

In-Situ Soil Solidification Treatability Study Work Plan

**37 Otsego Street
Brooklyn, New York 11231
Block 579, Lot 1
BCP Site No. C224300**

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau C
625 Broadway, 12th Floor
Albany, NY 12233-7016

Prepared for:
Columbia SF LLC
670 Myrtle Avenue, Suite 438
Brooklyn, New York 11205

Prepared by:
Matthew M. Carroll, P.E.
1085 Sackett Avenue
Bronx, NY 10461

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TABLE OF CONTENTS

1.0 INTRODUCTION.....	1
1.1 Project Background.....	1
1.2 Summary of Site Conditions and Proposed Remedial Actions.....	1
1.3 Site Soil Conditions.....	2
2.0 BENCH SCALE TREATABILITY STUDY.....	3
2.1 Field Investigation – Soil	3
2.2 Field Investigation – Groundwater.....	4
2.3 Sample Analysis.....	4
3.0 REPORTING	7

ISS Treatability Study Work Plan
37 Otsego Street, Brooklyn, New York
BCP Site No. C224300

FIGURES

Figure 1:	Site Location Map
Figure 2:	Site Boundary Map
Figure 3:	Proposed Sample Locations

ISS Treatability Study Work Plan
37 Otsego Street, Brooklyn, New York
BCP Site No. C224300

CERTIFICATION

I, Matthew M. Carroll, certify that I am currently a registered professional engineer licensed by the State of New York and that this In-Situ Soil Solidification Treatability Study Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).



091629
NYS Professional Engineer #

7/8/2025
Date

Matthew M. Carroll, P.E.
Signature/Stamp

It is a violation of Article 145 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.

1.0 INTRODUCTION

1.1 Project Background

Matthew M. Carroll, PE, on behalf of Columbia SF LLC (the Volunteer), has prepared this In-situ Soil Stabilization (ISS) Treatability Study Work Plan (TSWP), as required by the approved Remedial Action Work Plan (RAWP) prepared by AKRF, Inc. (AKRF) and dated January 2024. The January 2024 RAWP was approved by the New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH) in February 2024. Matthew M. Carroll, PE is the current Remedial Engineer for the Site.

The Site is located at 37 Otsego Street, Brooklyn, New York 11231 (Figure 1). During an investigation in December 2015, evidence of petroleum contamination was noted in the western portion of the Site, including petroleum odors, elevated photoionization detector (PID) readings, and the presence of light nonaqueous phase liquid (LNAPL) and a spill was reported to the NYSDEC spill hotline. Spill No. 1509420 was assigned to the Site on December 15, 2015. This spill is currently open. The Site was accepted into the New York State Brownfield Cleanup Program (BCP) as a Volunteer and was assigned BCP Site No. C224300. A Brownfield Cleanup Agreement (BCA) was executed on March 2, 2020. On January 20, 2022, the lease interest for the Site was transferred to Columbia SF LLC, and the BCA was amended (March 2022) to remove the original applicant and add the new lessee as the Volunteer applicant/remedial party to the BCA.

This TSWP was developed to collect soil, groundwater and LNAPL samples from the treatment area defined on Figure 9 of the RAWP. The soil samples will be used for a bench-scale treatability study. The results of the treatability study will be documented in an ISS Treatability Study Report.

1.2 Summary of Site Conditions and Proposed Remedial Actions

The Site is located in the Red Hook neighborhood of Kings County (Brooklyn) and is comprised of three tax lots (Block 579, Lots 1, 2 and 3). The lot occupies an entire city block and is located on the eastern side of Otsego Street between Lorraine Street and Creamer Street and extends to Columbia Street. The Site consists of 200 feet of street frontage along Otsego Street and Columbia Street and 500 feet of street frontage along Lorraine Street and Creamer Street. The Site is approximately 100,000 square feet (2.30 acres) and is bound by Lorraine Street to the north, Creamer Street to the south, Columbia Street to the east, and Otsego Street to the west (Figure 2).

In-situ stabilization of soil will be conducted in the western portion of the Site to address the gross petroleum-contaminated soil and to close-out Spill No. 1509420. It is anticipated that soil mixing for the ISS will be conducted in an approximately 25,000 square foot area down to approximately 28 feet below ground surface (bgs). An approximately six-foot soil cut will need to be excavated in this area to contain the ISS spoils and increased soil volume (swell) created by the soil mixing. The target ISS area is shown on Figure 9 of the RAWP.

1.3 Site Soil Conditions

Based on the historic investigations and the known extent of petroleum contamination, it is anticipated that ISS treatment would be required for an approximately 25,000 square foot area, and the target treatment depth will be approximately 28 feet below grade surface (bgs), for an estimated treatment volume of 20,500 cubic yards. Although the gross contamination has been noted down to 20 ft bgs, the Site is underlain by soft sediment/native clay up to a depth of approximately 25 ft bgs. Based on geotechnical considerations, ISS will be extended to approximately 28 ft bgs to prevent liquification of the soft sediment below and to limit settlement of the concrete block/mass created by ISS.

The primary objective of ISS is to permanently immobilize soil contaminants into a soil-cement matrix.

2.0 BENCH SCALE TREATABILITY STUDY

This section details the proposed field investigation and bench-scale treatability study scope of work. The ISS treatability study is based on the recommended approach defined in the Interstate Technology Regulatory Council (ITRC) Technical/Regulatory Guidance for Development of Performance Specifications for Solidification/Stabilization.

2.1 Field Investigation – Soil

A minimum of five soil borings will be advanced to 28 feet bgs across the ISS study area. As shown on Figure 3, the borings are uniformly distributed across the ISS area. There is one study area representing the entire area and depth of the proposed ISS monolith, which, as detailed above, represents approximately 20,500 cubic yards of material. As discussed above, there is a sediment/clay layer underlying the interval of gross contamination; given that the entire interval will be mixed together, these areas are not proposed for separate analysis.

Soil material will be collected from the entire 22 foot treatment interval (6 to 28 feet bgs). The soil material will be screened continuously to the boring termination depth for total organic vapor concentration using a PID equipped with a 10.6 electron volt (eV) bulb, and for visual and olfactory indications of environmental impacts (e.g., staining and odor) to ensure that samples with the high free product impacts are collected for the treatability study.

A minimum of 60 kilograms (kg) of soil will be required for the composite sample to perform the bench-scale treatability study; therefore, multiple borings may be advanced within the proposed sampling area until the minimum soil sample volume is met. Discrete soil samples will also be collected at the intervals of highest suspected contamination from each boring based on visual and field readings (i.e., PID).

The field investigation will be completed in accordance with the procedures specified in the Health and Safety Plan (HASP), provided in Appendix G of the RAWP. CAMP will be implemented during all ground intrusive activities performed as part of this investigation, as described in Appendix H of the RAWP.

Non-disposable, down-hole drilling equipment and sampling apparatus will be decontaminated between locations with Alconox (or similar) and water where NAPL is identified. Decontamination fluids used to decontamination equipment will be captured, containerized, and disposed of as investigation-derived waste (IDW). Following sampling, each soil boring will be backfilled beneath the groundwater table using bentonite followed by clean soil cuttings and/or a bentonite-grout slurry between the water table and grade surface.

The ISS treatability soil material will be collected into 5-gallon plastic buckets and submitted to the laboratory where it will be homogenized in the lab during the treatability study. Upon arrival, soil samples will be placed in refrigerated storage until the treatability study begins.

2.2 *Field Investigation – Groundwater*

Consistent with Section 7.0 of the RAWP, groundwater samples will be collected from each of the three off-site permanent monitoring wells (MW-7, MW-10, and MW-11), installed in the adjacent sidewalks (in the western portion of the Site) during the RI, to establish background concentrations prior to start of Site remediation. No groundwater sampling from the ISS area is proposed.

Prior to sampling, the monitoring wells will be gauged for static water levels and presence of LNAPL using an interface probe. Physical and chemical parameters (e.g., temperature, dissolved oxygen, oxidation-reduction potential [ORP], pH, turbidity) will be monitored during purging. Once dissolved oxygen and ORP stabilize to the ranges specified in the USEPA Low Stress Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells, dated 30 July 1996 and revised 19 September 2017, sample collection will begin. Samples will be collected with a peristaltic pump or equivalent and dedicated polyethylene tubing into laboratory-supplied pre-cleaned containers.

The pump and interface probe will be decontaminated with Alconox (or similar) and water between each sample location. Decontamination fluids used to decontaminate equipment will be captured, containerized, and disposed of as IDW. Purge water will be containerized and staged on-site, pending proper disposal at an off-site facility.

2.3 *Sample Analysis*

Baseline analysis for soil material and groundwater samples to establish pre-treatment conditions will include volatile organic compounds (VOCs) via EPA Method 8260, semi-volatile organic compounds (SVOCs) via EPA Method 8270 SIM, and total petroleum hydrocarbon (TPH) diesel range organics (DRO) and oil range organics (ORO) analysis. In addition, Synthetic Precipitation Leaching Procedure (SPLP) analysis will be completed for VOCs and SVOCs in soil by EPA Method 1312.

The bulk soil material will be homogenized by manually mixing the soil under a chemical hood. Gravel and/or cobble measuring greater than 0.5 inch in diameter will be removed from the bulk soil sample prior to homogenizing, unless it is representative of the sampling locations.

Soil samples from the homogenized material will be analyzed for soil pH by EPA Method 9045C, moisture and density by ASTM D2937/D2216.

Homogenized soil samples will be mixed with Portland cement (PC) and slag at the following ratios, by weight (based on sample unit weight).

ISS Treatability Study Work Plan
37 Otsego Street, Brooklyn, New York
BCP Site No. C224300

6% PC
3% PC + 3% slag
1.5% PC + 4.5% slag
8% PC
4% PC + 4% slag
2% PC + 6% slag
10% PC
5% PC + 5% slag
2.5% PC + 7.5% slag

The above formulations will be tested for hydraulic conductivity by ASTM D5084 and unconfined compressive strength (UCS) by ASTM D1633. Hydraulic conductivity will be tested at 28 days. UCS will be tested at 7, 14 and 28 days.

Additional formulations may be tested following receipt of the initial UCS and hydraulic conductivity analyses.

A table depicting the proposed soil and groundwater samples to be collected and analytical methods to be utilized is included below:

Table 1. Proposed Samples – ISS Treatability Study

Sample ID	Media	Analytical Parameters	Analytical Methods	Sample Volume/Container (per sample)
SB-1	Soil (ISS Treatment Area)	Discrete (five total, one from each boring): VOCs, SVOCs, TPH-DRO, TPH-ORO, SPLP VOCs, SPLP SVOCs	VOCS: EPA 8260C	VOCs: (3) 5 gram Encore samplers SVOCs, TPH-DRO, & TPH-ORO: (1) 4 oz amber glass jar SPLP VOCs: (1) 25 gram Encore sampler SPLP SVOCs: (1) 8 oz amber glass jar
SB-2			SVOCS: EPA 8270 SIM	
SB-3			TPH-DRO & TPH-ORO: EPA 8015B	
SB-4			SPLP VOCs & SPLP SVOCs: EPA 1312	
SB-5		Composite (one total): pH, Moisture, Density, Hydraulic conductivity, UCS	pH: EPA 9045C Moisture: ASTM D2937 Density: ASTM D2216 Hydraulic Conductivity: ASTM D5084 UCS: ASTM D1633	pH, Moisture, Density, Hydraulic Conductivity, UCS: (1) 5 gallon bucket, minimum 60 kg of soil. Bulk samples will be homogenized at the lab and analysis performed on the homogenized samples.
MW-7	Groundwater (Off-site)	VOCs, SVOCs, TPH-DRO, & TPH-ORO	VOCS: EPA 8260C	VOCs: (3) 40 mL glass vials SVOCs, TPH-DRO, & TPH-ORO: (2) 1 L amber glass bottles
MW-10			SVOCS: EPA 8270 SIM	
MW-11			TPH-DRO & TPH-ORO: EPA 8015B	

3.0 REPORTING

Upon completion of the treatability study, an ISS Treatability Study Report detailing results and conclusions (e.g., the ISS design mix) will be prepared by the Contractor and submitted to the Remedial Engineer and NYSDEC for review prior to the start of ISS treatment.

The cement mix design and ISS performance target criteria will include a hydraulic conductivity of less than 1×10^{-6} centimeters per second (cm/sec) and an unconfined compressive strength of greater than 50 pounds per square inch (psi) at the 28-day cure time. Following treatment, total and leachability analytical samples will be collected for Site constituents of concern. Total and leachability analytical sampling will be specified in the ISS Treatability Study Report.

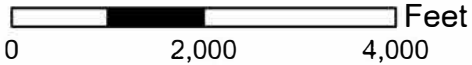
ISS Treatability Study Work Plan
37 Otsego Street, Brooklyn, New York
BCP Site No. C224300

FIGURES



Basemap: USGS Topographic Map, 7.5 Minute Quadrangles: Brooklyn, NY; Jersey City, NJ

Site Location



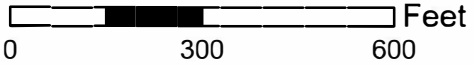
propertyinformationportal.nyc.gov

Department of Finance Digital Tax Map

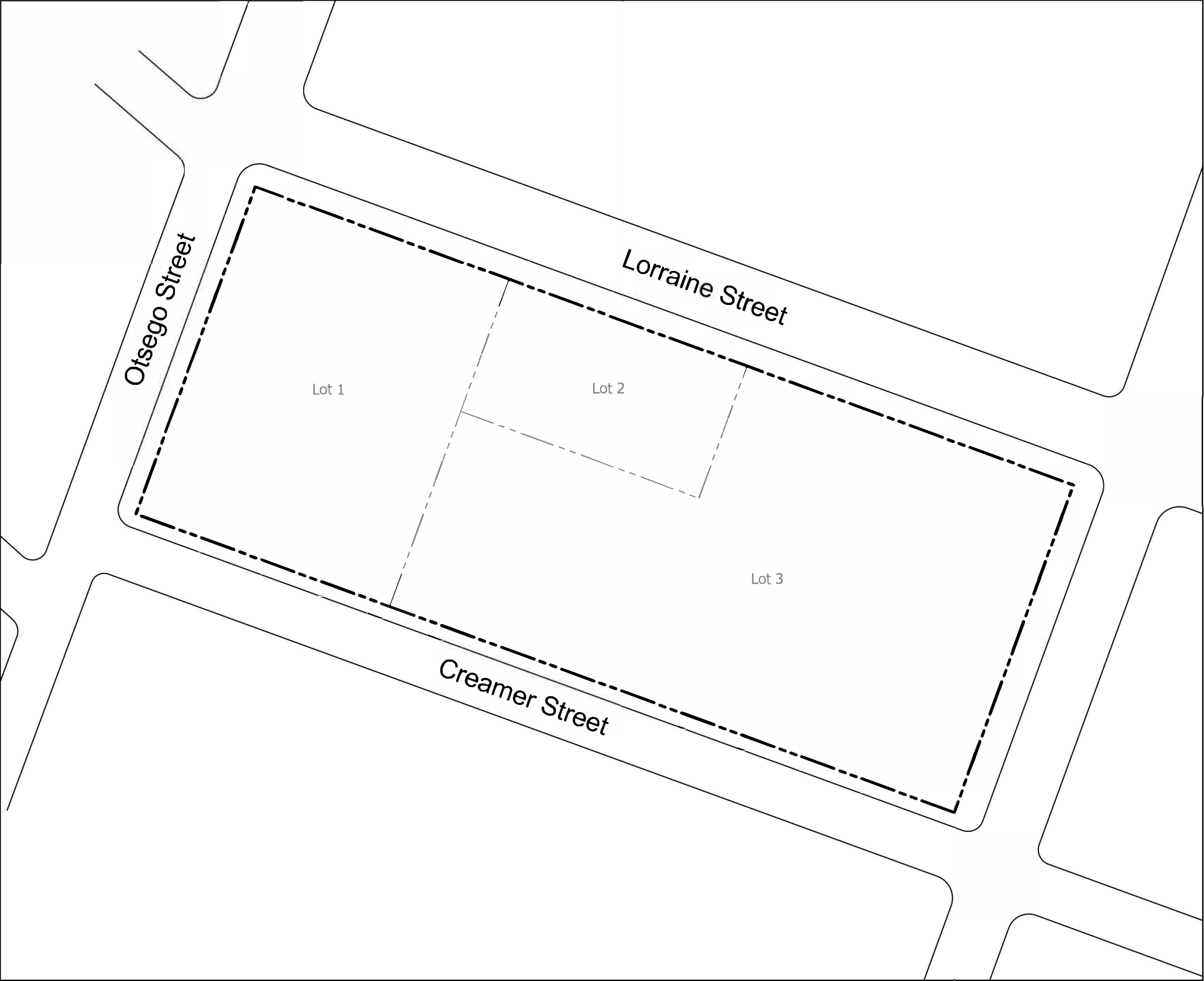


NYC OpenData, State of New Jersey, Esri, HERE, Garmin, INCREMENT P, Intermap, USGS, METI/NASA, EPA, USDA

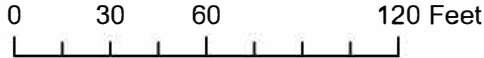
Department of City Planning MapPluto 2024 v4



Drawing Title	Site Location Map		Drawing No.	Figure 1
	Drawn By	LM		
	Checked By	AP	Matthew M. Carroll, PE 1085 Sackett Avenue Bronx, NY 10461 37 Otsego Street Brooklyn, New York Block 579, Lots 1, 2 & 3	
	Date	January 2025		
	Scale	As Noted		



Reference:
Site boundary and Tax Lot layout from propertyinformationportal.nyc.gov



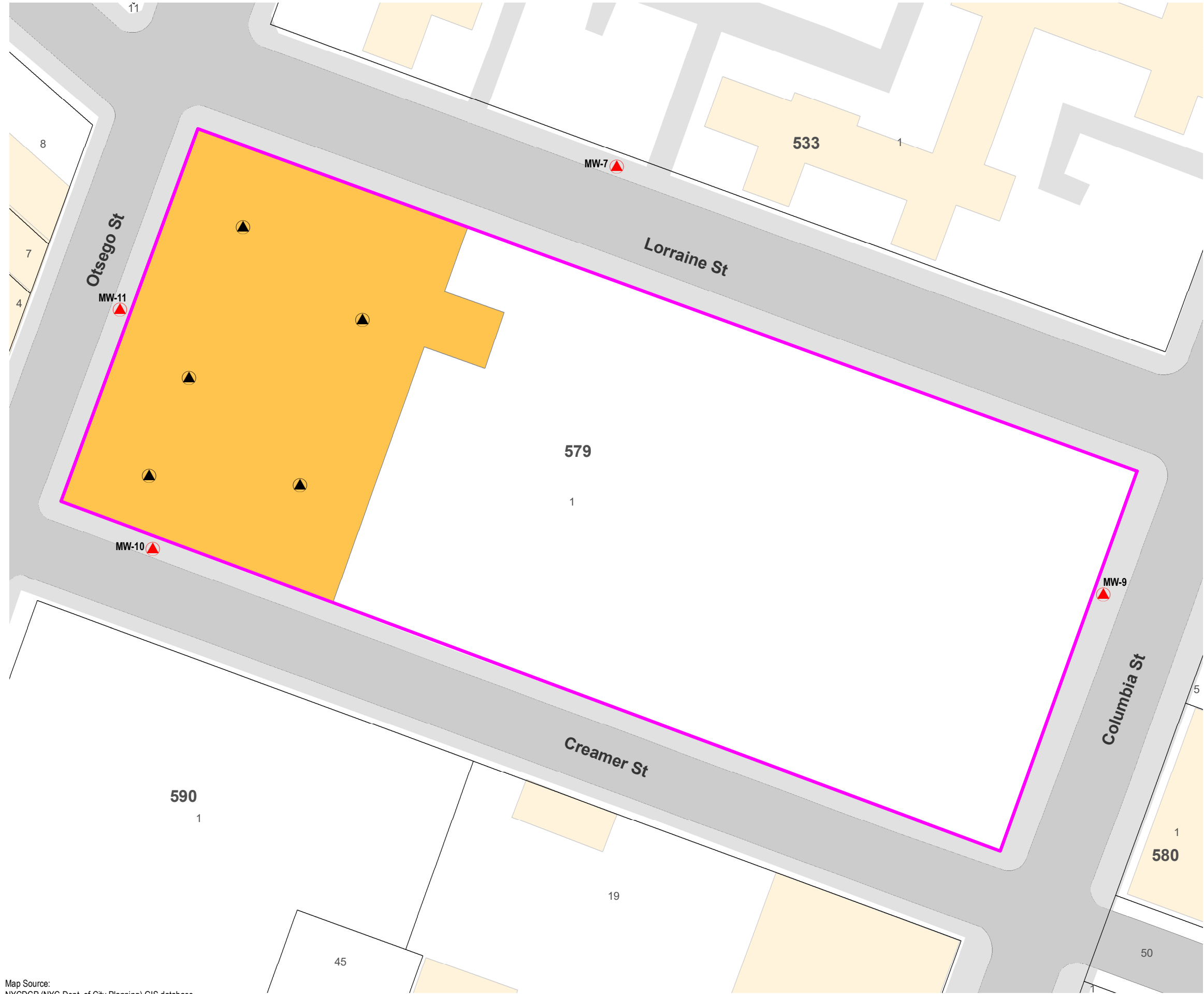
Legend

- NYC Tax Lots
- Site Boundary



Drawing Title	Site Layout		Drawn By	LM	Matthew M. Carroll, PE 1085 Sackett Avenue Bronx, NY 10461		37 Otsego Street Brooklyn, New York Block 579, Lots 1, 2 & 3	
	Figure 2		Checked By	AP				
Drawing No.			Date	January 2025				
			Scale	As Noted				

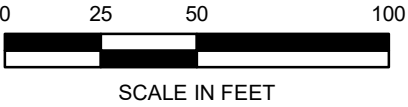
© 2023 AKRE O:\Projects\230011 - 37 OTSEGO & 498 COLUMBIA STREETS\BARBCP Rawp\230011 Fig 9 Proposed Off-Site Monitoring Well Locations.mxd 6/1/2023 5:15:29 PM isalus



Map Source:
NYCDCP (NYC Dept. of City Planning) GIS database

LEGEND

- BCP PROJECT SITE BOUNDARY
- LOT BOUNDARY AND TAX LOT NUMBER
- 579** BLOCK NUMBER
- BUILDING
- APPROXIMATE EXTENT OF IN-SITU SOLIDIFICATION (ISS) AREA
- EXISTING OFF-SITE MONITORING WELL
- PROPOSED SOIL BORING LOCATION



37 Otsego Street Brooklyn, New York	
PROPOSED ISS TREATABILITY STUDY SAMPLE LOCATIONS	
DATE	6/1/2023
PROJECT NO.	230011
FIGURE	9