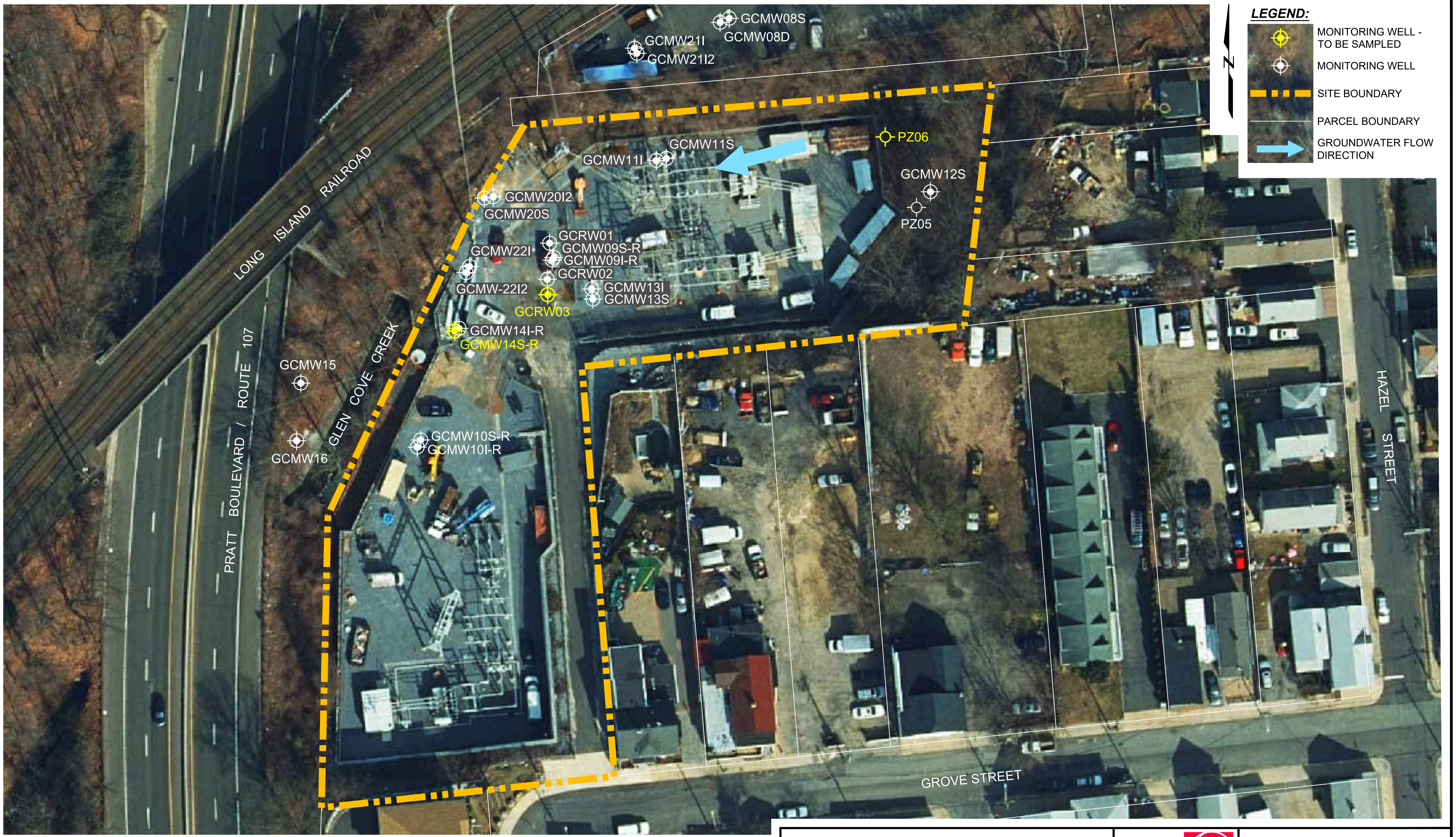

LEGEND:

- ⊕ MONITORING WELL - TO BE SAMPLED
- ⊕ MONITORING WELL
- ▬ SITE BOUNDARY
- ― PARCEL BOUNDARY
- ➡ GROUNDWATER FLOW DIRECTION

SOURCE:

1. AERIAL IMAGERY DATE: 02/26/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. FIGURES FROM *GROUNDWATER MONITORING REPORT - JUNE 2018 (Q2)*, PREPARED BY GEI CONSULTANTS, INC., DATE: AUGUST 2018.

0 150 30

SCALE: 1" = 150'

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National Grid New York Former MGP Sites

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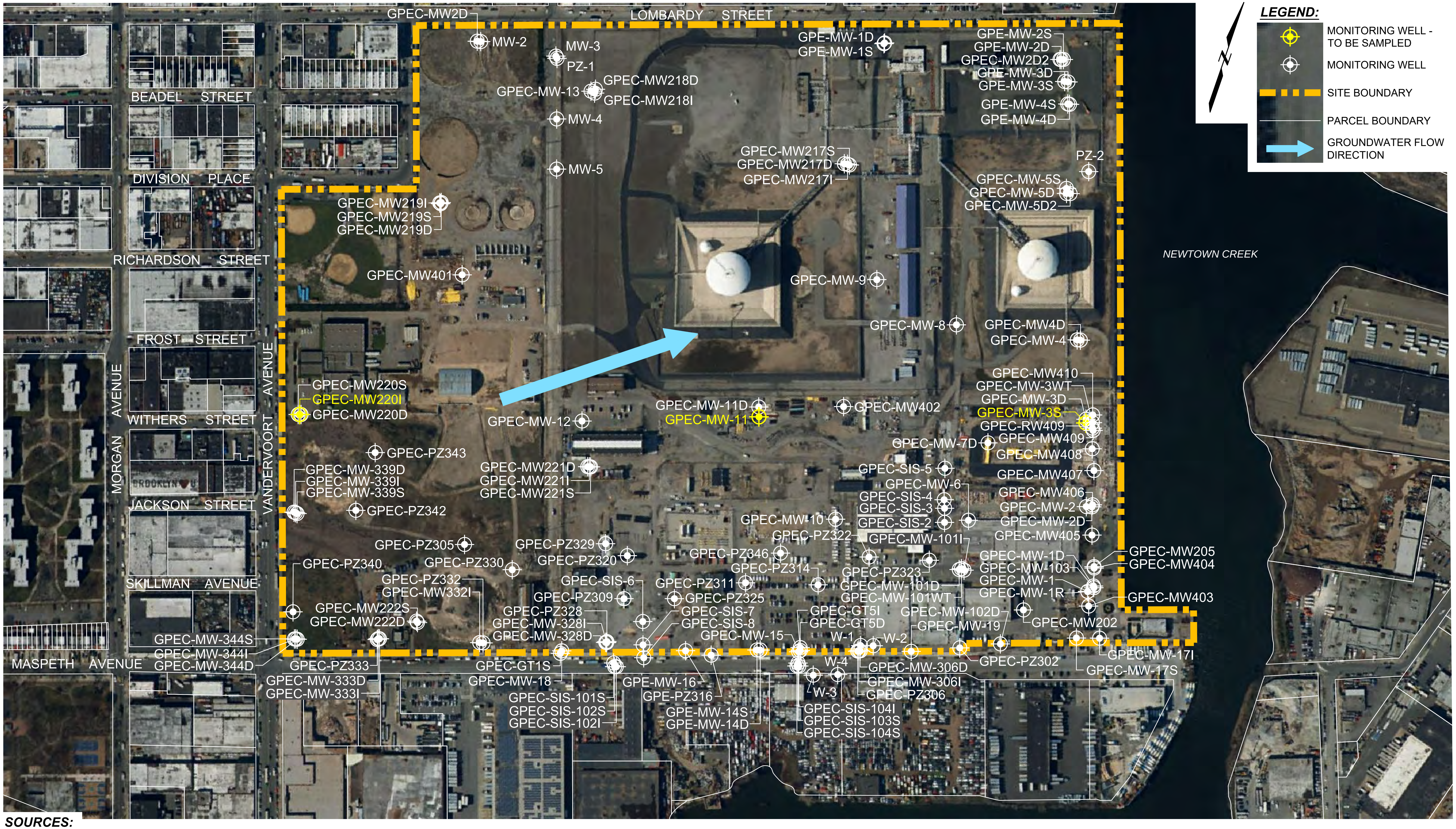
GROUNDWATER SAMPLE LOCATIONS -
GLEN COVE MGP SITE

September 2018

Fig. 11



LEGEND:

⊕	MONITORING WELL - TO BE SAMPLED
⊕	MONITORING WELL
▬ ▪ ▪ ▬	SITE BOUNDARY
—	PARCEL BOUNDARY
➡	GROUNDWATER FLOW DIRECTION

SOURCES:

1. AERIAL IMAGERY DATE: 03/29/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. FIGURES FROM *INTERIM REMEDIAL INVESTIGATION REPORT*, PREPARED BY GEI CONSULTANTS, INC., DATE: NOVEMBER 2016.
3. *FIGURE 4-4: QUALITATIVE CALIBRATION - UPPER GLACIAL AQUIFER*, PREPARED BY GEI CONSULTANTS, INC., DATE: 11/2017.

0 300 600

SCALE: 1" = 300'

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GROUNDWATER SAMPLE LOCATIONS - GREENPOINT MGP ENERGY CENTER SITE

Project 1802728 | September 2018 | Fig. 12

\\gtb1v-fs01\ I:\Project\National Grid\EC Sampling\1802728\CAD\Figures\ECSWP\1802728_ECSWP_GRNPT.dwg - 9/4/2018

SOURCE:

1. AERIAL IMAGERY DATE: 02/26/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. *FIGURE 4-3: SHALLOW GROUNDWATER ELEVATION CONTOUR MAP,* PREPARED BY AECOM, DATE: 9/30/13 (GROUNDWATER CONTOURS DATED 10/18/12).
3. *SITE CHARACTERIZATION WORK PLAN, FIGURE 2: PROPOSED SAMPLE LOCATIONS,* PREPARED BY GEI CONSULTANTS, INC., DATE: JULY 2007.

0 150 30

SCALE: 1" = 150'

Emerging Contaminant Sampling Work Plan
National Grid New York Former MGP Sites

nationalgrid

GEI Consultants

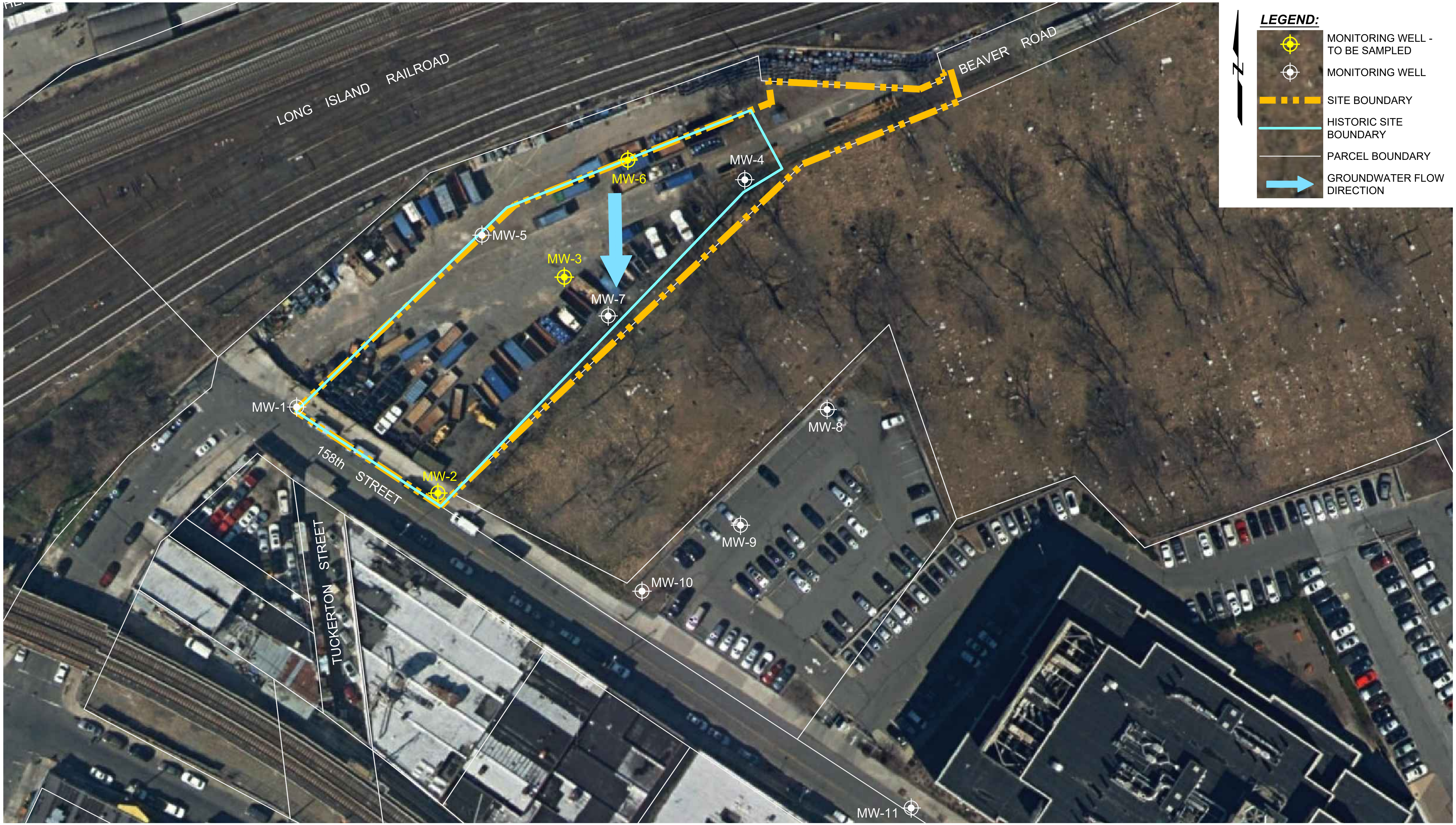
Project 1802728

GROUNDWATER SAMPLE LOCATIONS - INWOOD HOLDER SITE

September 2018

Fig. 13

---- I:\Project\National Grid\EC Sampling\1802728\CAD\Figures\ECSWP\1802728_ECSWP_INWOOD.dwg - 9/4/2018



SOURCE:

1. AERIAL IMAGERY DATE: 03/29/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. *REMEDIAL INVESTIGATION REPORT, FIGURE 4-5: GROUNDWATER ELEVATION CONTOUR MAP - DECEMBER 9, 2013,* PREPARED BY AECOM, DATE 4/1/14.

0 60 120

SCALE: 1" = 60'

Emerging Contaminant Sampling Work Plan
National Grid New York Former MGP Sites

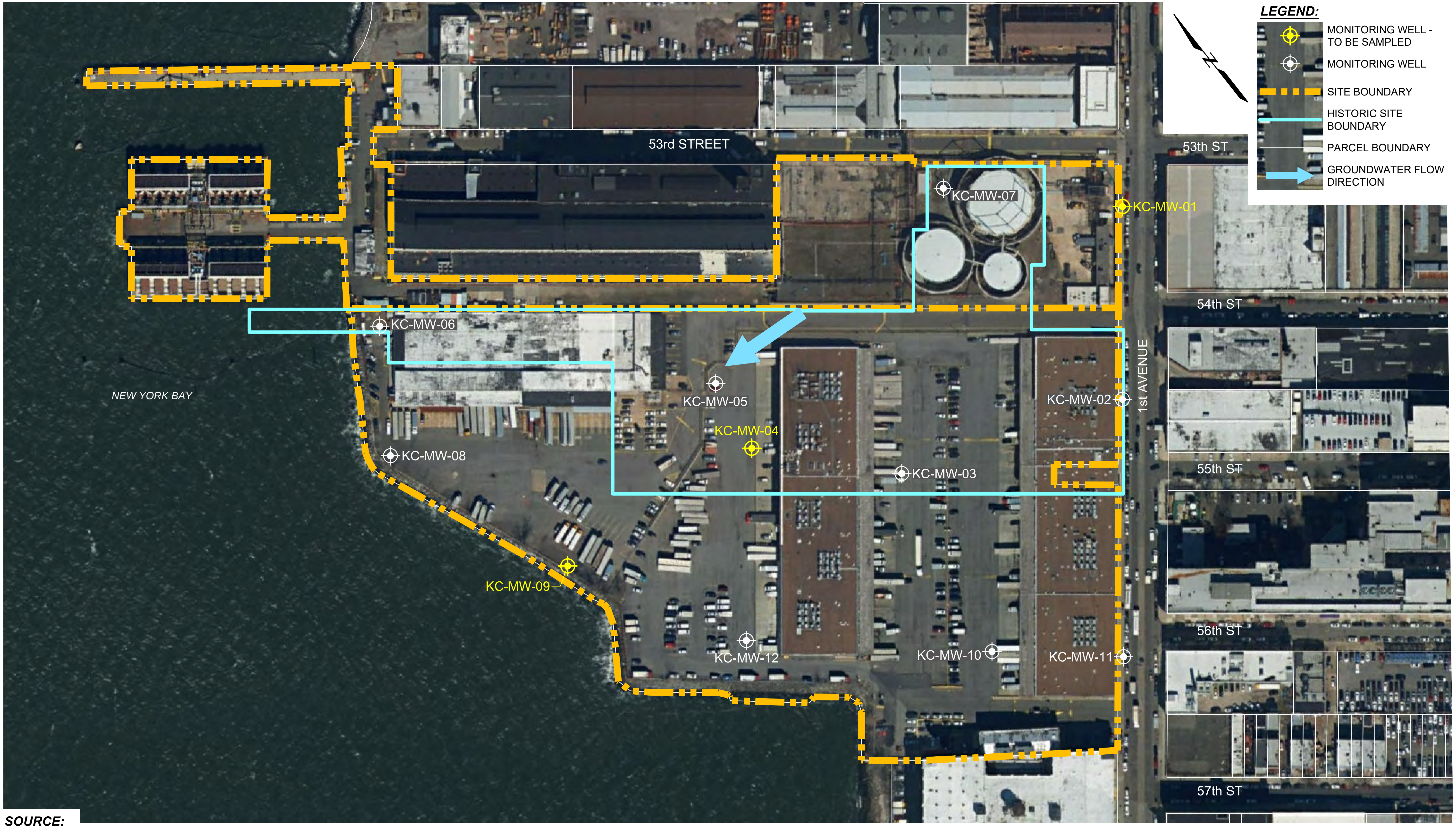
nationalgrid

GEI Consultants

GROUNDWATER SAMPLE LOCATIONS - JAMAICA GAS AND LIGHT MGP SITE

Project 1802728 | September 2018 | Fig. 14

\\gtb1v-fs01\ I:\Project\National Grid\EC Sampling\1802728\CAD\Figures\ECSWP\1802728_ECSWP_JAMAICA.dwg - 9/4/2018



SOURCE:

1. AERIAL IMAGERY DATE: 03/96/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. FIGURES FROM *SITE CHARACTERIZATION REPORT*, PREPARED BY GEI CONSULTANTS, INC., DATE: JUNE 2016.
3. *FIG. 1: MONITORING WELL LOCATIONS,* PREPARED BY GEI CONSULTANTS, INC., DATE: MAY 2018.

0 150 30

SCALE: 1" = 150'

Emerging Contaminant Sampling Work Plan
National Grid New York Former MGP Sites

nationalgrid

GEI Consultants

Project 1802728

GROUNDWATER SAMPLE LOCATIONS - KINGS COUNTY WORKS MGP SITE

September 2018

Fig. 15

\\gtb1v-fs01\ I:\Project\National Grid\EC Sampling\1802728\CAD\Figures\ECSWP\1802728_ECSWP_KINGS.dwg - 9/4/2018

SOURCES:

1. AERIAL IMAGERY DATE: 02/26/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. *REMEDIAL INVESTIGATION REPORT* FIGURES PREPARED BY AECOM, DATE: 7/21/14 (LOW TIDE GROUNDWATER CONTOURS DATED 3/15/12).

0 100 200

SCALE: 1" = 100'

Emerging Contaminant Sampling Work Plan
National Grid New York Former MGP Sites

nationalgrid

GEI Consultants

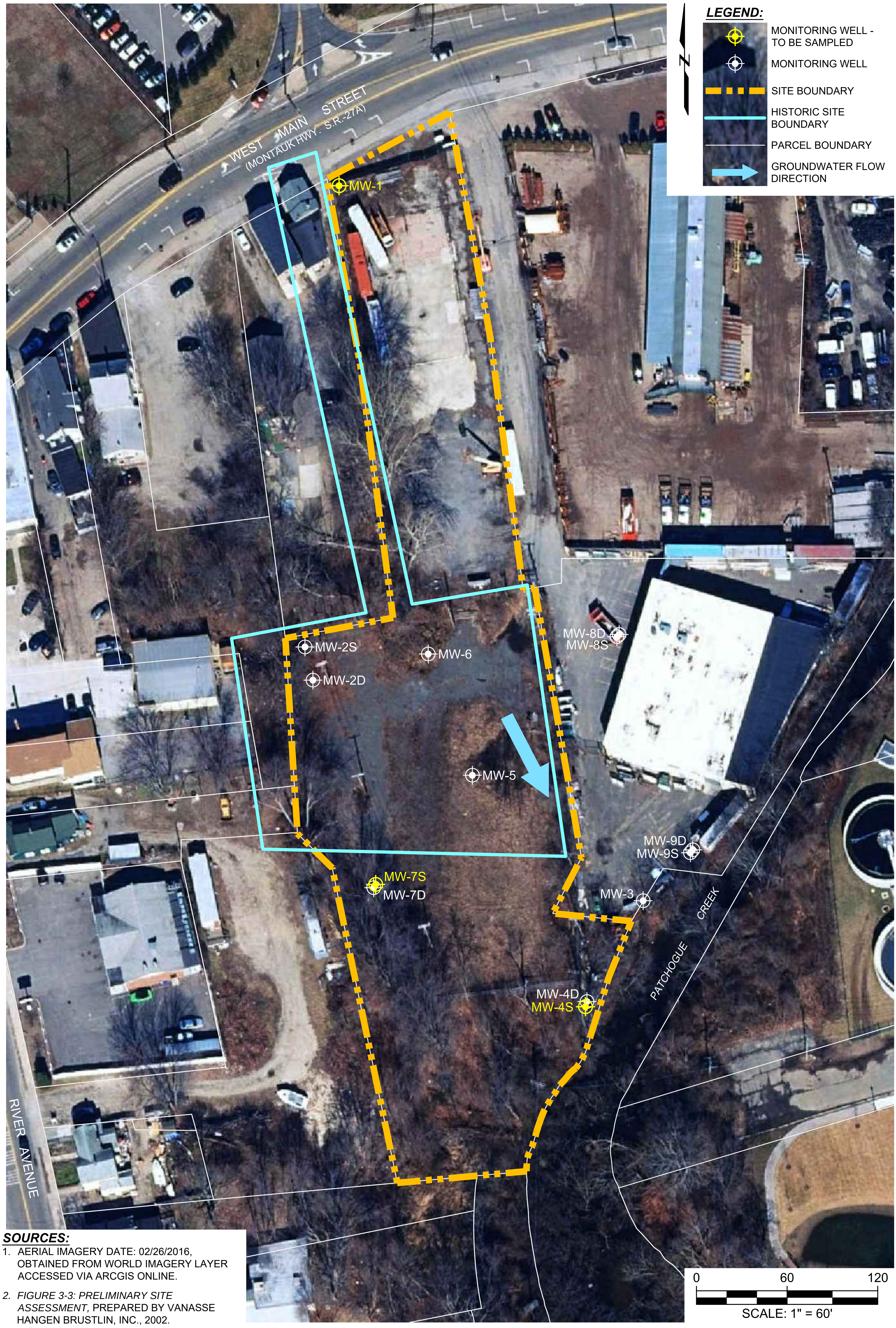
Project 1802728

GROUNDWATER SAMPLE LOCATIONS - METROPOLITAN WORKS MGP SITE

September 2018

Fig. 16

\\gtb1v-fs01\ I:\Project\National Grid\EC Sampling\1802728\CAD\Figures\ECSWP\1802728_ECSWP_METRO.dwg - 9/4/2018



SOURCES:

1. AERIAL IMAGERY DATE: 02/26/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. *FIGURE 3-3: PRELIMINARY SITE ASSESSMENT*, PREPARED BY VANASSE HANGEN BRUSTLIN, INC., 2002.
3. *FIGURE 2-4: MONITORING WELL LOCATIONS*, PREPARED BY TETRA TECH EC, INC.
4. *FIGURE 1: WATER TABLE ELEVATION CONTOUR MAP - DECEMBER 27, 2016*, PREPARED BY BROWN AND CALDWELL, DATE: 3/13/17.

Emerging Contaminant Sampling Work Plan
National Grid New York Former MGP Sites

nationalgrid

GEI Consultants

GROUNDWATER SAMPLE LOCATIONS - PATCHOGUE MGP SITE

Project 1802728

September 2018

Fig. 17

---- I:\Project\National Grid\EC Sampling\1802728\CAD\Figures\ECSWP\1802728_ECSWP_PATCH.dwg - 8/22/2018

SOURCES:

1. AERIAL IMAGERY DATE: 03/29/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. *FIGURE 12: MONITORING WELL LOCATIONS, GROUNDWATER ELEVATIONS AND ANALYTICAL RESULTS, PREPARED BY TETRA TECH INC., DATE: 8/3/17.*

0 50 100

SCALE: 1" = 50'

Emerging Contaminant Sampling Work Plan
National Grid New York Former MGP Sites

nationalgrid

GEI Consultants

Project 1802728

GROUNDWATER SAMPLE LOCATIONS - PEOPLES WORKS MGP SITE

September 2018

Fig. 18

\\gtb1v-fs01\ I:\Project\National Grid\EC Sampling\1802728\CAD\Figures\ECSWP\1802728_ECSWP_PPLS.dwg - 9/4/2018

0 100 200

SCALE: 1" = 100'

SOURCE:

1. AERIAL IMAGERY DATE: 05/29/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. *GROUNDWATER MONITORING REPORT* FIGURES, PREPARED BY GEI CONSULTANTS, INC., DATE: APRIL 2018 (GROUNDWATER CONTOURS DATED 12/2017).

Emerging Contaminant Sampling Work Plan
National Grid New York Former MGP Sites

nationalgrid

GEI Consultants

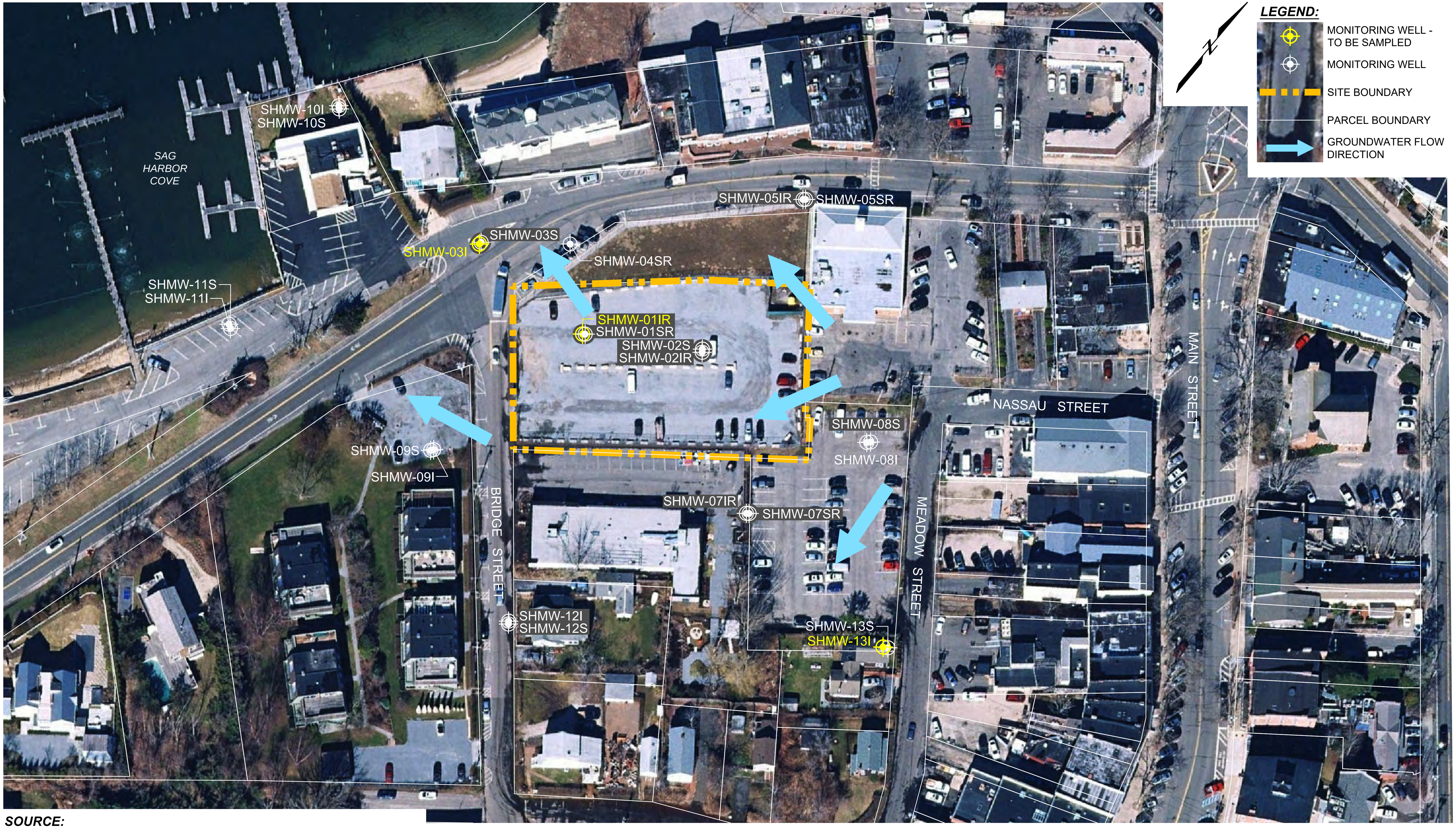
Project 1802728

GROUNDWATER SAMPLE LOCATIONS - ROCKAWAY PARK MGP SITE

September 2018

Fig. 19

\\gtb1v-fs01\ I:\Project\National Grid\EC Sampling\1802728\CAD\Figures\ECSWP\1802728_ECSWP_ROCKWY.dwg - 9/4/2018



SOURCE:

1. AERIAL IMAGERY DATE: 02/26/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. *FIG. 2: MONITORING WELL LOCATION MAP,* PREPARED BY GEI CONSULTANTS, INC., DATE: AUGUST 2017.
3. *FIGURE 1-4: GROUNDWATER FLOW MAP, WATER TABLE CONTOUR MAP - LOW TIDE - MAY 20, 2002,* PREPARED BY AECOM, DATE: 2/18/11.

0 80 160

SCALE: 1" = 80'

Emerging Contaminant Sampling Work Plan
National Grid New York Former MGP Sites

nationalgrid

GEI Consultants

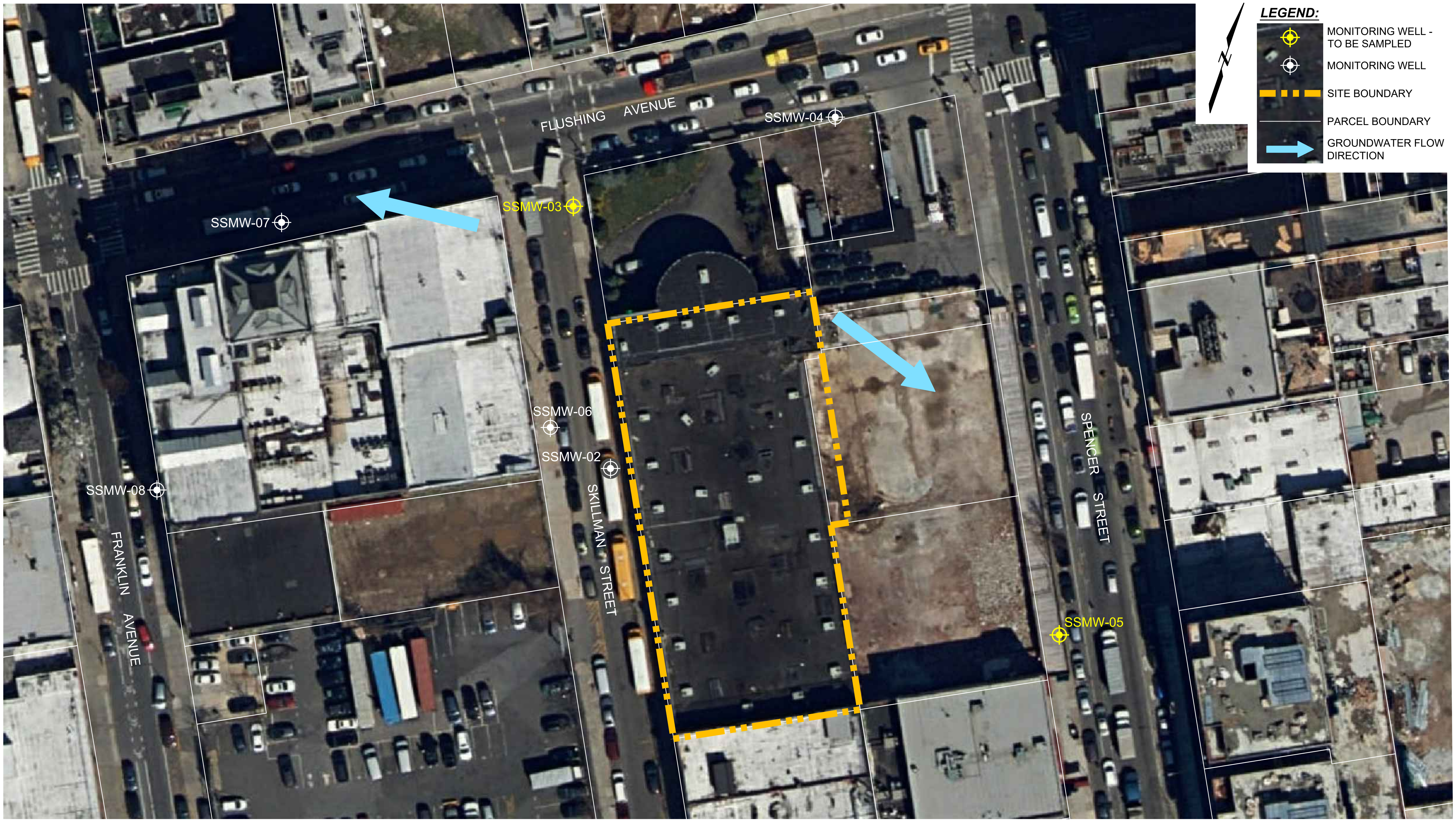
Project 1802728

GROUNDWATER SAMPLE LOCATIONS -
SAG HARBOR MGP SITE

September 2018

Fig. 20

\\gtb1v-fs01\ I:\Project\National Grid\EC Sampling\1802728\CAD\Figures\ECSWP\1802728_ECSWP_SAGHRB.dwg - 9/4/2018



SOURCES:

1. AERIAL IMAGERY DATE: 03/29/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. *ANNUAL GROUNDWATER SAMPLING REPORT, FIG. 4: GROUNDWATER CONTOURS (AUGUST 24, 2017) AND GROUNDWATER ANALYTICAL SUMMARY (ug/L)*, PREPARED BY GEI CONSULTANTS, INC., DATE: DECEMBER 2017.

0 50 100

SCALE: 1" = 50'

Emerging Contaminant Sampling Work Plan
National Grid New York Former MGP Sites

nationalgrid

GEI Consultants

Project 1802728

GROUNDWATER SAMPLE LOCATIONS - SKILLMAN ST. STATION SITE

September 2018

Fig. 21

\\gtb1v-fs01\ I:\Project\National Grid\EC Sampling\1802728\CAD\Figures\ECSWP\1802728_ECSWP_SKLM.dwg - 9/4/2018

SOURCE:

1. AERIAL IMAGERY DATE: 03/96/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. FIGURES FROM *DRAFT SITE CHARACTERIZATION REPORT*, PREPARED BY GEI CONSULTANTS, INC., DATE: DECEMBER 2016.

0 60 120

SCALE: 1" = 60'

Emerging Contaminant Sampling Work Plan
National Grid New York Former MGP Sites

nationalgrid

GEI Consultants

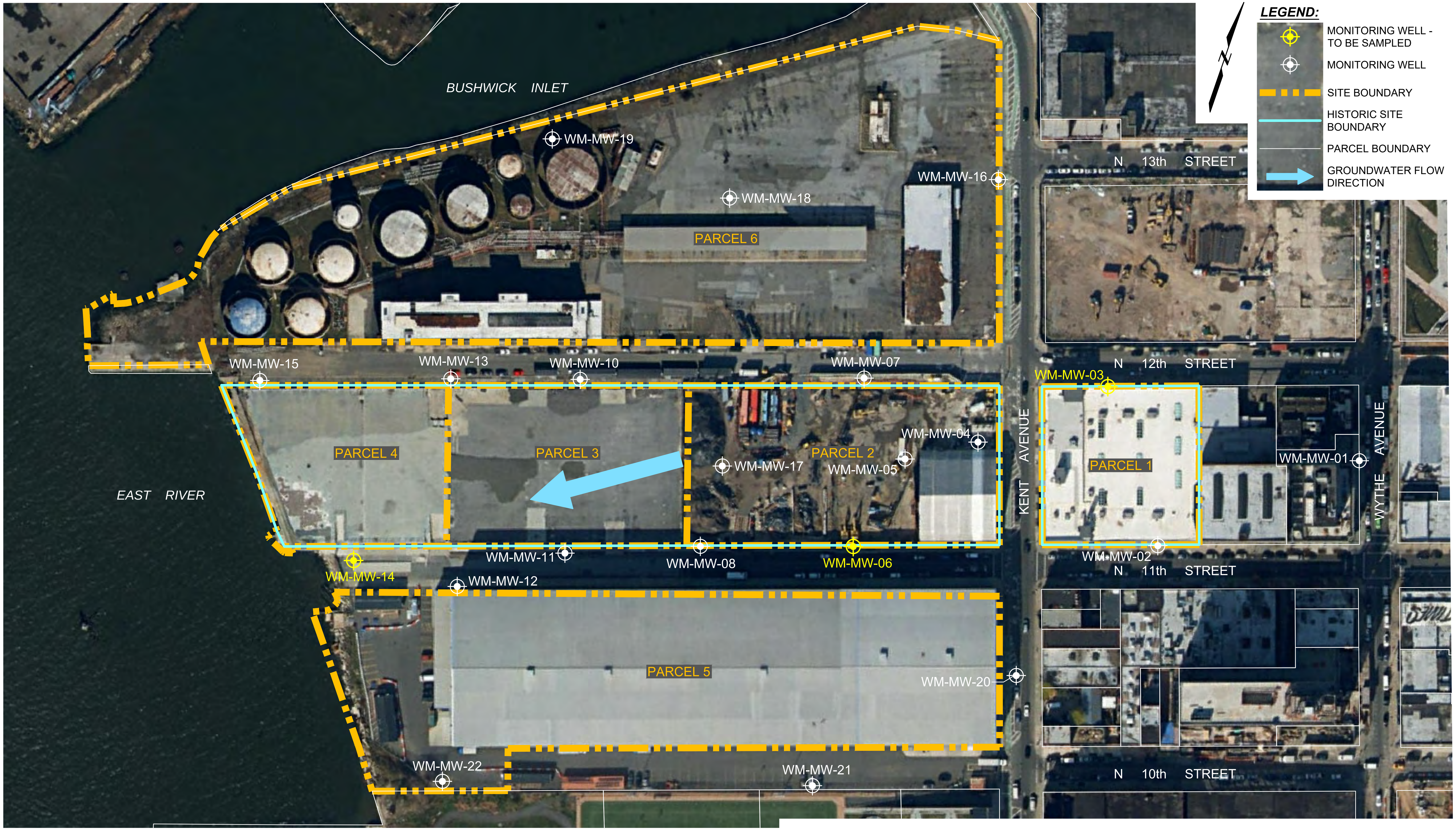
Project 1802728

GROUNDWATER SAMPLE
LOCATIONS -
UNION STATION HOLDER SITE

September 2018

Fig. 22

\\gtb1v-fs01\ I:\Project\National Grid\EC Sampling\1802728\CAD\Figures\ECSWP\1802728_ECSWP_UNION.dwg - 9/4/2018



SOURCES:

1. AERIAL IMAGERY DATE: 03/29/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. *REMEDIAL INVESTIGATION REPORT* FIGURES, PREPARED BY GEI CONSULTANTS, INC., DATE: JANUARY 2015.

0 120 240

SCALE: 1" = 120'

Emerging Contaminant Sampling Work Plan
National Grid New York Former MGP Sites

nationalgrid

GEI Consultants

Project 1802728

GROUNDWATER SAMPLE LOCATIONS - WILLIAMSBURG WORKS MGP SITE

September 2018

Fig. 23

\\gtb1v-fs01\ I:\Project\National Grid\EC Sampling\1802728\CAD\Figures\ECSWP\1802728_ECSWP_WBRG.dwg - 9/4/2018

SOURCES:

1. AERIAL IMAGERY DATE: 03/29/2016, OBTAINED FROM WORLD IMAGERY LAYER ACCESSED VIA ARCGIS ONLINE.
2. *INTERIM SITE MANAGEMENT PLAN, FIG. 4: HISTORICAL SITE CONDITIONS, SAMPLE LOCATION AND CROSS SECTION LOCATION MAP*, PREPARED BY GEI CONSULTANTS, INC., DATE: SEPTEMBER 2017.
3. *POST-REDEVELOPMENT GROUNDWATER SAMPLING REPORT, FIG. 4: JULY 2017 GROUNDWATER CONTOURS (ft) AND ANALYTICAL RESULTS SUMMARY (ug/L)*, PREPARED BY GEI CONSULTANTS, INC., DATE: OCTOBER 2017.

0 60 120

SCALE: 1" = 60'

Emerging Contaminant Sampling Work Plan
National Grid New York Former MGP Sites

nationalgrid

GEI Consultants

Project 1802728

GROUNDWATER SAMPLE LOCATIONS - WYTHE AVE. STATION SITE

September 2018

Fig. 24

\\gtb1v-fs01\ I:\Project\National Grid\EC Sampling\1802728\CAD\Figures\ECSWP\1802728_ECSWP_WYTHE.dwg - 9/4/2018

ATTACHMENT D

Proposed Sampling Locations
Emerging Contaminant Sampling
Upstate New York Sites

Explanation

- Monitoring well
- Wells recommended for sampling for emerging contaminants
- Parcel boundary
- Property boundary

Note:
Groundwater flow direction is based on seasonal canal operating levels. Historical reports indicate that during high canal levels (non-winter), flow is generally to the southeast; during low/drained canal levels (winter), flow shifts to an easterly/northeasterly direction.

Aerial imagery from Google Earth.
Image date is 10/14/2016.

RECOMMENDED SAMPLING FOR
EMERGING CONTAMINANTS
Albion Former MGP Site
Albion, New York

wood.

By: DHN
Date: 07/09/2018
Prj. No. 0078000050.03.1B
Figure 1

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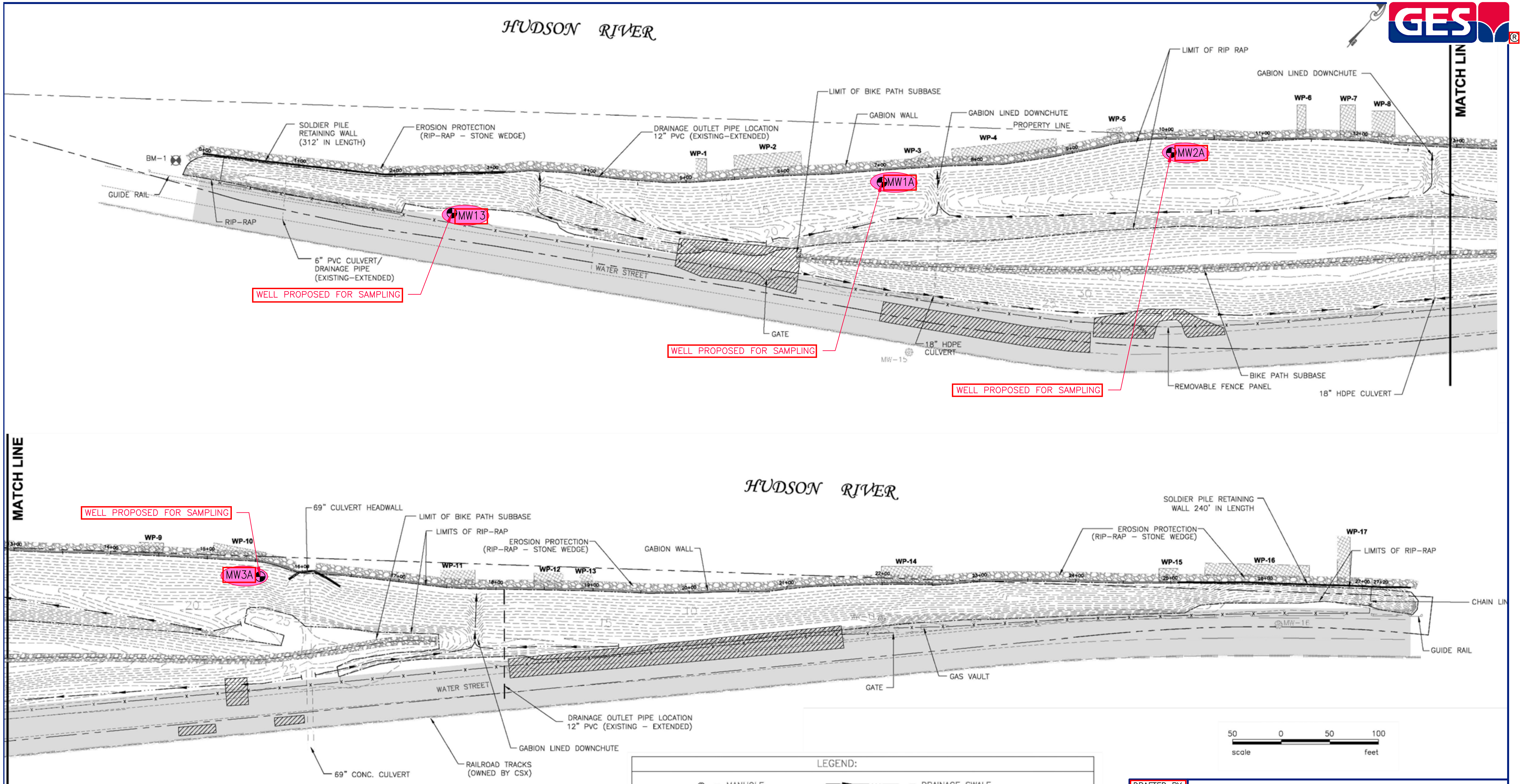


LEGEND:

Ⓢ = MANHOLE
= SANITARY VALVE
Ⓦ = MONITORING WELL
Ⓢ = GAS STANDPIPE
15+00 = SITE STATIONING
= RIP RAP WEDGE
—15— = FINAL GRADE
= UTILITY CORRIDOR
= GABION RETAINING WALL
= SOLDIER PILE RETAINING WALL
= DRAINAGE SWALE
WATER STREET = ROAD
= RAILROAD TRACKS
= GUIDE RAIL
= FENCE
= PROPERTY LINE
= LIMIT OF RIP RAP (FLOOD PROTECTION)
BM-1 = BENCHMARK
▨ = GEOMEMBRANE BARRIER (UTILITY CORRIDOR))
WP-2 = REMOVED TAR WEEP LOCATION AND ID

LEGEND

MONITORING WELL PROPOSED AS PFAS SAMPLE LOCATION
MONITORING WELL

DRAFTED BY:
W.G.S.
CHECKED BY:
REVIEWED BY:

SITE MAP

NATIONAL GRID
S INT RIVER ROAD & WATER STREET
TROY, NEW YORK

Groundwater & Environmental Services, Inc.
5 TECHNOLOGY PLACE, SUITE 4, EAST SYRACUSE, NY 13057

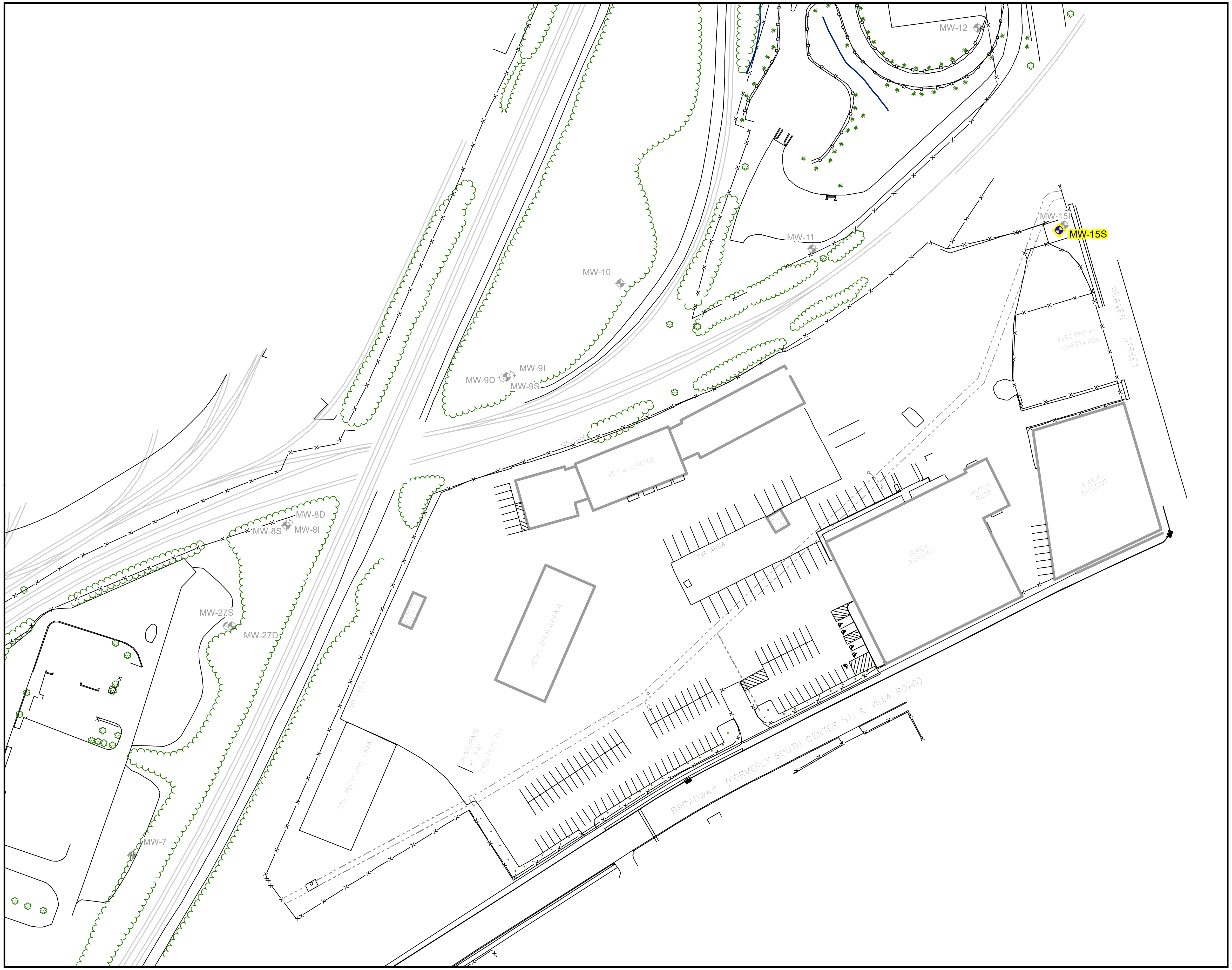
NORTH

SCALE AS SHOWN

DATE
7–11–18

FIGURE

M:\Graphics\0600-Syracuse\Misc\National Grid\Troy (Water street)\Troy SM.dwg 7/11/2018 1:37:42 PM



N

LEGEND

- ◆ PROPOSED PFC AND 1,4-DIOXANE SAMPLE LOCATION
- ◈ MONITORING WELL

NATIONAL GRID
SCHENECTADY
(BROADWAY) FORMER MGP SITE
SCHENECTADY, NEW YORK

PROPOSED
PFC AND 1,4-DIOXANE
SAMPLING LOCATIONS

0 55 110 220
Feet

1118.42895
JULY 2018

O'BRIEN & GERE ENGINEERS, INC.

I:\National-Grid.1118\42895.Schenectady-Bro\Docs\dwg\MXD\PFC_1_4_DIOXANE_SAMPLE_LOCS.mxd

7/11/2018 10:27:59 AM

7/10/2018 8:53:44 AM

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FIGURE 1

N

LEGEND

◆ PROPOSED PFC AND 1,4-DIOXANE SAMPLE LOCATION

◆ MONITORING WELL

▭ PROPERTY LINES

NATIONAL GRID
SOUTH FIRST STREET MGP SITE
FULTON, NEW YORK

PROPOSED
PFC AND 1,4-DIOXANE
SAMPLING LOCATIONS

0 25 50 100
Feet

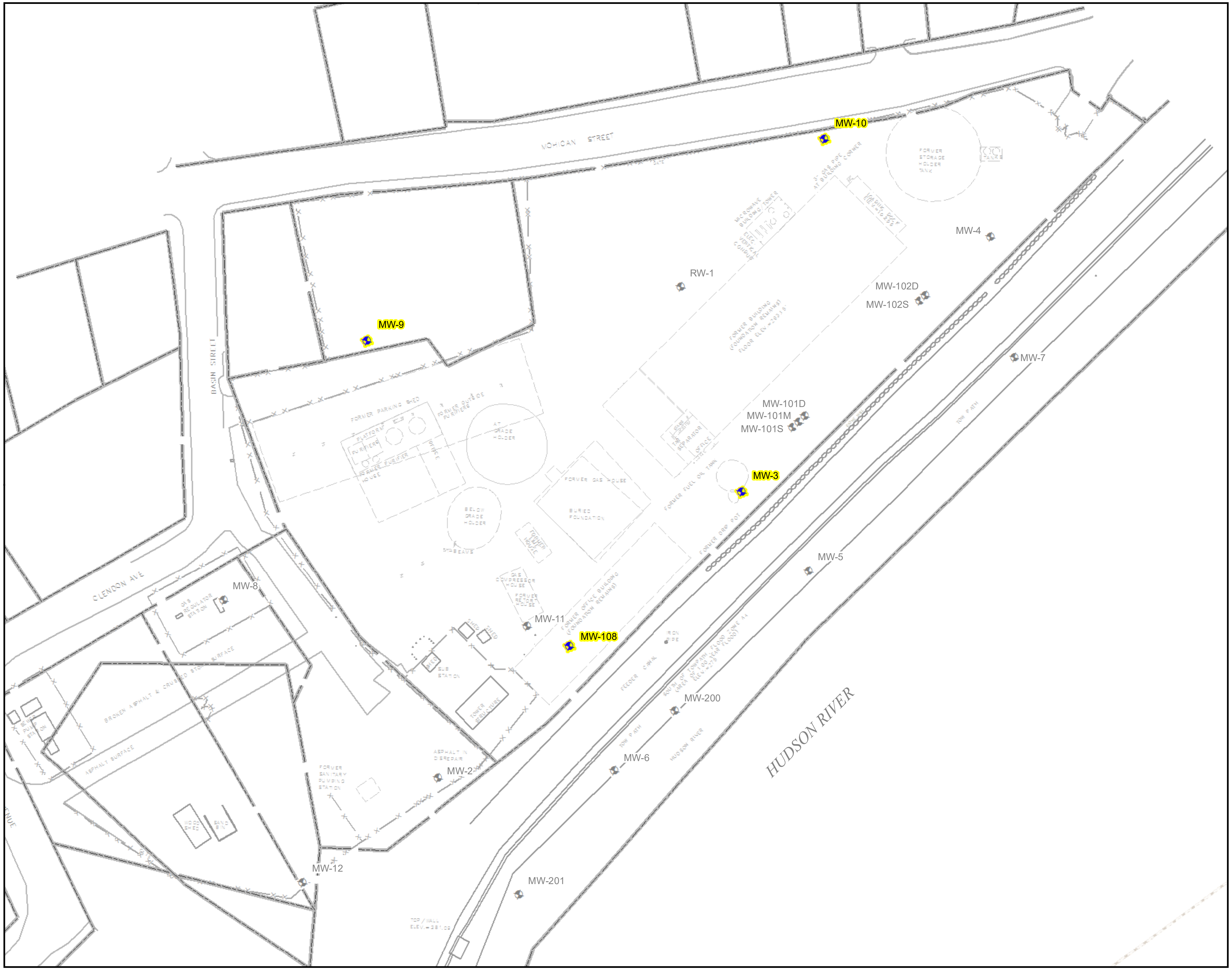
1118.44581
JULY 2018

O'BRIEN & GERE ENGINEERS, INC.

7/11/2018 3:13:34 PM

I:\National-Grid.1118\52076.Glens-Falls-Moh\Docs\DWG\MXD\PFC_1_4_DIOXANE_SAMPLE_LOCATIONS.mxd

FIGURE 1



N

LEGEND

◆ PROPOSED PFC AND 1,4-DIOXANE SAMPLE LOCATION

⊕ MONITORING WELL

— PROPERTY LINE

NATIONAL GRID
FORMER GLENS FALLS
(MOHICAN ST.) MGP SITE
GLENS FALLS, NEW YORK

PROPOSED
PFC AND 1,4-DIOXANE
SAMPLING LOCATIONS

0 40 80 160
Feet

1118.44581
JULY 2018

O'BRIEN & GERE ENGINEERS, INC.

CITY: SYRACUSE, NY GROUP: ENVCAD DB: P. LISTER, E. KRAHMER, R. ALLEN PM/TM: J. BRIEN TR: S. POWLIN LYR: ON=*;OFF=REF, (FRZ)
C:\Users\EKrahmer\OneDrive - ARCADIS\BIM 360 Docs\NATIONAL GRID\Gloversville (Hill St) Former MGP Site\2018\B0036652.0008\01-DWG\36652_Fig1_Prop MW Sampling Loc.dwg LAYOUT: 1 SAVED: 7/12/2018 3:32 PM ACADVER: 21.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB
PLOTTED: 7/13/2018 8:24 AM BY: KRAHMER, ERIC

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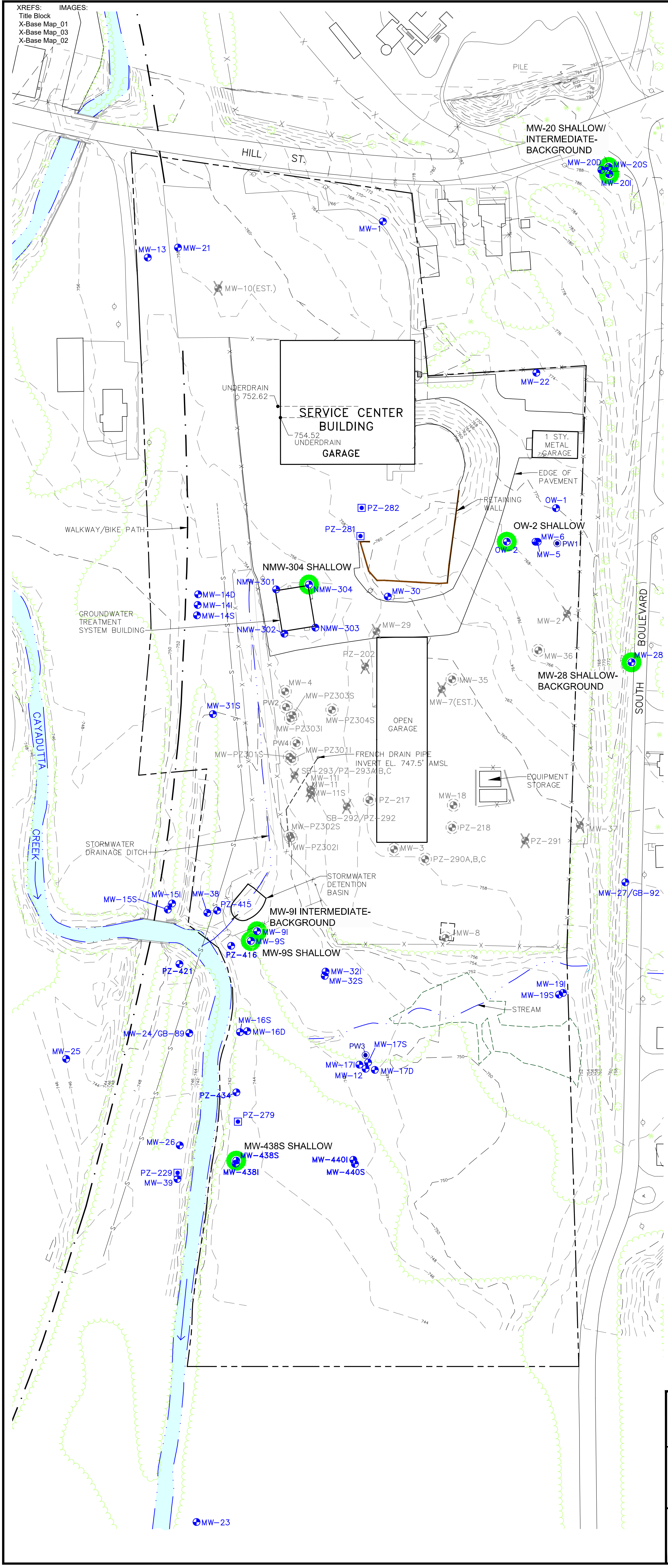
X-Base Map_03
X-Base Map_02



LEGEND:

MW-19I ●	MONITORING WELL
PZ-291 ▣	PIEZOMETER
PW-1 ◉	PUMPING WELL
MW-2 ✕	MONITORING WELL OR PIEZOMETER DESTROYED OR OTHERWISE INACCESSIBLE
MW-4 ◎	ABANDONED MONITORING WELL/PIEZOMETER/PUMPING WELL
— 746 —	TOPOGRAPHIC ELEVATION CONTOUR
— — —	PROPERTY LINE
— · · · —	WATER
⌒⌒⌒	TREE LINE
—×—×—	FENCE
—S—	SANITARTY SEWER
⌀	UTILITY POLE
🟢	PROPOSED MONITORING WELL TO BE SAMPLED

NOTES:

1. ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.
2. THE NATIONAL GRID PROPERTY LINE SHOWN IS APPROXIMATE.
3. ALL LOCATIONS ARE APPROXIMATE.
4. BASEMAP PREPARED FROM ELECTRONIC SURVEY FILE PROVIDED BY NIAGARA MOHAWK ON 7/23/01. PRIMARY SURVEY CONTROL FOR PHOTOGRAMMETIC MAPPING WAS ESTABLISHED FROM AN ON THE GROUND SURVEY, PERFORMED ON JULY 28, 1994 USING THE GLOBAL POSITIONING SYSTEM (GPS) AND CONFORMS TO ORDER 2 CLASS 2 FGCS ACCURACY SPECIFICATIONS. THE HORIZONTAL REFERENCE DATUM NORTH AMERICAN DATUM OF 1983 (NAD 83) ON REFERENCE ELLIPSOID ASSOCIATED WITH THE GEODETIC REFERENCE SYSTEM OF 1980 (GRS 80). THE COORDINATES ARE BASED ON THE NEW YORK STATE PLANE GEODETIC SYSTEM OF 1983 (EASTERN ZONE 3101).
5. EXISTING SITE FEATURES BASED ON "ASBUILT SURVEY" PROVIDED BY STANTEC ON 7/18/08.
6. FORMER LOCATIONS OF SITE FEATURES WERE DIGITIZED FROM PHOTOCOPIES OF FIGURES 2-4 & 2-5 FROM THE JUNE 1993 "GLOVERSVILLE MGP SITE IRM REPORT" BY ATLANTIC ENVIRONMENTAL SERVICES, INC., WHICH WERE BASED ON SANBORN INSURANCE MAPS, AND ARE APPROXIMATE ONLY.

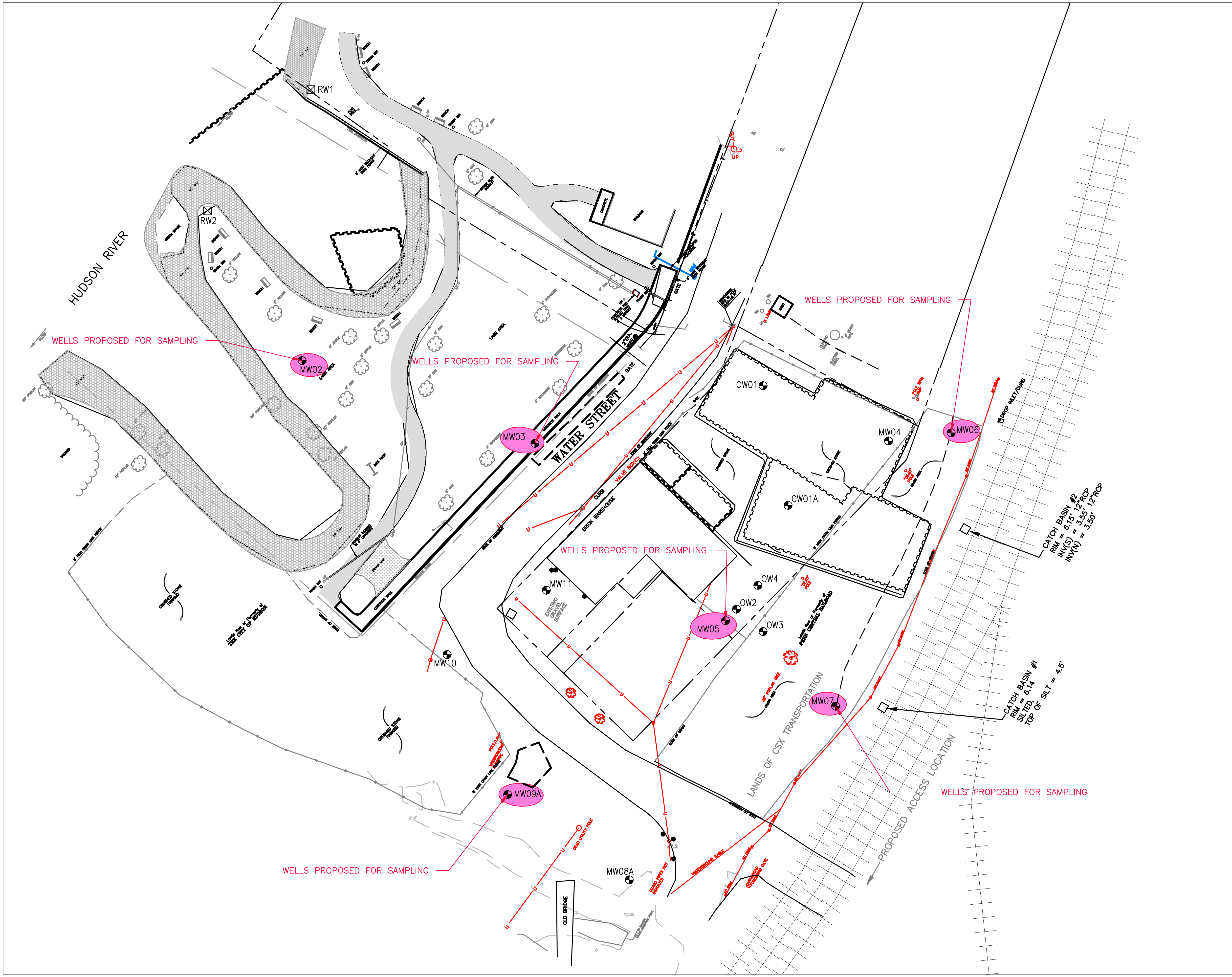
0 60' 120'
GRAPHIC SCALE

NATIONAL GRID
GLOVERSVILLE (HILL STREET) FORMER MGP SITE
GLOVERSVILLE, NEW YORK

PROPOSED MONITORING WELL SAMPLING LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
1



LEGEND

— — —	PROPERTY BOUNDARY
⊕	MONITORING WELL
☒	RECOVERY WELL
⬭	WELLS PROPOSED FOR PFAS SAMPLING

Site Map

National Grid
Water Street
Hudson, New York

Drawn
W.G.S.
Designed

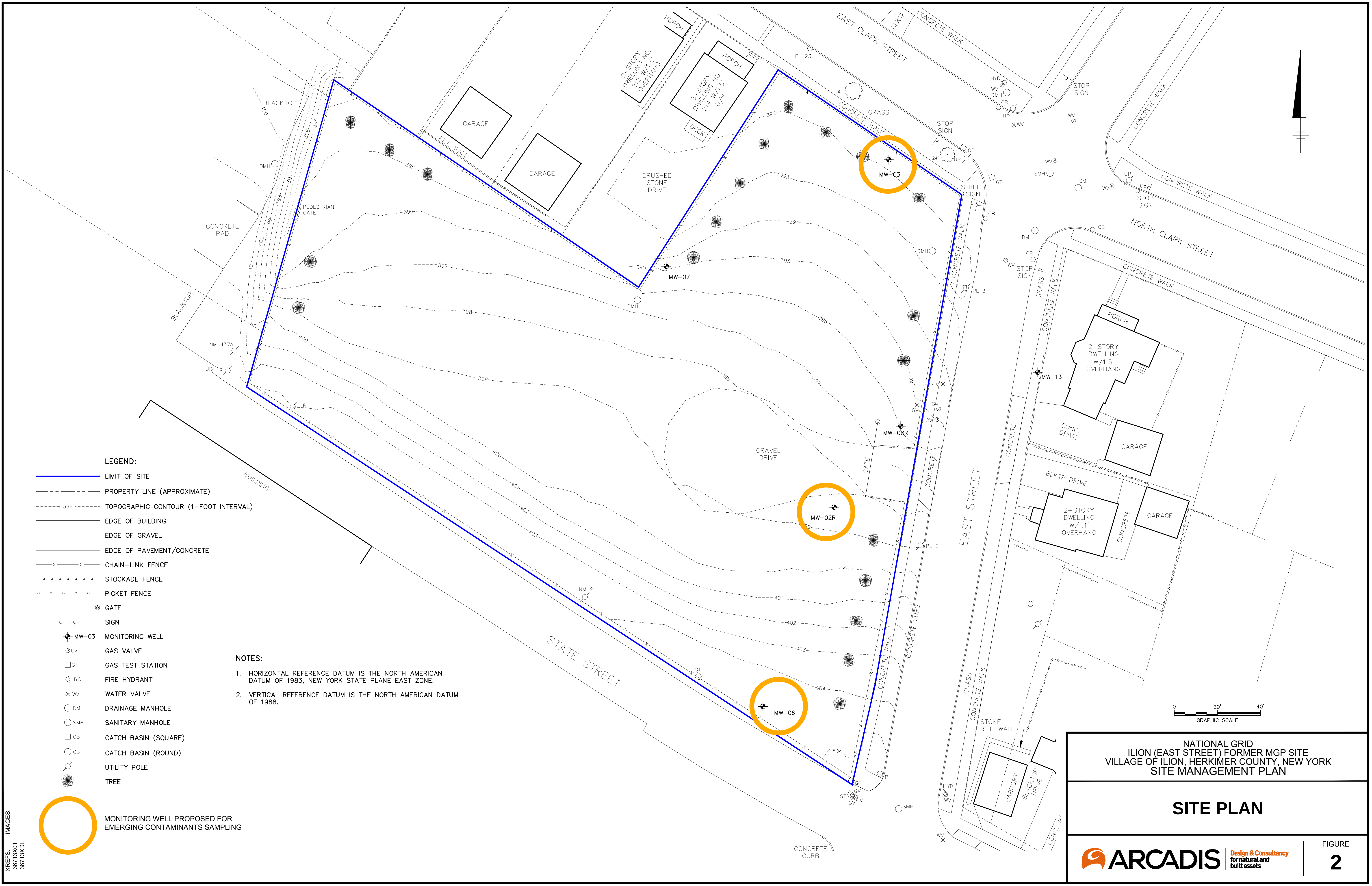
Approved

Date
7/6/18
Figure

Scale In Feet
0 60

GES
Groundwater & Environmental Services, Inc.

M:\Graphics\0600-Syracuse\Misc\National Grid\Hudson\Hudson SM.dwg, 7/11/2018 1:08:18 PM



LEGEND:

	LIMIT OF SITE
	PROPERTY LINE (APPROXIMATE)
396	TOPOGRAPHIC CONTOUR (1-FOOT INTERVAL)
	EDGE OF BUILDING
	EDGE OF GRAVEL
	EDGE OF PAVEMENT/CONCRETE
x x	CHAIN-LINK FENCE
	STOCKADE FENCE
	PICKET FENCE
	GATE
	SIGN
MW-03	MONITORING WELL
GV	GAS VALVE
GT	GAS TEST STATION
HYD	FIRE HYDRANT
WV	WATER VALVE
DMH	DRAINAGE MANHOLE
SMH	SANITARY MANHOLE
CB	CATCH BASIN (SQUARE)
CB	CATCH BASIN (ROUND)
	UTILITY POLE
	TREE
○	MONITORING WELL PROPOSED FOR EMERGING CONTAMINANTS SAMPLING

NOTES:

1. HORIZONTAL REFERENCE DATUM IS THE NORTH AMERICAN DATUM OF 1983, NEW YORK STATE PLANE EAST ZONE.
2. VERTICAL REFERENCE DATUM IS THE NORTH AMERICAN DATUM OF 1988.

NATIONAL GRID
ILION (EAST STREET) FORMER MGP SITE
VILLAGE OF ILION, HERKIMER COUNTY, NEW YORK
SITE MANAGEMENT PLAN

SITE PLAN

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2

CITY: SYRACUSE, NY DIV/GROUP: IMDV DB: K.DAVIS LD: B.DECLERQ PIC: T.YOUNG PM: M.BENOIT TM: A.GEORGE LYR: ON=*;OFF=*REF*
C:\Users\kdavis\OneDrive - ARCADIS\BIM 360 Docs\NATIONAL GRID\ILION FORMER MGP SITE\2017\B0036713.0000\01-DWG\SMP\36713F02.dwg LAYOUT: 2 SAVED: 1/17/2018 9:36 AM ACADVER: 20.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 1/17/2018 9:37 AM BY: DAVIS, KATHI

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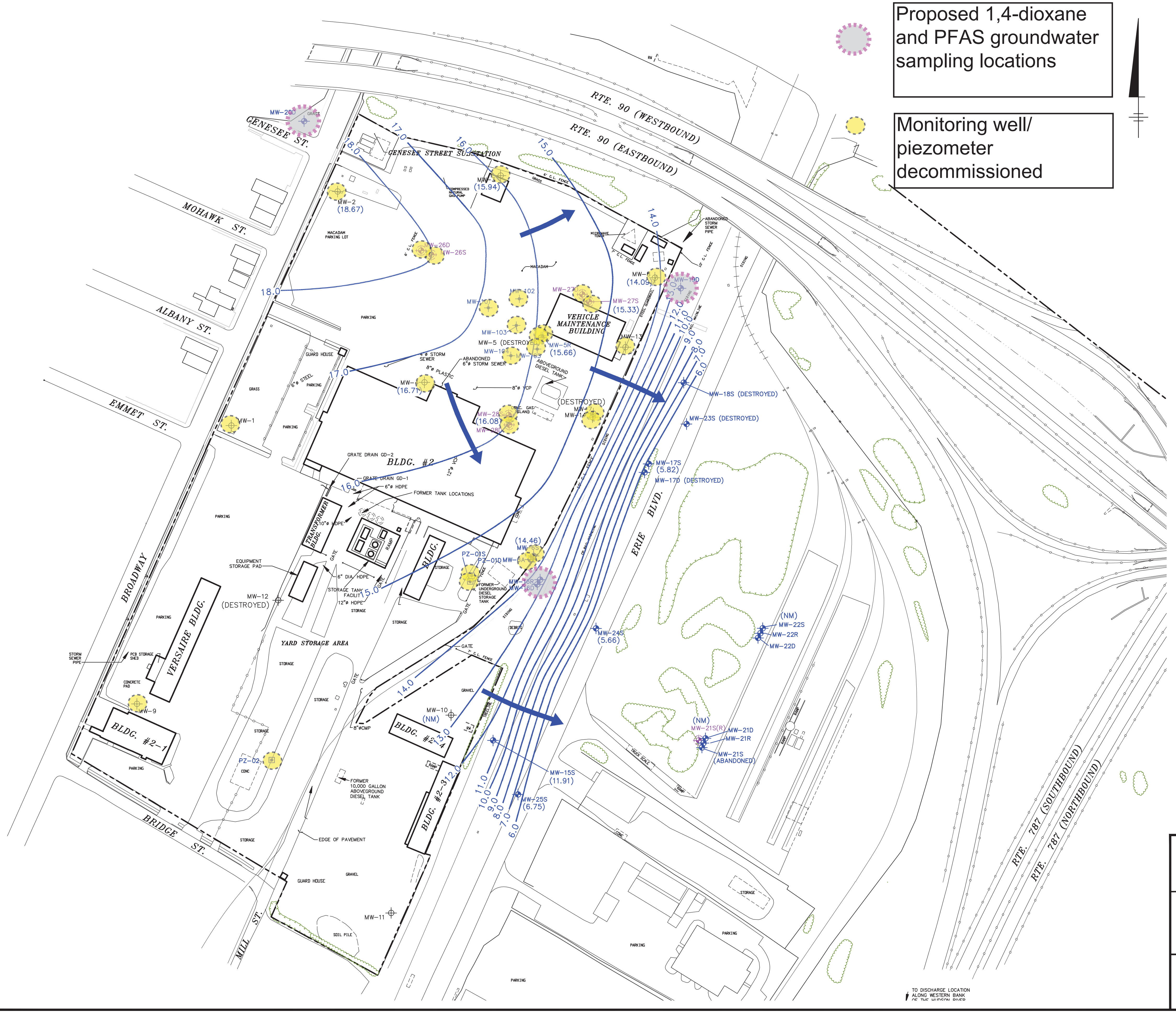
36713XDL



LEGEND:

—×—×—	FENCE
┼┼┼┼┼┼	EXISTING RAILROAD
— — —	APPROXIMATE PROPERTY LINE
MW-105	PILOT-TEST MONITORING WELL LOCATION
MW-28S	ADDITIONAL GROUNDWATER INVESTIGATION GROUNDWATER MONITORING WELL LOCATION
MW-15S	MGP/RCRA GROUNDWATER MONITORING WELL LOCATION
PZ-01S	MGP/RCRA PIEZOMETER
MW-11	PSA/IRM GROUNDWATER MONITORING WELL LOCATION
MW-18S	DESTROYED GROUNDWATER MONITORING WELL
☼	UTILITY POLE
(NM)	NOT MEASURED
(4.6)	GROUNDWATER ELEVATION (FT., AMSL)
[10.6]	GROUNDWATER ELEVATION (FT., AMSL; SEE NOTE 5)
6.0 ———	GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)(FT., AMSL)
⬅	GENERALIZED GROUNDWATER FLOW DIRECTION

NOTES:

1. BASE MAP (INCLUDING BUILDING LOCATIONS AND PSA/IRM SAMPLING LOCATIONS) DEVELOPED FROM ELECTRONIC FILE OF NATIONAL GRID DRAWING NO. C-29736-C, DATED JULY 1994, ENTITLED NORTH ALBANY SERVICE CENTER HAZARDOUS WASTE MANAGEMENT PERMIT APPLICATION, TOPOGRAPHIC MAP – INDEX SHEET.
2. LOCATIONS OF UNDERGROUND UTILITIES (INCLUDING ON-SITE STORM SEWERS, SANITARY SEWERS, TELEPHONE LINES, ELECTRICAL LINES, GAS LINES, WATER LINES, AND CABLE) WERE DIGITIZED FROM NMPC DRAWING NO. D-29734-E, FILE INDEX NO. 20.3-A1.1-B2, DATED JUNE 27, 1994, ENTITLED NORTH ALBANY SERVICE CENTER SITE PLAN – PAVING (OUTSIDE FENCE). LOCATION OF UNDERGROUND TELEPHONE LINES, ELECTRICAL LINES, GAS LINES, AND CABLE LINES WERE UPDATED BASED ON ELECTROMAGNETIC UTILITY SURVEY CONDUCTED BY UNDERGROUND SERVICES, INC. DURING OCTOBER 2012. ACTUAL LOCATIONS OF UNDERGROUND UTILITIES MUST BE DETERMINED/CONFIRMED PRIOR TO IMPLEMENTING SUBSURFACE WORK ACTIVITIES.
3. LOCATIONS OF MANHOLES AND CATCH BASINS WERE OBTAINED FROM SURVEYS CONDUCTED BY NMPC DURING JULY/AUGUST 1997 AND NATIONAL GRID DURING OCTOBER 2012.
4. LOCATIONS OF OFF-SITE STORM AND SANITARY SEWERS WERE DIGITIZED FROM CITY OF ALBANY DRAWINGS AND ARE APPROXIMATE.
5. GROUNDWATER ELEVATION DATA OBTAINED FROM MONITORING WELLS MW-1, MW-7, MW-11, MW-12, MW-14, MW-21SR AND PZ-02 WERE NOT INCLUDED WHEN CREATING THIS CONTOUR MAP.
6. MGP = MANUFACTURED GAS PLANT.
7. RCRA = RESOURCE CONSERVATION RECOVERY ACT.
8. PSA/IRM = PRELIMINARY SITE ASSESSMENT/INTERIM REMEDIAL MEASURE.
9. AMSL = ABOVE MEAN SEA LEVEL.

NATIONAL GRID
NORTH ALBANY FORMER MGP SITE
ALBANY, NEW YORK
REMEDIAL DESIGN WORK PLAN

WATER TABLE ELEVATION MAP (DECEMBER 2011)

ARCADIS Design & Consultancy for natural and built assets

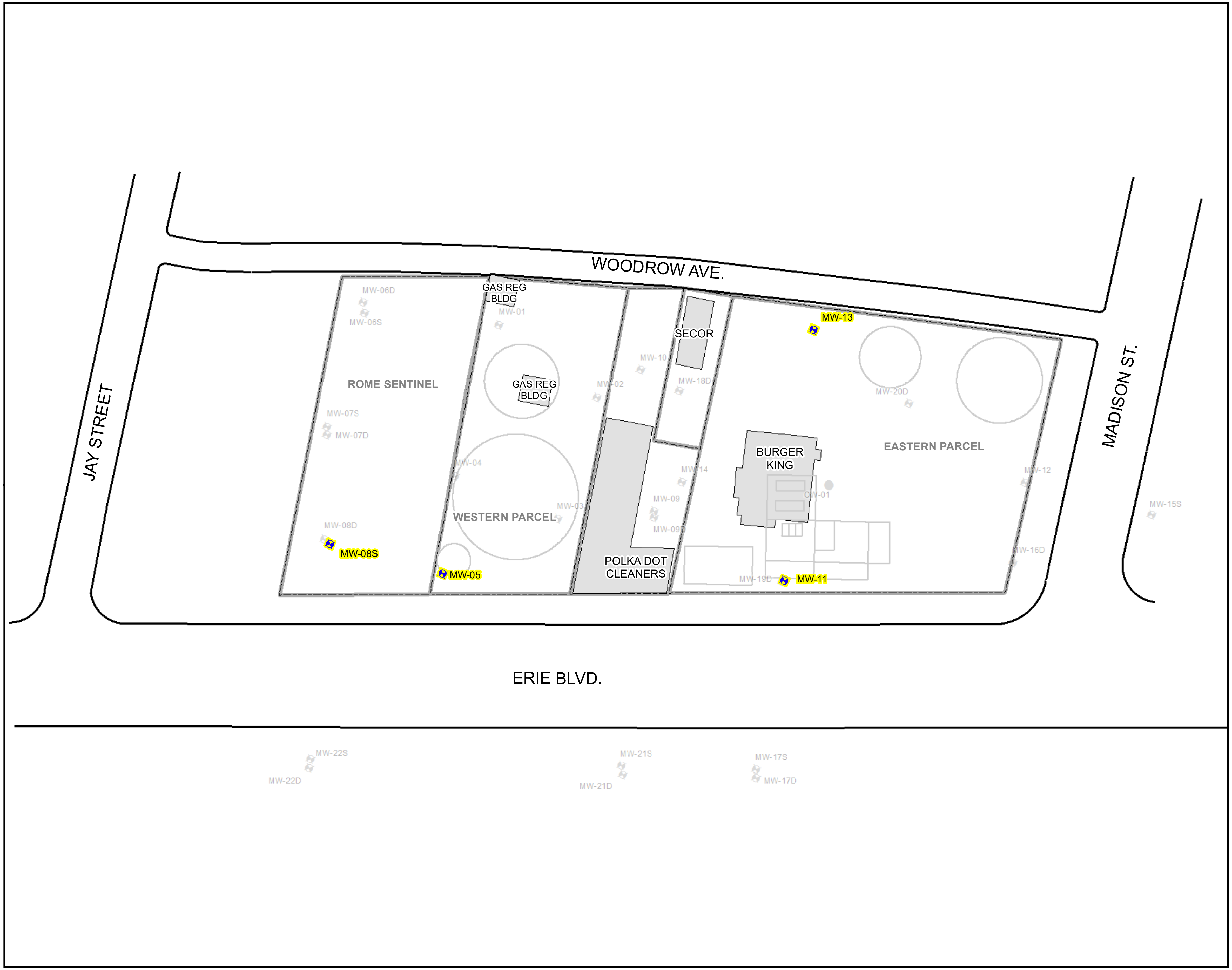
FIGURE
4

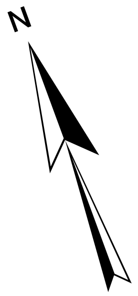
CITY: SYRACUSE NY DIV/GROUP: ENV/IM-DV DB: E.KRAHMER, R. BASSETT, R. ALLEN PM:(Reqd) TR: M.HYSELL LYR: ON=*;OFF=REF
G:\ENVCAD\SYRACUSE\ACT\B0036648\1401\00001\DWG\RD-WP\36648W03.DWG LAYOUT: 4 SAVED: 8/31/2016 1:28 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 8/31/2016 1:29 PM BY: ALLEN, ROYCE
XREFS: IMAGES: PROJECTNAME: ----
36648X01
36648XDL

7/10/2018 8:49:49 AM

I:\National-Grid.1118\36670.Rome-Remedial-I\dwg\MXD\PFC_1_4_DIOXANE_SAMPLE_LOCS.mxd

FIGURE 1





LEGEND

- ◆ PROPOSED PFC AND 1,4-DIOXANE SAMPLE LOCATION
- ◈ MONITORING WELL
- ● OBSERVATION WELL
- ▭ PROPERTY LINE

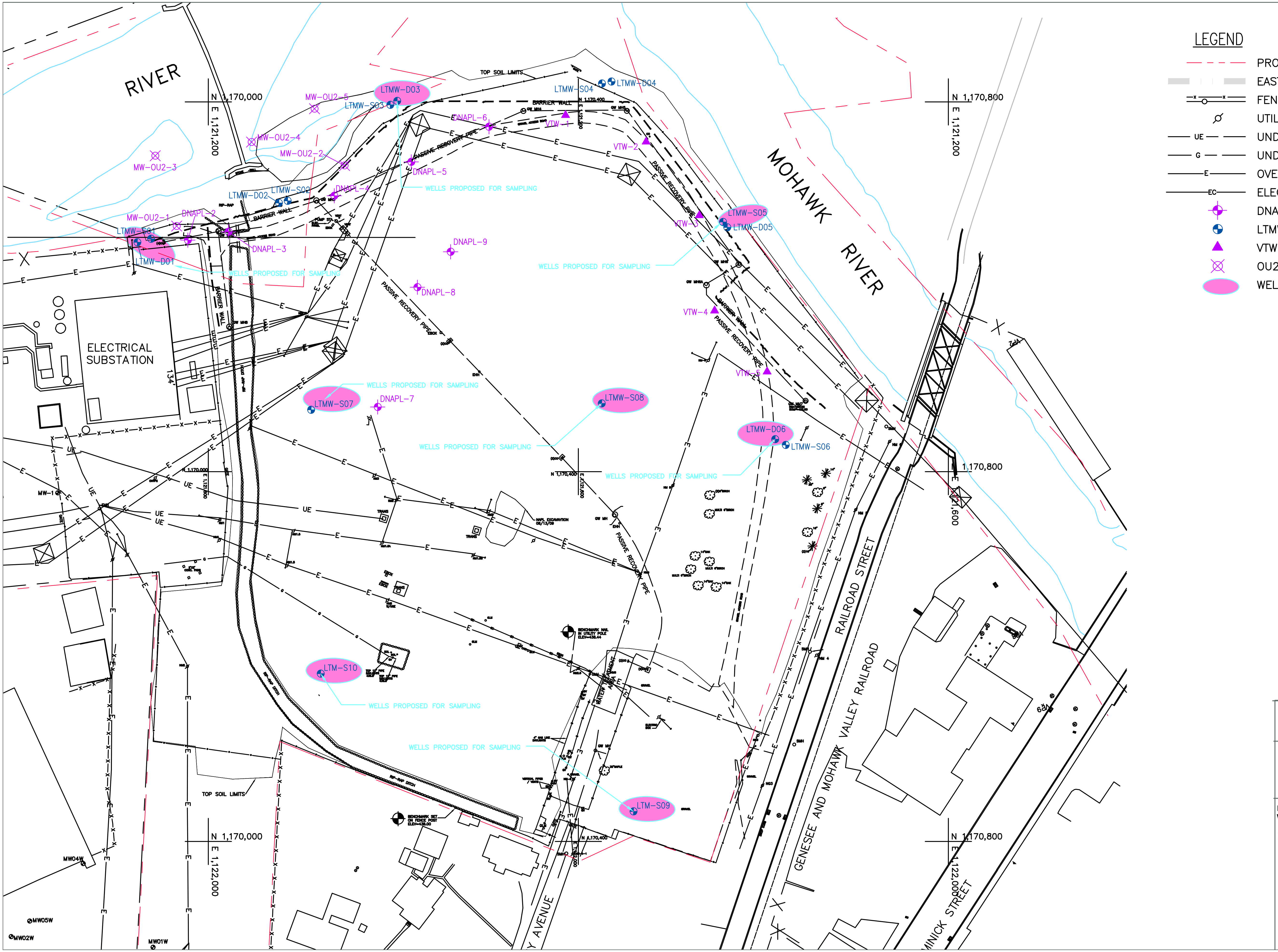
NATIONAL GRID
ROME
(JAY & MADISON STREET) MGP SITE
ROME, NEW YORK

PROPOSED PFC AND 1,4-DIOXANE SAMPLING LOCATIONS

0 35 70 140
Feet

1118.36670
JULY 2018

O'BRIEN & GERE ENGINEERS, INC.



LEGEND

— - —	PROPERTY BOUNDARY
▬	EAST WEST DIVIDE
—x—○—x—	FENCE
⌀	UTILITY POLE
— UE —	UNDERGROUND ELECTRIC LINE
— G —	UNDERGROUND GAS LINE
— E —	OVERHEAD ELECTRIC
— EC —	ELECTRICAL CONDUIT
⌖	DNAPL MONITORING WELL
◐	LTMW MONITORING WELL
▲	VTW MONITORING WELL
⊗	OU2 MONITORING WELL
⬬	WELLS PROPOSED FOR PFAS SAMPLING

Site Map

National Grid
Kingsley Avenue
Rome, New YorK

Drawn
W.G.S.
Designed

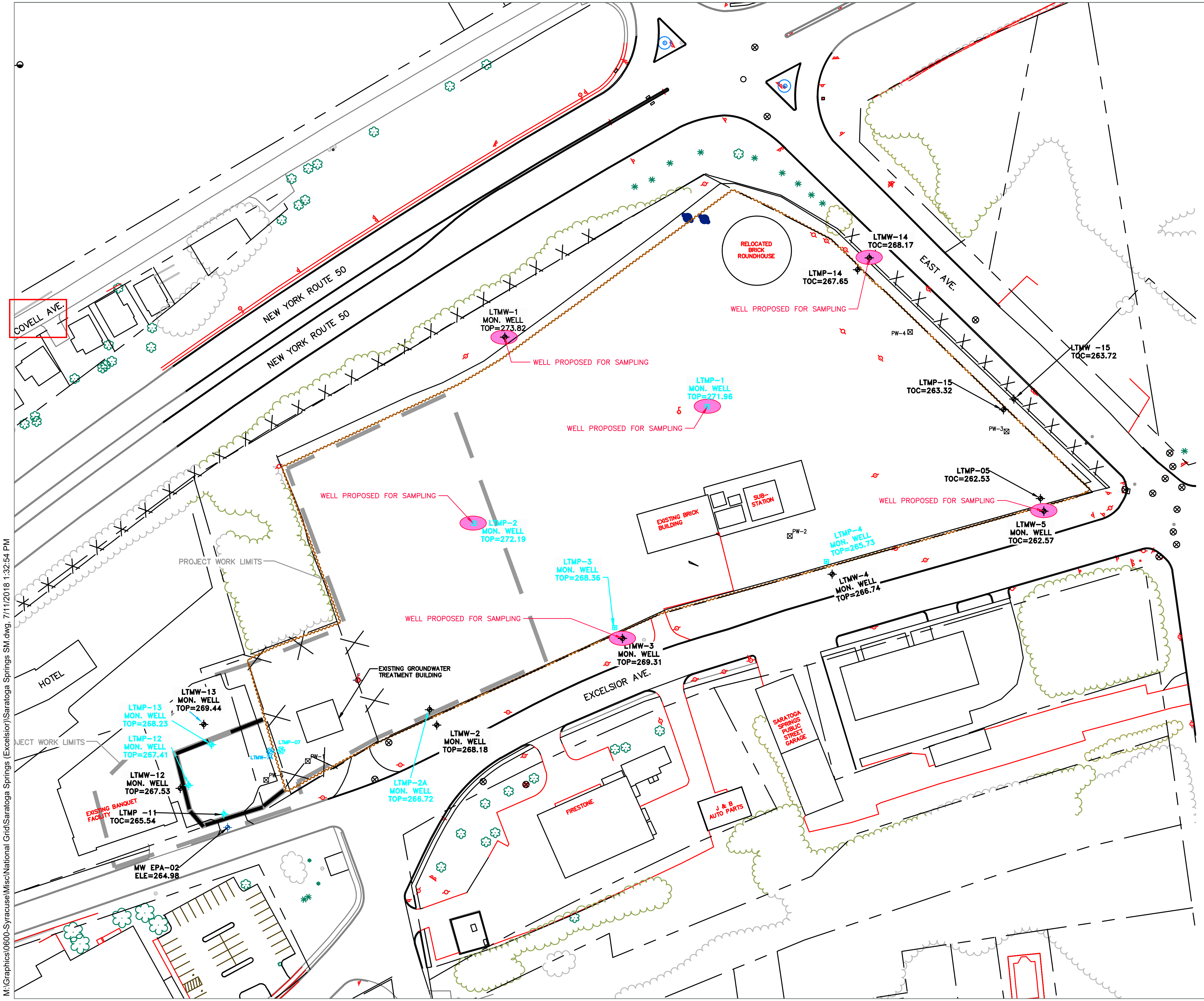
Approved

Date
8/23/13
Figure

Scale In Feet
0 100

Groundwater & Environmental Services, Inc.

M:\Graphics\0600-Syracuse\Misc\National Grid\Rome\Rome SM.dwg



LEGEND

- — — — PROPERTY BOUNDARY
- —— X —— FENCE
- ∿∿∿ STEEL SHEETING
- ▬ HEAVY DUTY WATER TIGHT STEEL SHEETING
- ● WELLS PROPOSED FOR PFAS SAMPLING

Site Map

National Grid
43 Excelsior Avenue
Saratoga Springs, New York

Drawn
W.G.S.
Designed

Approved

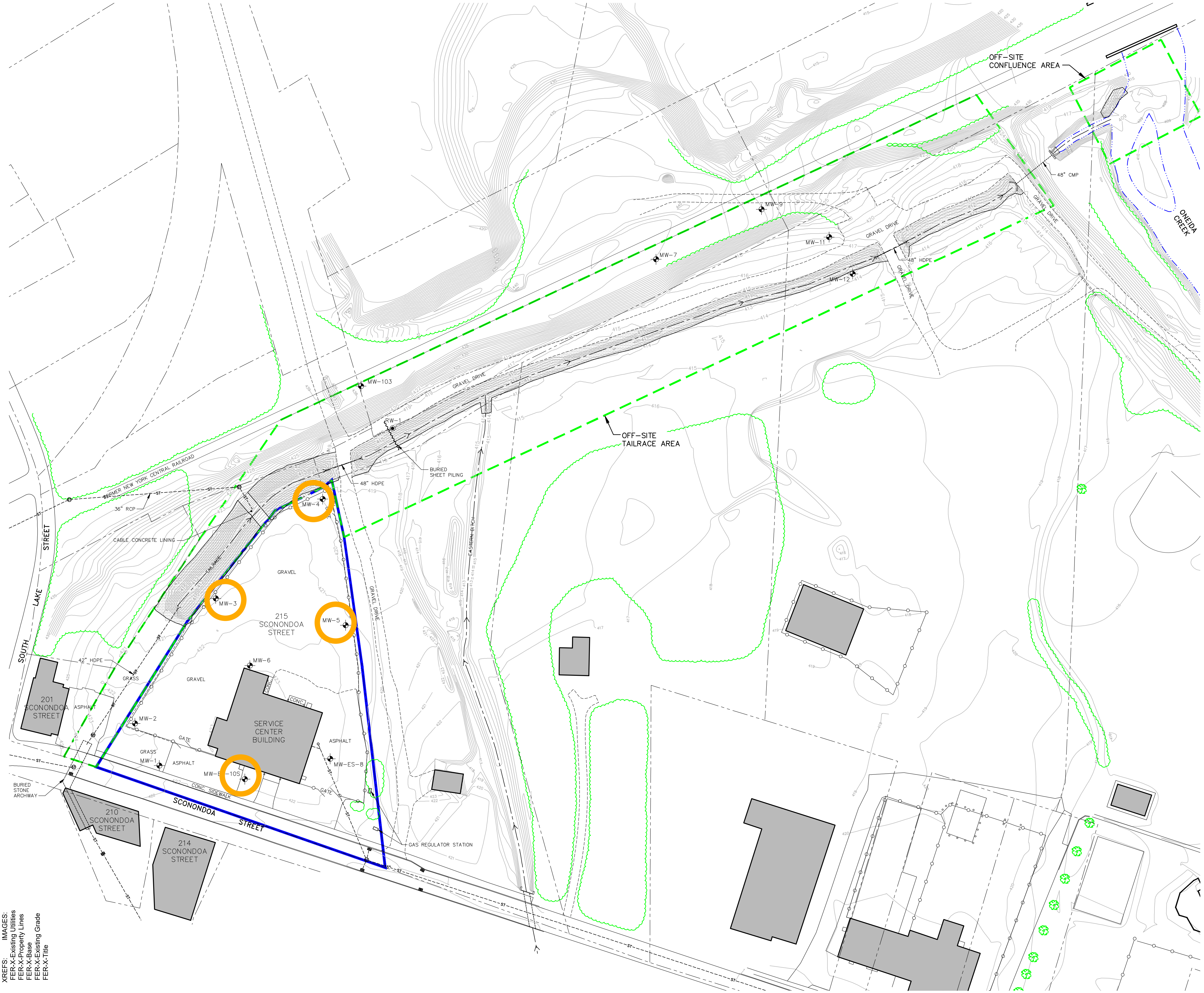
Date
7/11/18
Figure

N

Scale In Feet
0 100

GES
Groundwater & Environmental Services, Inc.

M:\Graphics\0600-Syracuse\Misc\National Grid\Saratoga Springs (Excelsior)\Saratoga Springs SM.dwg, 7/11/2018 1:32:54 PM



LEGEND:

	LIMIT OF SITE
	LIMIT OF OFF-SITE AREA (APPROXIMATE)
	PROPERTY LINE (APPROXIMATE)
415	TOPOGRAPHIC CONTOUR (1-FOOT INTERVAL)
	EDGE OF WATER (APPROXIMATE)
	EDGE OF GRAVEL
	EDGE OF PAVEMENT
	TREE LINE (APPROXIMATE)
▨	BUILDING
	CHAIN-LINK FENCE
	PZC-18 SHEET PILING
	DRAINAGE DITCH/CHANNEL AND FLOW DIRECTION
▨	RIPRAP
ST	STORM SEWER
⊛	STORM SEWER MANHOLE
■	CATCH BASIN
	CULVERT
MW-ES-8	MONITORING WELL
RW-1 ◉	RECOVERY/MONITORING WELL
○	MONITORING WELL PROPOSED FOR EMERGING CONTAMINANTS SAMPLING

NOTES:

1. VERTICAL REFERENCE DATUM IS THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29).

0 60' 120'
GRAPHIC SCALE

NATIONAL GRID
ONEIDA (SCONONDOA STREET) FORMER MGP SITE
CITY OF ONEIDA, MADISON COUNTY, NEW YORK
FINAL ENGINEERING REPORT

PLAN OF SITE AND OFF-SITE AREA

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2

CITY: SYRACUSE-NY DIV/GROUP: 141/ENV DB: B.GETTS LD: B.GETTS PIC: T.YOUNG PM: M.BENOIT TM: D.NODINE LYR:ON=*;OFF=*REF*
C:\Users\bdeclercq\OneDrive - ARCADIS\BIM 360 Docs\NATIONAL GRID\SCONONDOA STREET FORMER MGP SITE\2018\B0036653.0002\01-DWG\FER-Fig. 2-Site and Off-Site Area.dwg LAYOUT: 2 SAVED: 4/9/2018 1:52 PM ACADVER: 21.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB
PLOTTED: 4/9/2018 1:53 PM BY: DECLERCQ, BRIAN

XREFS: IMAGES:
FER-X-Existing Utilities
FER-X-Property Lines
FER-X-Base
FER-X-Existing Grade
FER-X-Title

CITY: SYRACUSE NY DIV/GROUP: ENVCAD DB: R. ALLEN, A. SCHILLING, E. KRAHMER LD:(Opt) PIC: T. W. YOUNG PM: J. BRUSSEL TM: M. HYSELL TR: J. SINAY LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0036694\0000\00010\DWG\36694W01.dwg LAYOUT: 6 SAVED: 4/28/2017 12:01 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 5/5/2017 10:58 AM BY: KRAHMER, ERIC
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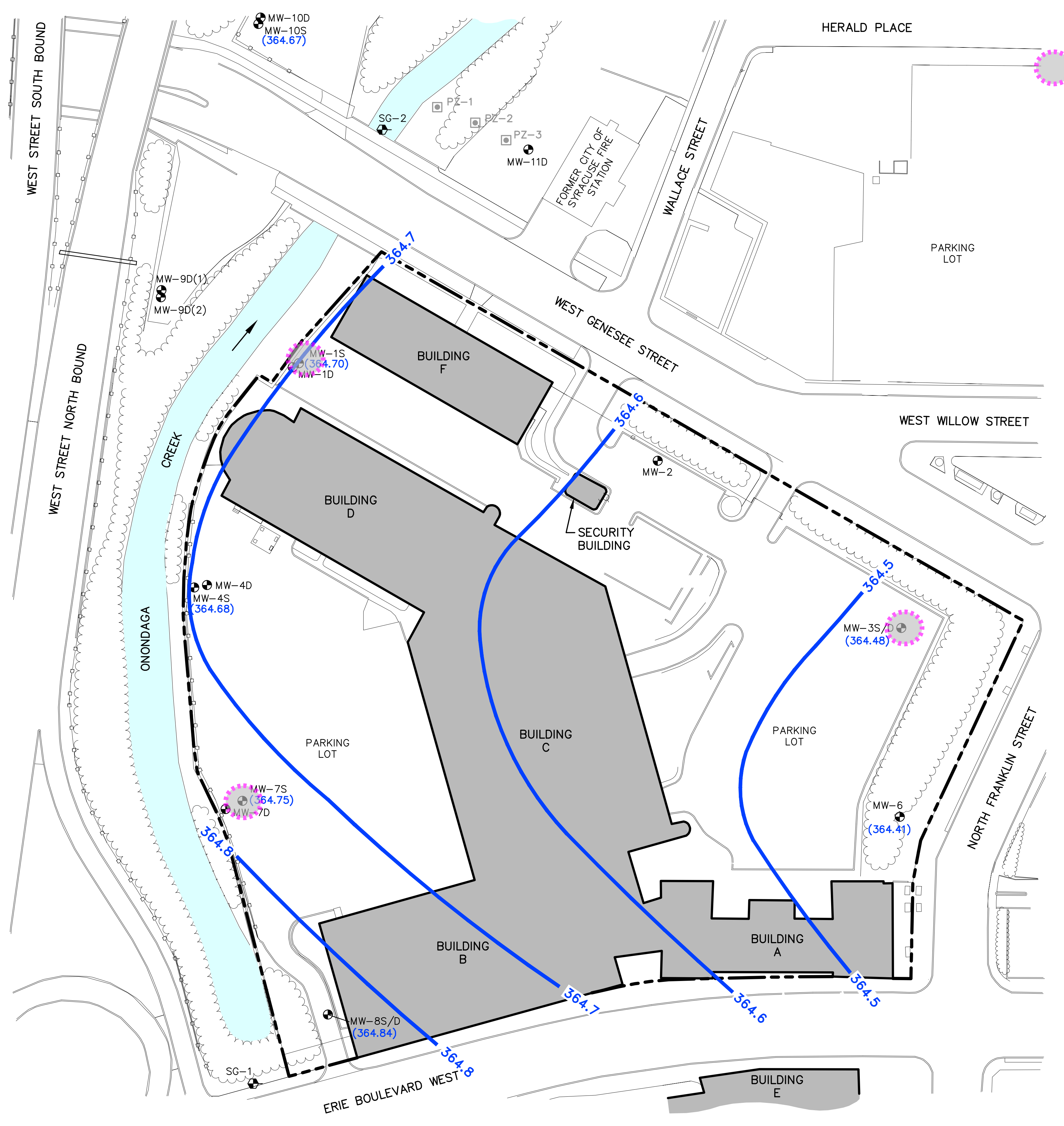
36694XLB
36694X01



Proposed 1,4-dioxane and PFAS groundwater sampling locations

LEGEND:

MW–1S/D ◐	EXISTING MONITORING WELL LOCATION
PZ–2 ▣	FORMER PIEZOMETER LOCATION (DECOMMISSIONED)
SG–2 ◐	EXISTING STAFF GAUGE LOCATION
— — —	SITE BOUNDARY (APPROXIMATE)
⌒⌒⌒	TREES/VEGETATION
▫–▫–▫	GUARD RAIL
364.5 ——	GROUNDWATER CONTOUR
(364.48)	GROUNDWATER ELEVATION

NOTES:

1. BASE MAP DEVELOPED FROM PHOTOGRAMMETRIC SURVEY PERFORMED BY LOCKWOOD MAPPING IN SPRING 1995.
2. MONITORING WELL, PIEZOMETER, AND STAFF GAUGE LOCATIONS ARE BASED ON SURVEY PERFORMED BY NATIONAL GRID.
3. ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.

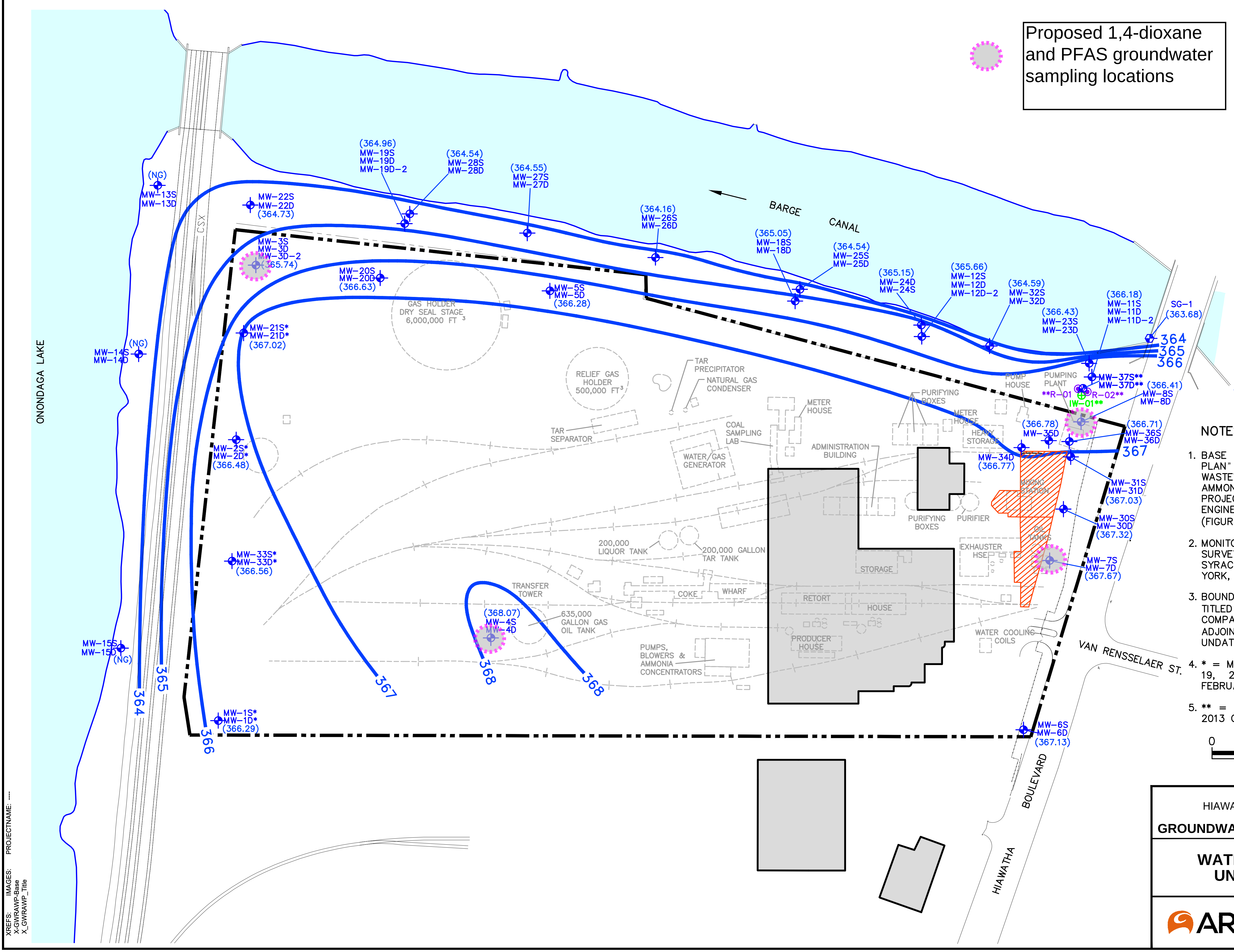
0 100' 200'
GRAPHIC SCALE

NATIONAL GRID
ERIE BOULEVARD FORMER MGP SITE
SYRACUSE, NEW YORK
SITE MANAGEMENT PLAN

WATER TABLE MAP FOR SHALLOW GROUNDWATER - APRIL 7 & 8, 2008

ARCADIS Design & Consultancy for natural and built assets

FIGURE
6



LEGEND:

- ▨ LIMITS OF IN-SITU SOIL SOLIDIFICATION REMEDIAL ACTION
- MW-1D ⊕ MONITORING WELL
- IW-01 ⊕ INJECTION WELL
- R-01 ◉ DOSE RESPONSE WELL
- SG-1 ⊕ STAFF GAUGE
- — · · — BOUNDARY OF FORMER MANUFACTURED GAS PLANT (MGP) SITE
- ☐ FORMER MGP STRUCTURES
- ▭ EXISTING BUILDINGS
- (364.54) GROUNDWATER ELEVATION
- 367 —— INFERRED ELEVATION CONTOUR
- (NG) NOT GAUGED

NOTES:

1. BASE MAP DEVELOPED FROM FIGURE TITLED "SITE PLAN" FOR THE METROPOLITAN SYRACUSE WASTEWATER TREATMENT PLANT STAGE III AMMONIA AND STAGE II PHOSPHOROUS REMOVAL PROJECT, PREPARED BY ENVIRONMENTAL ENGINEERING ASSOCIATES, LLP, DATED APRIL 2001 (FIGURE NO. G-008).
2. MONITORING WELL LOCATIONS ARE BASED ON SURVEY PERFORMED BY BRYANT ASSOCIATES OF SYRACUSE, NEW YORK AND ARCADIS OF NEW YORK, INC.
3. BOUNDARY OF FORMER MGP SITE FROM FIGURE TITLED "PROPERTY PLAN, THE SYRACUSE LIGHTING COMPANY, INC., HIAWATHA STREET PROPERTY & ADJOINING LANDS," AT A SCALE OF 1"=50" UNDATED.
4. * = MONITORING WELLS DECOMMISSIONED ON JUNE 19, 2015 AND JUNE 22, 2015 AFTER THE FEBRUARY 25, 2013 GAUGING EVENT.
5. ** = WELL INSTALLED AFTER THE FEBRUARY 25, 2013 GAUGING EVENT AND WAS NOT MEASURED.

0 150' 300'

GRAPHIC SCALE

NATIONAL GRID
HIAWATHA BOULEVARD FORMER MGP SITE
SYRACUSE, NEW YORK

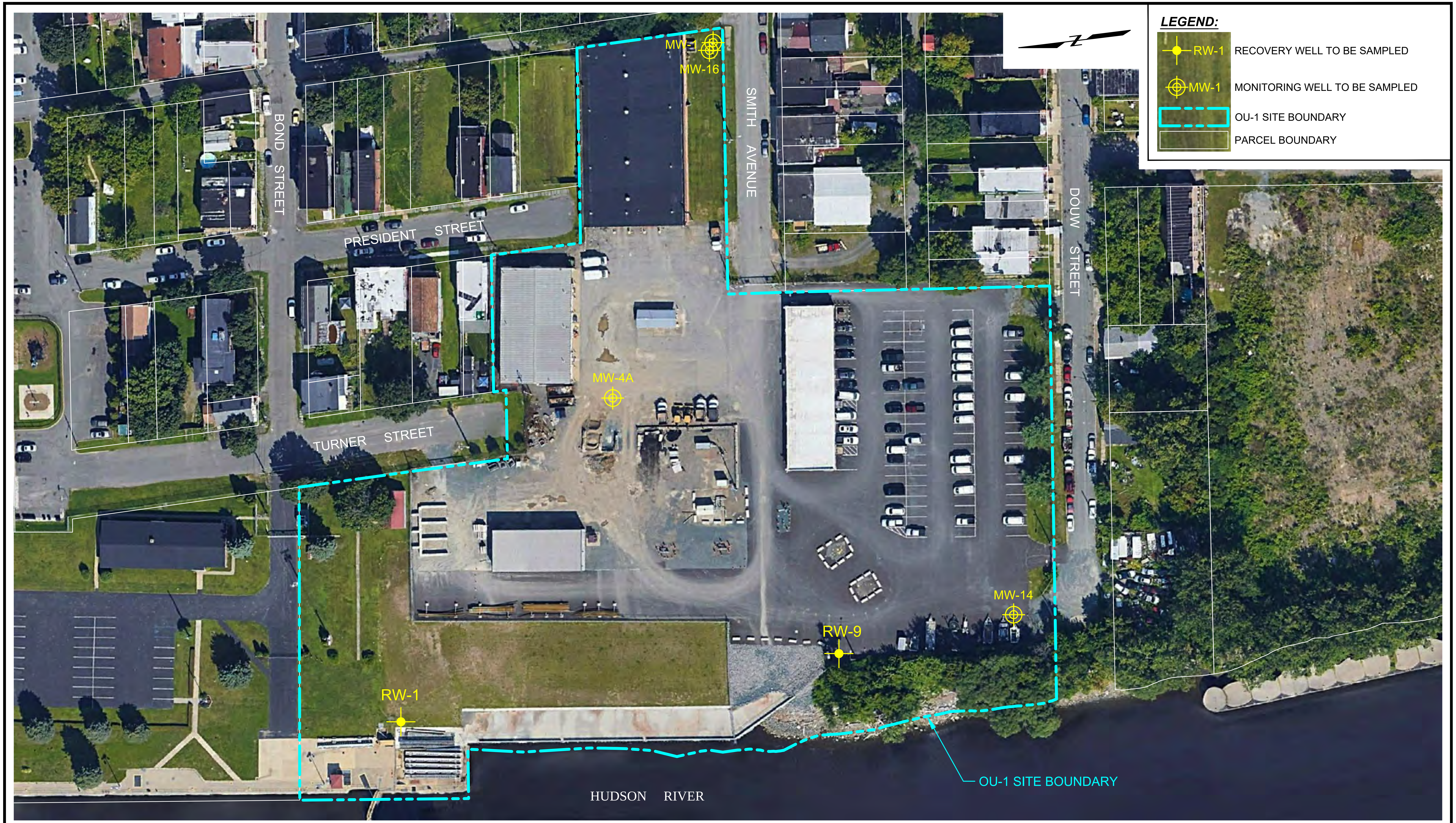
GROUNDWATER REMEDIAL ACTION WORK PLAN

WATER LEVEL MAP FOR SAND UNIT - FEBRUARY 25, 2013

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4

CITY: SYRACUSE, NY DIV/GROUP: ENVCAD DB: E. KRAHMER PIC: T.W. YOUNG PM: J. BRUSSEL TM: M. HYSELL TR: J. SINAY LYR:ON=*;OFF=*REF*
C:\Users\bdeclercq\OneDrive - ARCADIS\BIM 360 Docs\NATIONAL GRID\HIAWATHA BOULEVARD FORMER MGP SITE\2018\B0036693.0001\01-DWG\GWRAWP-Fig 4-Water Level Map.DWG LAYOUT: 4 SAVED: 2/6/2018 9:39 AM ACADVER: 20.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE:
PLTFULL.CTB PLOTTED: 2/6/2018 9:39 AM BY: DECLERCQ, BRIAN
XREFS: IMAGES: PROJECTNAME: ----
X-GWRAWP-Base
X_GWRAWP_Title



LEGEND:

⌖ RW-1	RECOVERY WELL TO BE SAMPLED
⌖ MW-1	MONITORING WELL TO BE SAMPLED
▭	OU-1 SITE BOUNDARY
▭	PARCEL BOUNDARY

SOURCE:
GOOGLE EARTH PRO AERIAL IMAGE © 2018 GOOGLE INC.,
IMAGERY DATE: 7/30/2017, ACCESSED ON 7/3/2018.

0 80 160
SCALE: 1" = 80'

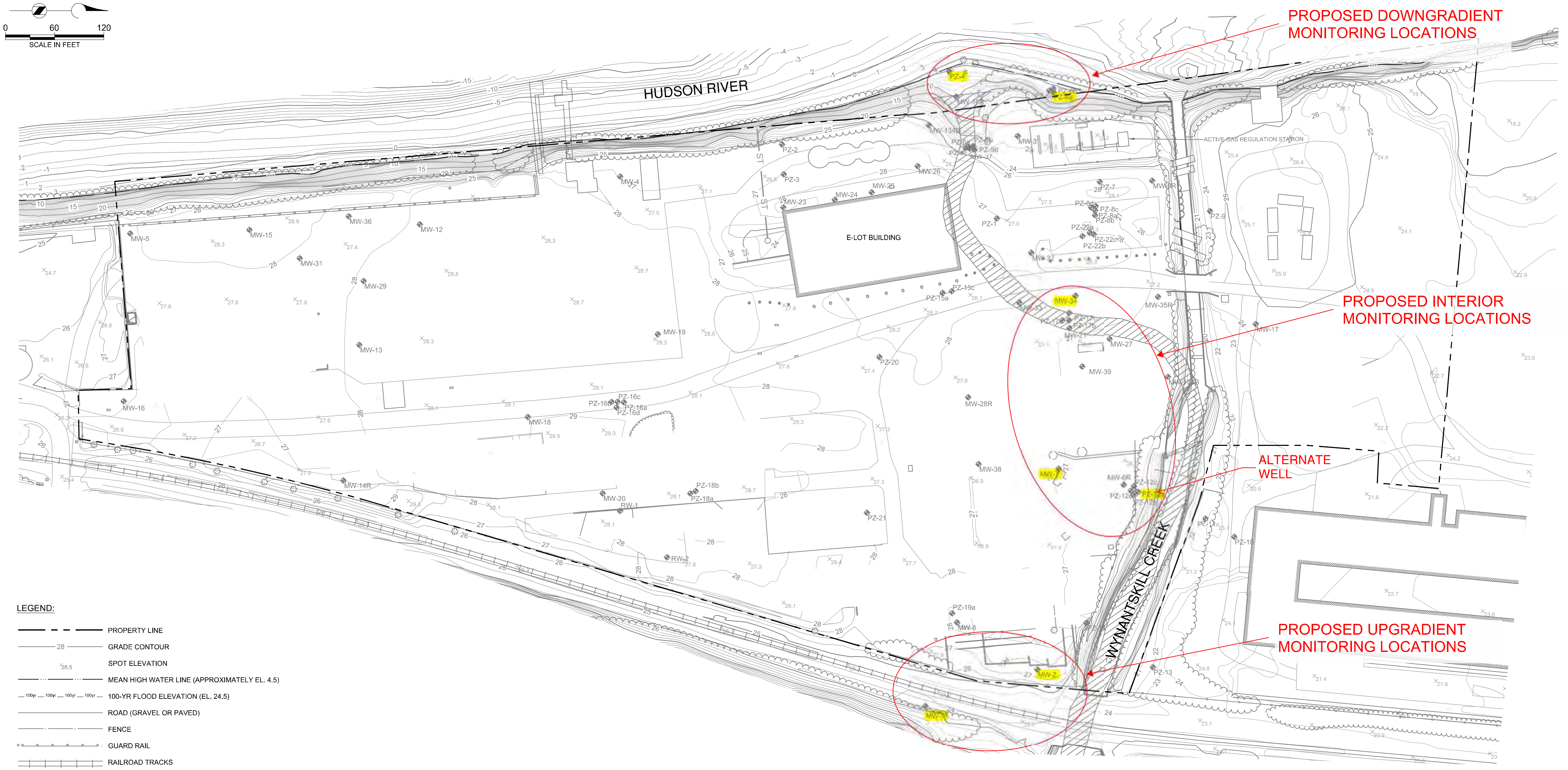
Emerging Contaminant Evaluation
Troy-Smith Avenue Former MGP Site
Troy, New York

nationalgrid

GEI Consultants

PROPOSED GROUNDWATER
SAMPLE LOCATIONS

Project 116830 | July 2018 | Fig. 1



LEGEND:

PROPERTY LINE

GRADE CONTOUR

SPOT ELEVATION

MEAN HIGH WATER LINE (APPROXIMATELY EL. 4.5)

100-YR FLOOD ELEVATION (EL. 24.5)

ROAD (GRAVEL OR PAVED)

FENCE

GUARD RAIL

RAILROAD TRACKS

TREES

EXISTING BUILDING

MONITORING WELL/PIEZOMETER

NOTES:

1. EXISTING CONDITIONS IDENTIFIED HEREIN SHALL BE FIELD VERIFIED BY THE CONTRACTOR. THE OWNER'S REPRESENTATIVE AND THE DESIGN ENGINEER SHALL BE NOTIFIED OF ANY DISCREPANCIES BETWEEN THE DESIGN DRAWINGS AND ACTUAL CONDITIONS.
2. THE LOCATION OF THE ACCESS ROAD (A.K.A. INDUSTRIAL PARKWAY OR KING ROAD) IS BASED ON FIELD OBSERVATIONS BY BROWN AND CALDWELL PERSONNEL.

Brown AND Caldwell

BROWN AND CALDWELL ASSOCIATES
UPPER SADDLE RIVER, NEW JERSEY

NIAGARA MOHAWK POWER CORP.
(D/B/A NATIONAL GRID)

TROY (WATER STREET) SITE - AREA 2
TAX SECTION-BLOCK-LOT NO. 111.75-1-1
CITY OF TROY, RENSSELAER COUNTY, NEW YORK

REMEDIAL ACTION CONSTRUCTION DRAWINGS
FOR THE NORTHERN AREA

EXISTING CONDITIONS PLAN

FILENAME
146880-C-101.dwg
BC PROJECT NUMBER
146880
CLIENT PROJECT NUMBER

DRAWING NUMBER
C-101
SHEET NUMBER
3 OF 43

7/12/2018 8:14:44 AM

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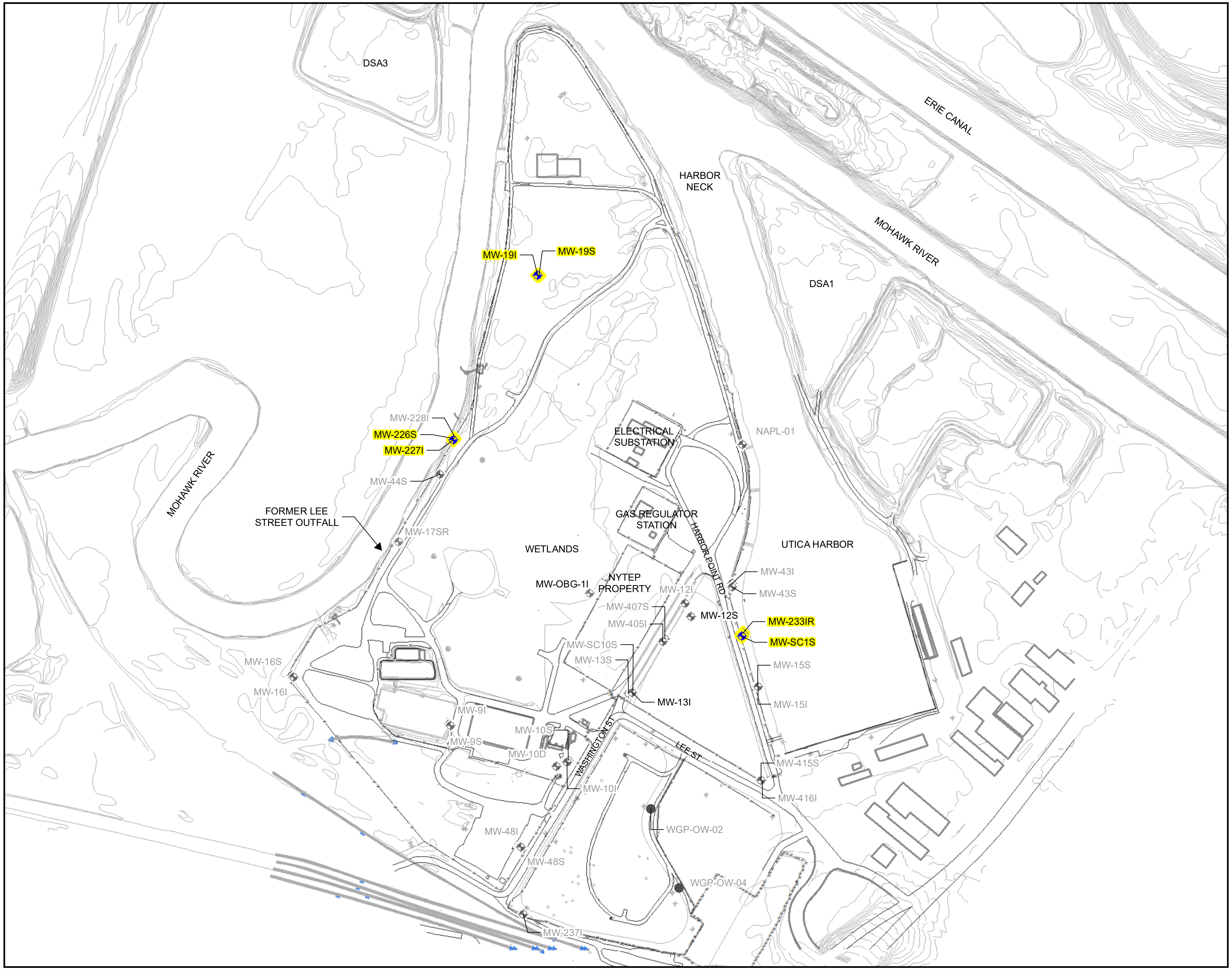
FIGURE 1



N

LEGEND

- ◆ PROPOSED PFC AND 1,4-DIOXANE SAMPLE LOCATION
- ⌖ MONITORING WELL
- ● OBSERVATION WELL

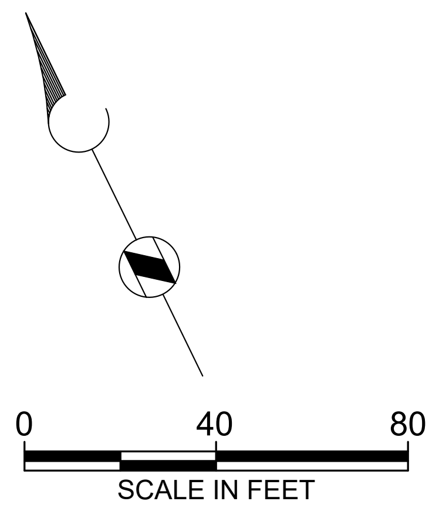
NATIONAL GRID
HARBOR POINT SITE
UTICA, NEW YORK

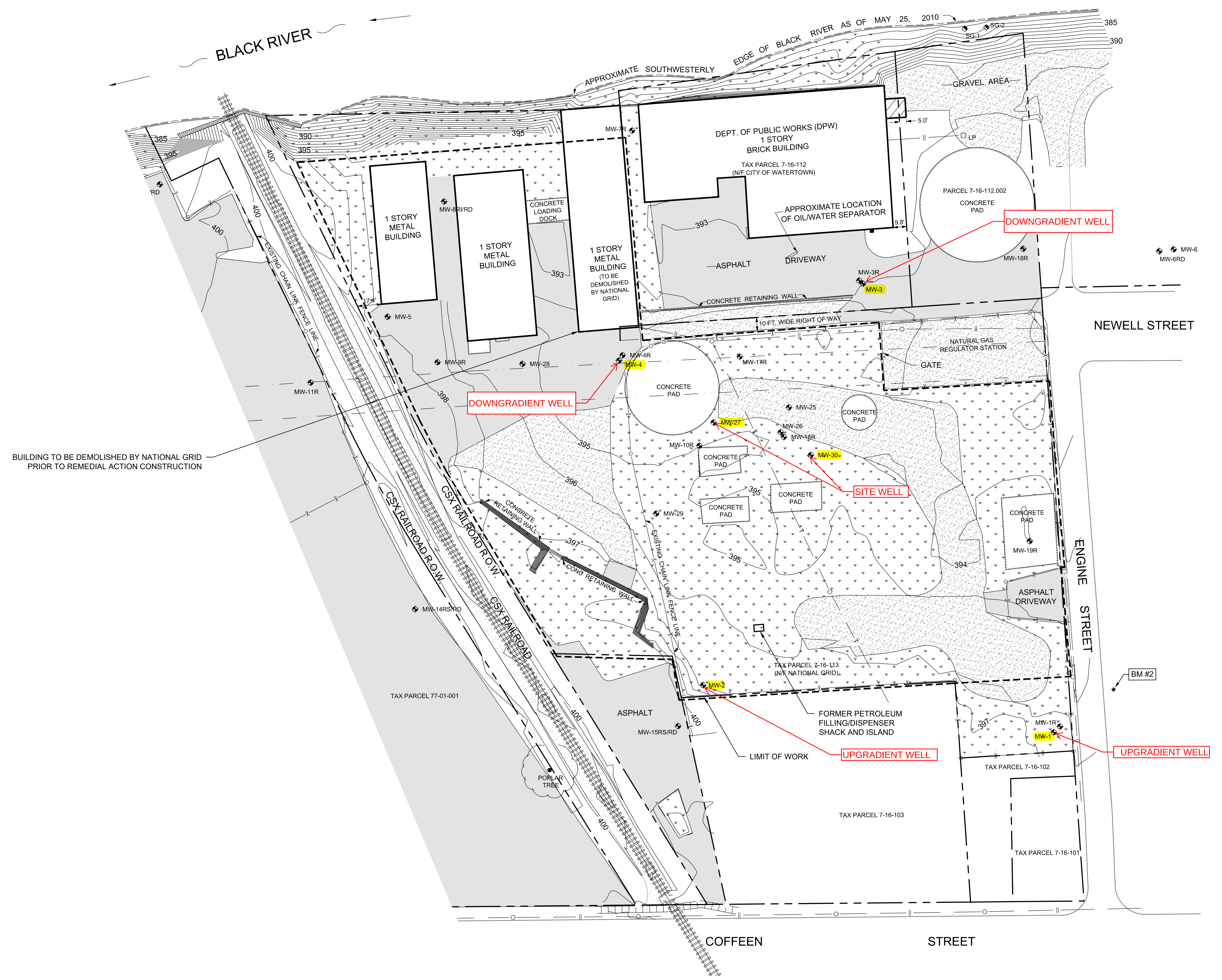
PROPOSED
PFC AND 1,4-DIOXANE
SAMPLING LOCATIONS

0 200 400 800
Feet

1118.43175
JULY 2018

O'BRIEN & GERE ENGINEERS, INC.





LEGEND:

– – – – –	LIMIT OF WORK
—— 390 ——	EXISTING GROUND CONTOUR
—— — ——	PROPERTY LINE
▨	EXISTING ASPHALT
▨	EXISTING GRAVEL
▨	EXISTING GRASS / VEGETATION / SOIL
▨	EXISTING CONCRETE PAD
—X——X—	FENCE
—— // ——	OVERHEAD POWER POLE LINE
—— T ——	OVERHEAD TELEPHONE LINE
○	EXISTING POWER POLE
LP ○	EXISTING LIGHT POLE
◎	EXISTING ROUND CATCH BASIN
□	EXISTING SQUARE CATCH BASIN
MW ◆	MONITORING WELL
┼┼┼┼┼┼┼┼	EXISTING RAILROAD TRACKS
══	RIGHT-OF-WAY
══ · · ══	EASEMENT
SG-2	STREAM GAGE
BM #2	BENCHMARK

NOTES:

1. MONITORING WELLS DESIGNATED TO REMAIN DURING REMEDIAL CONSTRUCTION SHALL BE PROTECTED
2. EXISTING CONDITIONS IDENTIFIED HEREIN SHALL BE FIELD VERIFIED BY THE CONTRACTOR. THE CONSTRUCTION MANAGER AND DESIGN ENGINEER SHALL BE NOTIFIED OF ANY DISCREPANCIES BETWEEN THE CONSTRUCTION DRAWINGS AND ACTUAL CONDITIONS.

Apr 03, 2017 - 3:29pm agutta
U:\National_Grid\Watertown\CADD\Phase_I_Design\2-SHEETS\C-CIVIL\C-100.dwg

Brown AND Caldwell

BROWN AND CALDWELL ASSOCIATES
ENVIRONMENTAL ENGINEERING AND CONSULTING
2 PARK WAY, SUITE 2A UPPER SADDLE RIVER, N.J. 07458

WARNING: IT IS A VIOLATION OF THE NEW YORK STATE EDUCATION LAW ARTICLE 145, SECTION 7209(2) FOR ANY PERSON, UNLESS HE/SHE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY. IF THIS ITEM, BEARING THE SEAL OF AN ENGINEER, IS ALTERED, THE ALTERING ENGINEER SHALL AFFIX TO THE ITEM HIS/HER SEAL AND THE NOTATION "ALTERED BY" FOLLOWED BY HIS/HER SIGNATURE AND THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

LINE IS 2 INCHES AT FULL SIZE
(IF NOT 2" - SCALE ACCORDINGLY)

DESIGNED: PP/CO
DRAWN: RJN
CHECKED: KB
CHECKED:
APPROVED: ARS

EXTERNAL REFERENCE FILES
Basemap_Topo-Bdry Srvy.dwg
TBlock.dwg
Bench_Mark.dwg
LimitofWork.dwg

ADAM RICHARD SHERMAN

4/3/17

ADAM R. SHERMAN
PROFESSIONAL ENGINEER
N.Y. LICENSE NO. 087306

DATE

REVISIONS

ZONE	REV.	DESCRIPTION	BY	DATE	APP.
	0	SUBMITTAL TO NYSDEC		04/03/17	ARS

NIAGARA MOHAWK POWER CORPORATION
D/B/A NATIONAL GRID
300 ERIE BOULEVARD WEST
SYRACUSE, NEW YORK 13202

EXISTING SITE CONDITIONS PLAN

PHASE I - SOIL EXCAVATION PROJECT
WATERTOWN (ENGINE STREET) FORMER MGP SITE
WATERTOWN, NEW YORK

FILENAME
C-100.dwg
BC PROJECT NUMBER
145806
CLIENT PROJECT NUMBER
-
DRAWING NUMBER
C-100
SHEET NUMBER
3 OF 19