Scope of Work (Schedule 1) for:

PRE-DESIGN INVESTIGATION FOR THE HARBOR VIEW SQUARE, OFF-SITE (NYSDEC SITE #C738040A) OSWEGO, OSWEGEO COUNTY, NEW YORK

Prepared for:

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

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SCHEDULE 1

SCOPE OF WORK

PRE-DESIGN INVESTIGATION FOR THE HARBOR VIEW SQUARE, OFF-SITE (OU-2), OSWEGO, NEW YORK

1.0 INTRODUCTION

The Harbor View Square Site (Site) is located at 68 West First Street in an urban area in the City of Oswego, NY as shown on Figure 1. The site is divided into two operable units (OU). Operable Unit No. 1 (OU-1) is a 2.4 acre block bounded by West First Street to the east, West Second Street to the west, West Schuyler Street to the south, and Lake Street to the north. The OU-1 Site was investigated under the Environmental Restoration Program (Site E738040) originally, but is now owned by Harbor View Square, LLC, and is undergoing remediation under the Brownfield Cleanup Program, (Site C738040). Operable Unit No. 2 (OU-2, Site C738040A) is considered the off-site portion of OU-1 and is the focus of this Pre-Design Investigation (PDI).

The OU-2 area predominantly includes land located between OU-1 and the Oswego River (approximately 390 feet east of OU-1). This area is dominated by industrial properties including a cement shipping terminal, a major oil storage facility and the City of Oswego West Side Excess Flow Management Facility. Some additional investigation will occur up-gradient (west) of OU-1 between the residential houses on West Second Street and OU-1. Lake Ontario is approximately 100 feet to the north (at its closest point). The land in between includes a parking area, boat launch, marina, a United States Coast Guard facility and a marine museum located on property owned by the Oswego Port Authority. Residential and commercial businesses are located to the south. A map of the site and surrounding properties is provided on Figure 2.

OU-1 is actively being developed. Former site buildings have been demolished and replaced with multi-story buildings consisting of apartments/townhomes and ground-floor commercial spacing. Concurrently, Synapse Risk Management and Holt Consulting (Synapse), on behalf of Harbor View, LLC are performing a Pre-Design Investigation for OU-1 to design a strategy for remediation of existing contamination as part of the commercial and residential redevelopment (Synapse June 2018). The remainder of this section provides a general description of the project background, project objectives and investigation approach as it relates to OU-2.

1.1 Project Background

Historical Operations:

Sanborn Fire Insurance (Sanborn) maps and aerial photos included in the Phase I Environmental Site Assessment for OU-1 (ENSR 2005) indicate the OU-1 Site and adjacent properties were used for industrial activities dating back to 1890. A historical summary based on a review of these maps was presented in the Supplemental Subsurface Investigation (SSI)/Alternatives Analysis Report (O'Brien and Gere 2013). The summary indicated the following businesses occupied some portion of OU-1 between 1890 and 2003: Oswego Gasket Company, Jason Malone Lake Ontario Planning Mill, Global Match Company, E.W. Rathburn and Company Lumber, Oswego Machine Works (later Oswego Tool Company), Flex-O-Wire Company, Copperweld Steel Company (Flex-O-Wire Division), residential dwellings, saloons, sheds, 50,000 gallon water tank, rail lines and City of Oswego Department of Public Works.

Prior industrial operations at the OU-1 site that may have attributed to existing contamination are listed below (Synapse June 2018).

- Solvent usage and disposal, reportedly associated with wire drawing operations;
- Coal storage, usage and coal ash disposal; and
- Metal working operations including machining and annealing.

Two sumps (Sump 1 and Sump 2) were known to have existed on the OU-1 site, the bases of which were located directly on top of bedrock at the locations shown on Figure 2. Reportedly, Sump 1 may have been used during the wire manufacturing process to circulate chlorinated solvents through underground process lines to a 15,000 gallon underground storage tank (UST, believed to be a buried railcar tanker) on top of bedrock. Although the historic use of Sump 2 is unknown, it was reported by the City of Oswego DPW employees to be associated with the wire manufacturing process. This is supported by a pipe-like anomaly between the UST and Sump 2 (O'Brien and Gere 2013). The UST, including 4,258 gallons of sludge, was removed for off-site disposal during an Interim Remedial Measure completed during the Remedial Investigation in September 2009 (CHA 2011). The sumps were reportedly filled with crushed stone and capped with concrete (O'Brien and Gere 2013). A second IRM was completed in August 2009 to remove a 550 gallon above ground storage tank (AST) located on the west side of the property and was reportedly used to store fuel oil for an on-site heater (CHA 2011).

Previous Investigations:

A Remedial Investigation (RI) was completed at the OU-1 site between April 2007 and May 2010 to evaluate the presence and extent of environmental impacts to the site due to on-site or off-site activities. The investigation included the installation of soil borings, groundwater monitoring wells and soil vapor points. Results from the investigation concluded that contaminants detected in soils (primarily metals and semi-volatile organic compounds) were not impacting groundwater but rather groundwater contamination was likely associated with leaks from the chlorinated solvent circulation system including the UST and associated sumps. Since the UST was located on top of bedrock, it is possible the contaminants leaked over time from the UST through the porous fractured sandstone bedrock into groundwater. Additionally, soil vapor samples collected immediately adjacent to the site indicated soil vapor may be contaminated with volatile organic compounds (VOCs) which may be volatilizing from groundwater and entering soil vapor (CHA 2011).

The SSI was completed between December 2011 and August 2012 to further evaluate the nature and extent of contaminants at OU-1 and OU-2. The OU-2 investigation was limited to the installation of three shallow/deep monitoring well pairs (MW-10S/10D, MW-11S/11D, MW-12S/12D) and two soil vapor points. Results from the groundwater investigation concluded that the primary contaminants of concern (COCs) for OU-2 include chlorinated volatile organic compounds (CVOCs), specifically, tetrachloroethene (PCE) and trichloroethene (TCE) and their degradation products: 1,1-dichloroethene (1,1-DCE); cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-dichloroethene (trans-1,2-DCE) and vinyl chloride (VC). Concentrations of CVOCs were higher in the deeper bedrock wells compared to the shallower wells. The maximum concentration of TCE and cis-1,2-DCE detected in OU-2 groundwater was 10,0000 micrograms per Liter (µg/L) each in MW-11D. These concentrations are greater than groundwater sample collected as part of the OU-1 investigation (O'Brien and Gere 2013).

Four soil vapor samples were collected during the RI (CHA 2011) and the SSI (O'Brien and Gere 2013) west of OU-1. At these sample locations, the maximum concentration detected was 410 micrograms per cubic meter (µg/m^3) of PCE. Two additional soil vapor samples were collected east of OU-1. TCE was detected at a concentration of 220 µg/m^3 at one of the locations. Soil vapor samples collected on the north end of OU-1 and immediately northwest of OU-1 detected PCE up to 5 µg/m^3 and TCE up to 23 µg/m^3.

Site Geology and Hydrogeology:

The subsurface geology at the site consists of unconsolidated heterogeneous overburden to a depth of approximately 8 to 10 feet overlying a competent sandstone bedrock formation. The overburden deposits consist of well-graded sands and silts with little gravels and debris fragments to silt and clay with some gravel, and debris fragments. The debris fragments consist of ash, asphalt, brick, cinders, coal, concrete pieces and wood.

The bedrock at the site consists of the Late Ordovician Oswego Formation and the underlying Pulaski Formation. The Oswego Formation is an interlayered thinly to thickly bedded deposit of medium bluish gray sandstone with minor lenses of gray to red shale. The underlying Pulaski Formation is an interbedded unit of sandstone, siltstone, and shale. This unit has considerably more shale than the overlying Oswego Formation. Previous drilling at OU-1 to a depth of 60 feet bgs does not appear to have encountered the Pulaski Formation.

Structurally, the sandstone bedding planes dip slightly to the south and there are two dominant vertical to subvertical joint sets. The joint sets trend east-northeast (ENE) and northwest (NW). Based on observations from previous drilled cores at the site, the bedrock appears largely competent. Groundwater was measured at the site in June 2019 and was observed at depths between approximately 2 and 12 feet bgs. Groundwater flow is to the east towards the Oswego River. Groundwater was generally not observed in the overburden deposits.

1.2 Project Objectives

The vertical and horizontal extent of the CVOC plume associated with the Harbor View Square Site has not been delineated. A PDI consisting of a dynamic, high-resolution discrete fracture network (DFN) approach will be implemented to provide the details necessary to characterize the geologic formation and initiate environmental delineation. The DFN approach incorporates the geometry and properties of discrete fractures (connections) to identify those responsible for the primary groundwater flow path within the bedrock and subsequent contaminant transport.

The primary focus of this PDI is the portion of the off-site area (OU-2) located between OU-1 and the Oswego River. Data collected under the investigation will be used to evaluate the need for additional phases of work, primarily if the horizontal limits of the plume are not delineated.

1.3 Investigation Approach

Delineation of groundwater contamination within fractured bedrock formations to evaluate fate and transport of the contaminant plume migrating from the source area can be challenging. The transport pathways are largely dependent on the nature of the fractures (horizontal vs. vertical), the width and angle of the fractures, and the hydraulic conditions (isolated vs. interconnected) within the fracture network. Delineation in sandstone (sedimentary) bedrock is more complicated yet, because the contaminants, particularly near the source area, can absorb and reside predominantly in the porous rock matrix and slowly diffuse back into the fractures over time. A remedy designed solely on treating the fracture pathways may not address the contaminant mass residing within the rock matrix allowing the plume to reside in perpetuity.

Understanding the fracture network and mass distribution in the rock matrix is critical to designing an appropriate in-situ chemical treatment remedy as required under the Record of Decision for OU-2 (NYSDEC 2013). This PDI focuses on characterizing both the location of the contaminant mass and the movement of water through the fractures to assist in developing a robust conceptual site model and to determine the optimal positioning of the monitoring wells. Additionally, the PDI will assess the horizontal and vertical delineation of the contaminant plume migrating from the upgradient source. This will be achieved using a combination of CORE Discrete Fracture Network (DFN), borehole geophysics, fluid replacement testing, packer testing and slug testing as described in Section 3.

2.0 PRELIMINARY ACTIVITIES (TASK 1)

Preliminary activities include preparing this scope of work and associated New York State Department of Environmental Conservation (NYSDEC) contract-related forms, participating in the initial site visit and reviewing available site file information provided by NYSDEC to date.

Additional costs are included for the June/July 2019 field efforts to install pressure transducers in the existing OU-2 monitoring well pairs MW-10S/10D; 11S/11D and 12S/12D. This field effort was discussed with NYSDEC in advance to evaluate the down-gradient hydraulic connection and influence during the OU-1 drilling operations. The purpose of the data was to:

- Establish a base groundwater level in the OU-2 wells prior to intrusive drilling activities scheduled for OU-1 since this data has not been collected since August 2012.
- Monitor groundwater levels in the OU-2 wells during scheduled drilling activities at OU-1.

The results from this field effort will be presented in the Pre-Design Investigation Report, Task 3 (see Section 4.0).

3.0 PRE-DESIGN INVESTIGATION IMPLEMENTATION (TASK 2)

Parsons' approach to the PDI is described in the following sections. Each portion will follow NYSDEC guidelines outlined in the Division of Environmental Remediation (DER)-10 Technical Guidance document. The overall program consists of:

- Geophysical Investigation: subsurface utility mapping;
- Site Survey of utilities, monitoring wells and vapor intrusion sampling points;
- Bedrock groundwater investigation, including:
    - Bedrock borehole drilling/rock coring;
    - High-resolution Core DFN screening;
    - Borehole Geophysical Investigation;
    - Fluid Replacement Testing;
    - FLUTe™ liner Installation;
    - Bedrock monitoring well installation and development;
    - Slug Testing;
    - Groundwater sampling;
- Surface water sampling; and
- Vapor intrusion sampling program.

Field activities will be conducted in accordance with the Generic Quality Assurance Project Plan and the Generic Health and Safety Plan prepared and approved for this contract. Site-specific elements and specific activity hazard analysis for rock coring, well installation, groundwater sampling, soil vapor sampling and waste characterization sampling will be added to the Health and Safety Plan.

A Community Air Monitoring Plan (CAMP) will be implemented for real-time monitoring for VOCs and particulates (i.e., dust) at the upwind and down-wind perimeter of each designated work area during intrusive drilling activities on-site. CAMP details are provided in Attachment A of this Scope of Work.

3.1 Geophysical Investigation: Subsurface Utility Mapping

Prior to intrusive activities, a geophysical investigation will be completed to identify and locate utilities and/or subsurface anomalies at six boring locations (Figure 3), five sub-slab soil vapor points (commercial/industrial buildings, Figure 4) and up to seven temporary soil vapor points (outside residential properties, if needed, Figure 4). Geophysical technologies may include but not be limited to ground penetrating radar (GPR), radio frequency (RF) and electromagnetic induction (EM). These techniques will be used to locate subsurface utility lines or features off-site (OU-2) within a 10-ft radius of each proposed intrusive activity. Any subsurface utilities or obstructions will be marked in the field and documented in field notes and figures. Additionally, utility mark-outs will be recorded during the site survey described in Section 3.2. The results of the geophysical site survey, along with available information obtained from previous site investigations and any as-built building plans provided from property owners (where available) will be used when selecting drilling and sampling locations.

Geophysical investigation activities will be completed by a subcontractor to Parsons. The cost estimate for this item assumes up to four field days under a maximum of four separate mobilizations as listed below. Multiple mobilizations were budgeted to account for the potential difficulties of coordinating all vapor intrusion sampling activities with all property owners within the same time period. Costs are also included for Parsons to provide oversight.

- One mobilization: Six bedrock boring locations
- Two mobilizations: Sub-slab sampling locations (commercial/industrial buildings)
- One mobilization: Exterior temporary soil vapor points (if needed)

3.2 Site Survey

Following the subsurface utility mapping, a site survey will be completed by a licensed professional land surveyor registered to practice in the state of New York to survey select features as part of the PDI. The site survey task will include as-built coordinates and elevations for bedrock monitoring wells (including top of inner casing elevations), temporary soil vapor monitoring points (if completed), and other notable site features.

Horizontal (coordinates) and vertical (elevation) controls will be established during this phase and will be based on the New York State Plane Coordinate System Central Zone North American Datum of 1983 (NAD 83) and the North American Vertical Datum of 1988 (NAD 88), respectively. Approximate property lines and existing street boundaries will be placed within the mapping limits using available Oswego County tax mapping.

Surveyed features identified during the geophysical investigation (Section 3.1) within approximately 10-feet of proposed boring locations or temporary vapor intrusion monitoring points will be captured as part of the Site survey. Specific features may include subsurface utilities, subsurface anomalies, large voids, former subsurface structures, abandoned utilities, and former utility trenches. The survey should also include mark-outs from Dig Safe at least within 10-feet of each proposed location. Additionally, utility poles, vaults/manholes, street/sidewalk/paved areas, fencing, building corners, etc. within 10-feet of the proposed boring locations will be surveyed as well.

Survey activities will be completed by a subcontractor to Parsons. The cost estimate for this item assumes up to four field days under a maximum of four separate mobilizations as listed below. Multiple mobilizations were budgeted to account for the potential difficulties of coordinating all vapor intrusion sampling activities with all property owners within the same time period. Costs are also included for Parsons to provide oversight.

- One mobilization: Survey utilities within 10 feet of six bedrock boring locations
- One mobilization: Survey utilities within 10 feet of exterior temporary soil vapor points (if needed)
- One mobilization: Survey as-built coordinates of six monitoring wells
- One mobilization: Survey as-built coordinates of temporary soil vapor points (if needed).

3.3 Discrete Fracture Network Investigation

As described in Section 1, the purpose of this PDI is to further evaluate the horizontal and vertical distribution of CVOCs in the sandstone bedrock aquifer and develop an understanding of the mechanisms of transport (through the bedrock matrix, fractures, or a combination thereof) to define the groundwater plume extent. Subsequently, this data will be used to evaluate the need for additional characterization and/or delineation efforts. Due to the complex nature of groundwater flow in bedrock, a variety of techniques are proposed to aid in the horizontal and vertical placement of the well locations. Continuous CAMP monitoring will be completed for the intrusive (i.e., drilling or coring) activities.

The current conceptual model for the site suggests that the bedrock concentrations of CVOCs are below New York State soil cleanup objectives (SCOs) at a depth of 65 ft bgs, based on the initial data obtained from the June 2019 CORE DFN OU-1 sampling. The initial phase of work (first mobilization – scope of this PDI) assumes six (6) rock cores will be advanced at the locations shown on Figure 3 to this depth. These first six rock cores will be used to complete a borehole geophysical investigation to map bedrock fracture patterns and evaluate groundwater flow to identify preferential pathways within the bedrock (see Section 3.3.3). Additionally, three (3) of the initial six (6) rock cores will be used for high resolution screening using CORE DFN analysis to facilitate making field/real time decisions and to aid in delineating the vertical and horizontal extent of the plume (see Section 3.3.2). Field decisions based on a review of the technical data by the Contractor will determine if the initial rock cores will be converted to monitoring wells. Additionally, the data will be used to determine the screened depth interval and to provide justification for installing additional adjacent wells at varying depth intervals (e.g., shallow or intermediate under future phases of work). Upon completion of well installation activities, two rounds of groundwater samples will be collected from the newly completed monitoring wells and existing well pairs.

3.3.1. Bedrock Borehole Drilling/Rock Coring

Six (6) bedrock borings will be installed to a depth of 65 ft bgs, at the locations shown on Figure 3. Boring locations may be modified in the field, with concurrence from NYSDEC as required, to afford access to each sample location. Sample locations may also change because of design or site changes (e.g., presence of overhead or subsurface utilities). The drillers will be required to obtain any necessary permits and traffic control measure to complete the intrusive activities within public rights-of-way (ROWs). At a minimum, barricades will be placed around each borehole location, and a wood or preferably steel surface plate will be placed on top of the open borehole during non-working hours.

Prior to drilling, each location will be hand cleared to five (5) feet below ground surface (or to top of bedrock if overburden is less than five (5) feet thick). Following hand clearance, boreholes shall be advanced through the remaining overburden to the top of bedrock using hollow stem auger (HSA) drilling techniques. Overburden soils will be continuously sampled using 2-inch split spoon samplers and will be described and logged in accordance with ASTM Method D1586 and screened with a photoionization detector (PID). A nominal 6-inch diameter steel casing will be permanently installed approximately three (3) feet into the top of bedrock to isolate the bedrock monitoring intervals from the overburden fill materials. The casing will be sealed in-place by tremie grouting with cement-bentonite grout from the bottom up. Approximately 1 to 2 feet of grout will also be placed inside the base of the casing to ensure that no surface water enters the underlying bedrock. The purpose of the nominal casing is to provide an isolation casing, thus minimizing the potential for groundwater flow between the overburden and the underlying bedrock. A wood or preferably steel surface plate, provided by the driller, will be used to cover the open borehole prior to the start of bedrock drilling or in between drilling and other borehole geophysical tests or packer tests. In addition, barricades will be used at all times around the work area, including both during working as well as non-working hours.

After the seal is confirmed, the driller will then advance the borehole using an HQ triple core barrel to produce a 2.5” O.D core in five-foot runs to the targeted depth of 65 feet bgs. The HQ triple core barrel is mandatory to preserve the core to the maximum extent possible, to achieve minimal mechanical fractures during drilling, and to leave the core walls as smooth as possible to facilitate the subsequent CORE DFN analysis (Section 3.3.2) and borehole geophysical investigation (Section 3.3.3). The cored bedrock will be logged, photographed, and evaluated for a Rock Quality Designation (RQD). Marked rock cores will be stored in standard core boxes provided by the driller and missing sections of the core shall be replaced with spacers.

Upon completion of drilling activities, each borehole will remain open prior to well installation to allow for the completion of borehole geophysical logging, fluid replacement testing, and packer testing. Blank FLUTe™ liners will be installed to minimize migration of surface water into the borehole and minimize cross-contamination between fracture zones of varying depth intervals. The blank FLUTe™ liner system will be installed using the procedures specified by the manufacturer. Costs have been included to procure the necessary liners directly through FLUTe™ and include all equipment, materials and supplies for installation.

Drilling equipment will be decontaminated between borehole locations. Drill cutting, purge water, decontamination water, and PPE/disposable materials will be handled in accordance with Section 3.6 of this proposal.

3.3.2 CORE Discrete Fracture Network

CORE Discrete Fracture Network (CORE DFN) technology is a high resolution approach to matrix diffusion analysis and has been used to investigate contamination in fractured, porous, bedrock aquifers. The technology was developed by Professor Beth Parker, associated with the G^{360} Institute for Groundwater Research (University of Guelph, Ontario, Canada). The technique involves using an on-site mobile laboratory to rapidly extract and analyze in real-time, samples of the rock core matrix to assess the effects of diffusion on the contaminants. This technique expedites field decisions and aids in the delineation of the vertical and horizontal extent of the contaminant mass distribution. Pace Analytical retains an exclusive agreement with the University of Waterloo and the University of Guelph to implement CORE DFN field services and related analytical services.

Three of the six borehole locations will be selected for CORE DFN analysis. CORE DFN will be completed concurrently with the coring activities described in Section 3.3.1 above. As the coring advances, sample intervals from each core run will be selected based on types of fractures, start and end time of run, estimated drilling water lost during drilling run, description of bedrock type, weathering texture, color, recovery, PID readings and evidence of groundwater and/or DNAPL fluid flow. Approximately one sample will be selected every 1 to 1.5 feet of the core run for analysis of select CVOCs. Additionally, one sample will be selected approximately every 20 feet for analysis of physical properties to capture different lithologies. Fewer samples may be needed if there are no significant changes in lithology.

The rock core samples selected for analysis will be processed by the on-site mobile laboratory by crushing the samples using a hydraulic press. The crushed samples will be extruded into 40 millimeter VOA vials containing a known volume of purge and trap grade methanol. The rock mixture will then be subjected to microwave assisted extraction (MAE), followed by solid phase microextraction (SPME). Following extraction, each sample will be analyzed for select VOCs by USEPA SW-846 Method 8260 including PCE, TCE, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE and vinyl chloride. Detection limits for the rock matrices will be 20 micrograms per kilogram (µg/kg). Additionally, up to nine (9) samples will be analyzed for physical properties including bulk density (ASTM Method D7263); porosity (ASTM Method D7263); water content (ASTM Method D2216); total organic carbon (Walkley and Black Wet Oxidation Method) and specific gravity (ASTM Method D854).

Table 1 summarizes the sample quantities and indicates the anticipated number of quality assurance/quality control (QA/QC) samples to be collected for CORE DFN.

3.3.3 Borehole Geophysical Investigation

An open borehole geophysical investigation will be performed a minimum of 24 hours after the completion of drilling at each of the six (6) boreholes discussed in Section 3.3.1, and prior to the fluid replacement, packer testing, and well installation activities discussed in later sections. The 24-hour wait period allows the water in the borehole to equilibrate with the surrounding environment. The logging activities will be completed by a qualified geophysical company able to demonstrate they are authorized or are in the process of obtaining a New York Certificate of Authorization to offer geological services in the state of New York. The borehole geophysical investigation will be overseen by Parsons personnel. The investigation will consist of a down-hole geophysical logging suite including the following techniques to support identification of water bearing fractures for subsequent packer testing:

- Borehole diameter using a **caliper log**.
- Borehole **gamma ray logging** to identify changes in formation composition. The gamma ray tool will be run all the way to the ground surface to allow correlation with other site wells.

- Borehole imaging using an **acoustic televiewer** to identify significant bedding planes or fracture zones that may provide a preferential groundwater migration pathway.
- Borehole imaging using an **optical televiewer** to visually confirm and further identify any significant bedding planes or fracture zones in the borehole.
- Water characteristics using a **fluid temperature/conductivity probe** under static conditions at different borehole depth intervals
- Flow meter logging to identify vertical flow within the open borehole.

Any downhole geophysical equipment in contact with groundwater will be decontaminated between locations. Decontamination water will be handled as IDW in accordance with Section 3.6 of this proposal. Final reporting of borehole geophysical results will include a formal downhole geophysical and televiewer logging surveys report with standard boring logs including fracture analysis with strike, dip, and Paillet Rank.

3.3.4 Fluid Replacement Testing

Fluid replacement testing will be completed either before or after the completion of borehole geophysical logging and prior to packer testing to further support identification of water bearing fractures. A minimum of 24 hours will be allotted between the end of drilling activities in the boreholes and the fluid replacement testing.

The formation water in the borehole will be replaced with water of a low specific conductance (e.g., distilled, deionized) relative to groundwater. Historical measurements of specific conductivity taken during low-flow groundwater sampling in August 2012 from the existing OU-2 well pairs (MW-10D/10S; 11D/11S and 12D/12S) ranged between 330 and 2,320 microsiemens per centimeter (µS/cm) (O'Brien and Gere 2013). Fluid replacement testing will be performed at each of the six (6) borehole locations and will be used to assign the screen interval in subsequent monitoring wells.

During the fluid replacement test, sample tubing will be lowered to approximately one foot above the bottom of the borehole. This will be the lower tube. A second (upper tube) will be lowered to approximately one foot below the water table. A conductivity probe will be lowered into the borehole to collect water profile measurements for every 2-3 feet of the water column in the borehole. Three baseline profiles will be conducted prior to fluid replacement.

Following the baseline profiles, a pump will be connected to the lower tube. Water with low specific conductance will be pumped slowly into the borehole while simultaneously pumping groundwater from the lower tube. The low specific conductance water will be added to the borehole at approximately the same rate as water is pumped from the bottom tube. This will be confirmed using a water level meter to check that there is no change in the borehole water elevation during fluid replacement. The addition of low specific conductance water will be continued until the specific conductivity is lowered to approximately 50 µS/cm, or at least 10 percent of the lowest value of the original conductivity profile, thereby effectively replacing the groundwater with distilled water. Following fluid replacement, conductivity profiles will be collected by measuring specific conductivity every 2-3 feet of the water column. Approximately every ten to fifteen minutes, a small volume of water will be withdrawn from the upper tube at a low flow rate in order to promote groundwater flowing through the borehole. Conductivity profiles will be collected until the borehole water conductivity returns to approximately 50 to 60 percent of the original profile conductivity values.

3.3.5 Packer Testing

Upon completion of borehole drilling, CORE DFN, borehole geophysical logging, and fluid replacement testing, and prior to well installation, vertical profile groundwater sampling using packer testing methodology will be conducted by the driller at two (2) borehole locations. Packer testing will be completed from up to five (5) intervals at each boring location utilizing a double-packer system to isolate groundwater zones. Groundwater will be purged from each interval using a decontaminated pump and flow rates recorded. While purging, water levels will be monitored and logged above, between, and below the packers via pressure transducers to obtain continuous water level readings and to obtain a general understanding of the fracture zone productivity and potential interconnectivity between other fracture zones.

Once packer testing is complete, a representative groundwater sample will be collected in laboratory-provided bottleware and submitted for analysis of Target Compound List (TCL) VOCs by EPA 8260C. For QA/QC purposes, duplicate samples, equipment blanks and matrix spike/matrix spike duplicate (MS/MSD) samples will be collected at a rate of 1:20 samples and trip blanks will be included in each sample cooler. Table 1 summarizes the packer test samples to be collected for analysis.

3.3.6 Bedrock Monitoring Well Installation and Development

Upon completion of the borehole testing described in the above sections, monitoring wells will be installed in each of the six boreholes. Bedrock monitoring wells will be constructed as an open hole well based on RQD values measured in six rock core locations at OU-2 and two rock core locations at OU-1. The majority of RQD values ranged between 80 and 100 percent. Localized fracture zones had RQD values between 0 and 27 percent.

For open bedrock boreholes advanced more than 5 feet beyond the desired fracture interval, the bottom of the borehole will be grouted up to 5 feet below the target fracture. If the bedrock at a location is not competent to support an open borehole well, a 2-inch diameter, 10-slot PVC well screen and riser will be installed. The actual depth for screen interval placement will be field determined based on a review of coring logs, CORE DFN, borehole geophysical, fluid replacement, and packer testing results. Well screen lengths will be dependent on the depth interval selected and will generally be a 10-foot length for wells up to 20 feet bgs and a 5-foot length for wells greater than 20 feet bgs. For budgeting purposes, it was assumed all six boreholes will be installed as monitoring wells to 65 ft bgs. All well materials will consist of 2-inch ID, schedule 40 PVC, factory slotted (0.01-inch) screen, flush threaded to solid 2-inch ID schedule 40 PVC threaded joint casing that will extend to the ground surface.

The annular space around the well screen shall be backfilled with clean, washed, well-rounded silica #00 sand. The filter pack will be installed using a tremie pipe and will extend to 2 feet above the well screen. Transition sand (#000 sand) may be placed up to 0.5 feet above the initial 2-foot thick sand filter pack.

A 5-foot thick bentonite seal will be installed in the annular space above filter pack sand. Bentonite pellets shall not exceed one-half inch diameter. If the bentonite seal is positioned above the water table, the bentonite shall be installed in 1-foot lifts with each hydrated a minimum of 30 minutes between lifts before proceeding. Clean, potable water shall be added to hydrate the bentonite. After the placement of the final lift, the bentonite seal shall be allowed to hydrate an additional two hours before grouting begins. The bentonite seal shall be placed immediately after installing the filter pack, unless the well is going to be developed prior to placement of the seals, in which case, the seal shall be placed immediately upon completion of development.

Bentonite grout slurry will be placed from the top of the bentonite chip seal to within ten feet of the ground surface, as needed to seal the borehole annulus above the bentonite chip seal. Grout shall be placed by pumping through a side discharging tremie pipe with the lower end of the tremie pipe located within 3 feet of the top of the bentonite seal. The annular seal shall be placed within 48 hours, but no sooner than two hours after the final lift of the bentonite seal installation. The tremie pipe and the casing string will be slowly withdrawn as the annulus fills. The grout will be prepared by thoroughly mixing the bentonite powder and water as per the manufacturer to create at least a 20 percent solids slurry. Grout will continue to be added if any subsidence occurs as the slurry sets up.

Cement grout shall be placed above the bentonite grout slurry to the ground surface and will be incorporated into the surface completion pad. The cement grout shall consist of a mixture of Portland cement (ASTM C 150) and water in the proportion of not more than 7 gallons of approved water per bag of cement (94 pounds). Additionally, 3 percent by weight of sodium bentonite powder shall be added.

Each monitoring well shall be completed with an 8-inch diameter, flush mount protective casing. Flush-mount curb boxes will be fitted over the well head and will be set in an approximate 2-foot diameter concrete pad. A locking J-plug will be installed on top of the well. Following installation, each new monitoring well will be developed by the driller to remove material which may have settled in and around the well screen.

Well development will consist of the removal of 10 well volumes or achieving a turbidity of 50 Nephelometric Turbidity Units (NTUs), as recorded by a water quality meter. While developing, purge rates and water level changes will be recorded to obtain a qualitative estimate of the well yield. If no water is observed immediately during installation, periodic checks will be performed on the monitoring well to assess if water recharge is slow. If the well goes dry during development, it will be allowed to recharge to 80 percent of the initial water level and pumped or bailed again. The well will be considered developed after pumping the well dry three times.

In addition, water levels collected from existing OU-2 wells in June 2019 revealed anomalously high water levels in at least one well. It is suspected that such high levels could be a result of sediment build-up in the well screen. Therefore, the six (6) existing OU-2 monitoring wells (MW-10S/D, MW-11-S/D, and MW-12-S/D) will also be developed during the drilling mobilization in an effort to allow the wells to be in better contact with the geologic formation water.

3.3.8 Slug Testing

Hydrological tests such as slug tests will be conducted to identify the physical characteristics of subsurface formations, including the spatial distribution ranges of hydraulic conductivity values. Results from the hydrological test will be used to calculate groundwater extraction or injection rates, and natural groundwater flow rates required to estimate contaminant fate and transport.

Following well installation and development, rising and falling-head slug tests will be conducted at each new well location (6 total) with monitoring to include the existing OU-2 shallow and deep well pairs (MW-10S/D, MW-11S/11D, and MW-12S/12D). A stainless steel or PVC slug will be inserted into each well, whereupon water levels will be monitored using an electronic downhole transducer to record water level changes. Each test will be considered complete when the water level has returned to near static level (i.e., 90 percent of total drawdown has recovered), or after 10 to 15 minutes in the wells with slow recovery. Following field data collection, transducer data will be downloaded and analyzed to estimate hydraulic conductivity within the vicinity of each well. Additionally, a down-hole multi-parameter meter will be used to monitor for redox potential (ORP), dissolved oxygen (DO), conductivity, temperature, and pH to establish a vertical profile in each well.

3.3.9 Groundwater Sampling

Two rounds of groundwater sampling will be completed and will consist of sampling the six (6) existing shallow and deep well pairs (MW-10S/D; MW-11S/D and MW-12S/D) and six (6) new monitoring wells (12 wells total). The first groundwater sampling event will be completed a minimum of two (2) weeks after well development activities, and the second event will be completed after the results of the initial sampling event are reviewed and discussed with NYSDEC. Both groundwater monitoring events will include depth to water measurements for determining groundwater elevations.

Although the focus of the groundwater sampling will be CVOCs, Parsons will select up to five locations, in concurrence with NYSDEC, for analysis of per- and polyfluoroalkyl substances (PFAS) and 1,4-dioxane. Special precautions will be taken on the day of sampling to avoid introduction of PFAS and 1,4-dioxane related compounds into groundwater samples. Prior to collecting groundwater samples, depth to groundwater will be measured in each sampled monitoring well to the nearest 0.01 foot using a PFAS-free electronic water level meter. Groundwater samples will be collected using a decontaminated bladder pump and high-density polyethylene (HDPE) tubing using low-flow methodology (less than 500 milliliters per minute, mL/min). Groundwater quality field parameters (temperature, pH, conductivity, oxidation reduction potential, dissolved oxygen, and turbidity) will be measured in 5-minute intervals during purging. Static water levels will be maintained during well purging until select water quality parameters have stabilized followed by collection of groundwater samples.

Samples will be secured in laboratory-provided bottleware, packaged with ice, and shipped to the NYSDEC standby laboratory: Test America located in Buffalo, NY. The groundwater samples will be analyzed for the following parameters:

- TCL VOCs via EPA 8260C (12 wells)
- PFAS via Modified EPA Method 537 (5 select wells)
- 1,4-dioxane via EPA Method SIM 8270D (5 select wells)

For QA/QC purposes, duplicate samples and MS/MSD samples will be collected and analyzed at a rate of 1:20 samples for the above parameters, and equipment blanks will be collected daily for each equipment setup for VOCs, PFAS, and 1,4-dioxane. Trip blanks will be included in VOC sample coolers and analyzed for VOCs. A PFAS field blank will be collected daily during PFAS sampling. Table 1 summarizes the field and QA/QC samples proposed for collection under the groundwater sampling program.

Groundwater results for VOCs will be compared to the NYSDEC Ambient Water Quality Standards presented in Technical and Operational Guidance Series 1.1.1 NYCRR Part 703. Groundwater results for PFAS and 1,4-dioxane will be compared to the New York State Department of Health (NYSDOH) current proposed maximum contaminant levels (MCLs) for each compound.

Groundwater sampling equipment (e.g., down-hole pumps) will be decontaminated between samples by washing equipment with an Alconox® solution or 7th Generation Free & Clear dish soap followed by a water rinse. Only deionized (DI) PFAS-free water provided by the laboratory will be utilized in the decontamination process. Equipment blanks will be collected and analyzed, as stated above, to verify the completeness of the decontamination process. Purge water and decontamination water will be managed as described in Section 3.6.

3.4 Surface Water Sampling

Two rounds of surface water sampling have been included in this scope of work. Surface water samples will only be collected following a review of the analytical results from the first groundwater sampling event, if the data indicates potential for CVOC plume migration into/under the river from OU-2. A possible second surface water sampling event may be completed approximately six months later based on consultation and approval from NYSDEC to confirm the results of the first event or provide data from different seasonal or river flow conditions.

Surface water samples will be collected from the shoreline immediately east of RC-101 and RC-104 as shown on Figure 3. Surface water samples will be collected from the same locations during each event; however, the downstream sample east of RC-101 will be collected first. Samples will be collected standing onshore using a direct dipping method. Where possible, dedicated equipment will be used; any non-dedicated sampling apparatus in contact with the water will be decontaminated between sampling locations. Surface water quality field parameters (temperature, pH, conductivity, oxidation reduction potential, dissolved oxygen, and turbidity) will be measured at the time of sampling using a water quality meter. In addition, GPS coordinates, site conditions, weather, and any other pertinent information will be recorded from each sampling location.

Surface water samples will be analyzed for TCL VOCs via EPA SW-846 Method 8260C. For QA/QC purposes, duplicate samples and MS/MSD samples will be collected from each sampling event, equipment blanks will be collected for each equipment setup, and trip blanks will be included in each sample cooler.

3.5 Vapor Intrusion Sampling Program

A Vapor Intrusion (VI) investigation will be completed to evaluate the potential for soil vapor intrusion in up to five commercial/industrial office buildings and seven residences in areas potentially impacted by site-related contamination. Recommendations to mitigate exposures to soil vapor intrusion will be made, as appropriate following a review of the analytical results. The proposed sampling locations are shown on Figure 4. Actual sample locations within commercial buildings may vary pending the use of the building areas.

The soil vapor sampling will be completed pursuant to the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (2006). The VI investigation will include collection of three types of air samples 1) co-located first floor indoor air and basement/crawl space vapor samples, 2) sub-slab vapor samples, and 3) outdoor ambient air samples, for analysis of VOCs. Samples will be collected during the 2019-2020 heating season, when vapor intrusion would likely be most significant.

A building survey and chemical inventory will be completed prior to sampling. This survey will also identify conditions that may affect the results of the proposed investigation, including potential indoor air sources for VOCs. An "Indoor Air Quality Questionnaire and Building Inventory" form (NYSDOH 2006) will be completed during the survey using visual observations and information obtained from the building owner and/or tenants. If this initial survey identifies any items that could potentially impact the results of the VI sampling, the sources will be removed, and the sampling should be postponed for a period of time. A copy of the "Indoor Air Quality Questionnaire and Building Inventory" form is included as Attachment B.

Additionally, the visual inspection and interview with property owners/tenants will also be used to identify any subsurface utilities which may be present. Dig-Safe mark-outs will be reviewed as well for residential sampling. For slab-on-grade or industrial/commercial facilities, a geophysical subsurface investigation in the vicinity of each proposed sub-slab vapor sample will also be completed as a precautionary measurement.

In general, one sub-slab sample will be collected from beneath the concrete slab in the basement, or beneath the slab on grade if the structure does not have a basement. Sub-slab samples will each be collected from temporary sampling points installed into bare concrete (unfinished surface) that do not require re-finishing (e.g., replacing carpet). Sample locations will avoid cracks or openings in the floor, and sub-slab utilities (water and gas lines). A tracer gas test will also be completed at each location to evaluate the integrity of the seal between the sample tubing and concrete floor. Upon completion of VI sampling and after verifying that no further sub-slab vapor samples will be collected, the hole will be abandoned and sealed with cement concrete mix.

If a resident or commercial/industrial business denies access to conduct indoor air/ sub-slab samples, or if conditions of the slab construction or subsurface conditions preclude the ability to collect sub-slab samples, a temporary soil vapor point will be installed outside either within the property limits near the building or within the ROW closest to the building. Outside soil vapor point locations will be discussed with NYSDEC in advance of installations. A slide hammer or equivalent will be used to advance soil vapor points in accessible areas (e.g., lawn areas). Prior to soil vapor point installation, a geophysical survey of underground utilities will be required. Similar to sub-slab samples, a tracer gas test will also be completed at each location to check for a sufficient seal. Upon completion of soil vapor sampling the hole will be abandoned, backfilled with bentonite, and restored (if necessary).

The quantity and locations for VI sampling will be determined based on a number of factors, including the presence of a basement/crawl space, the number of floors, and usage of each floor, as listed below. To the extent possible, first floor indoor air sample locations will be in the rooms directly above the basement sample locations and the inlet of the canisters will be positioned approximately three to five feet above the slab/floor (breathing zone). No indoor air samples will be collected from the second or higher floors.

- For buildings containing a basement, one basement air sample (co-located with the sub-slab sample), and one first-floor air sample will be collected.
- For buildings containing a crawl space, a crawl-space air sample and one first-floor air sample will be collected.
- For buildings with no basement or crawl space, a minimum of one indoor air sample will be collected from the first floor.
- If a building is subdivided into apartments, an indoor air sample will be collected from each apartment/dwelling provided access is granted.

Table 1 summarizes the proposed samples and identifies the necessary QA/QC samples for VI sampling.

Up to seven outdoor air samples will be taken; one sample for each day indoor samples are collected. This number may be modified based on the actual number of days needed for indoor air sampling. The outdoor ambient air samples will be collected from locations selected based on wind direction conditions at the time of sampling. Outdoor air samples will generally be collected from a location upwind of the building or other area being sampled.

Each set of VI samples (co-located sub-slab, basement breathing zone and first floor breathing zone) will be collected over a 24-hour period using 6 liter (L) stainless steel Summa canisters each equipped with a flow-controller, in-line particulate filter and vacuum gauge. All samples will be collected in individually certified canisters. Each sample will be analyzed for VOCs by EPA Method TO-15 by the NYSDEC standby lab for this project: Test America, Knoxville. Detection limits for the analyzed compound list will be requested from the laboratory prior to sampling and discussed with NYSDEC. Sample collection field forms will be used to document weather conditions at the time of sampling, record canister and flow controller identification numbers, sample start and end pressures, sample duration and sample location.

3.6 Investigation Derived Waste Disposal

Waste streams expected to be generated as part of this PDI include drilling cuttings, drilling water (e.g., rock coring fluids, fluid replacement testing, packer testing, well development water, decon water, etc.); purge water from groundwater sampling; personal protective equipment (PPE) and disposable sampling materials/supplies.

Parsons estimates approximately 6,000 gallons of water waste from drilling activities; 23 drums of soil/rock cuttings and PPE/disposable materials/supplies; and 2 drums of groundwater from subsequent sampling. To minimize the number of drums on-site, liquid waste will be managed in a single 10,000 gallon tank. Based on the estimated quantity of liquid waste, Parsons has budgeted for the mobilization/demobilization and rental of such a tank for approximately four months to account for field work duration, collection of waste characterization samples following the field work, procurement time to subcontract an appropriate waste transportation and disposal company and time to schedule a pick-up.

Soil/rock cuttings, PPE, disposable sampling materials/supplies and the groundwater from sampling will be managed using New York State Department of Transportation-approved 55-gallon 17-H type drums. The drums will be provided by the drilling subcontractor. All drums will be affixed with appropriate labeling. All rock cores will be archived on-site in rock core boxes to be provided by the drilling subcontractor.

Upon completion of waste generation, representative samples will be obtained of each waste type (e.g., solids, liquids) and submitted to Test America, Buffalo, (under direct contract with NYSDEC) for analysis of the disposal facility's requirements on an expedited turn-around. The IDW will be classified as hazardous or non-hazardous based on characterization results and will be disposed of in accordance with applicable federal, state, and local regulations. For budgeting purposes, Parsons has assumed the waste will be characterized as non-hazardous. The IDW will be managed under two mobilizations as follows:

Waste Grouping 1: (drilling and related activities, up to and including the 1st groundwater and surface water sampling event)

- One 10,000 gallon tank for liquid waste
- 23 x 55-gallon drums for soil/rock cuttings, PPE, disposable sampling materials/supplies

Waste Grouping 2: (2nd groundwater sampling/surface water sampling event)

- 2 x 55-gallon drums for liquid waste

4.0 PRE-DESIGN INVESTIGATION SUMMARY REPORT (TASK 3)

A Pre-Design Investigation Summary Report will be prepared following completion of the investigations and receipt of analytical data. This Report will be submitted to NYSDEC. Costs for up to one round of comments and re-submittal of the revised report have been included.

5.0 SCHEDULE

The work scope described herein is assumed to be completed by the third quarter 2020. The schedule estimated below assumes no significant delays due to uncontrollable circumstances or severe winter conditions.

Task/Effort	Date
NYSDEC approval/Parsons Procurement	October 2019
Field Work (including 1st groundwater sampling event)	November 2019 – January 2020
Lab Analysis and Data Validation	February 2020
Pre-Design Investigation Summary Report	March/April 2020
Field Work (including 1st groundwater sampling event)	July/August 2020

6.0 OTHER COST ASSUMPTIONS

- General:
  - A formal work plan is not needed prior to conducting any of the field activity described herein as this proposal constitutes the work plan.
  - This proposal assumes access for working in the roadway ROW and access to private or public properties will be feasible and can be obtained within a reasonable level of effort.
  - Field efforts will be conducted in Level D or modified Level D personal protection. Additional costs would apply for a higher level of protection.
  - The cost estimate assumes the rented tank for liquid IDW waste, drums, conex box and port-a-johns will be stored in the fenced/gated area adjacent to the Oswego Excess Management Flow facility and a daisy chain lock link will be used to allow Parsons and their subcontractors accesses as needed through the field work duration.

- Costs have not been included for Parsons to collect groundwater samples for parameters that are needed for the in-situ chemical treatment (ISCT) remedial alternative design. ISCT data collection will be limited to vertical profile screening for ORP, DO, conductivity, temperature and pH during slug testing. Parameters such as metals, ferric and ferrous iron, natural oxidant demand, dissolved organic carbon, etc. are expected to be collected under a future phase of work. Ideally, these samples would be collected within and around the known limits of the contaminant plume; however, since the horizontal and vertical limits of the plume have not yet been defined and the depth interval(s) of the predominant contaminant fate and transport pathways (fractures) are unknown, it is premature to collect these samples.

- Labor Estimates:
  - Two people will be on-site implementing the buddy system whenever work is being conducted at the site, unless the activities are identified as low risk (e.g., utility clearance, surveying, etc.).
  - Borehole geophysics and fluid replacement testing will be occurring simultaneous to drilling activities and will require additional field teams.
  - Two separate people have been budgeted for managing FLUTe™ liner installation and removal to minimize the occurrence of standby time by either the driller, Pace Analytical or the borehole geophysics team.
  - NYSDEC will be responsible for making the initial contacts to the commercial businesses and residential property owners to obtain access permission for VI sampling. Additional time will need to be budgeted for Parsons to complete this effort.
- Investigation Derived Waste:
  - Costs are based on the waste being characterized as non-hazardous. If characterization sampling results indicate the waste is hazardous, additional disposal costs may apply.
  - The IDW cost estimate includes rental of a conex box, or equivalent, to archive the rock core samples for up to six months until a suitable long-term storage space is identified in concurrence with NYSDEC.
- Laboratory Requirements:
  - Costs for all analytical laboratory services (with the exception of CORE DFN) will be contracted directly to NYSDEC, and costs for this work have not been included in this proposal.
  - Groundwater, surface water and VI samples will be analyzed on a standard turn-around time, whereas the packer test groundwater samples and waste characterization samples will be on a one or two day turn-around time, whichever can be accommodated by the lab.
  - Split samples (10 percent as required by DER-10) will not be collected for CORE DFN based on discussions with NYSDEC on September 27, 2019. Although the mobile laboratory's analytical methods are not accredited under the NYSDOH Environmental Laboratory Approval Program (ELAP) this requirement has been waived. The MAE method (EPA 3546) is unique to the

mobile laboratory to facilitate an expedited tun-around-time in the field and is not standard practice for laboratories extracting VOCs from soil. To achieve comparable split sample results, both laboratories would need to analyze the samples using the same extraction method.

- Data Validation:
  - Parsons will provide in-house data validation with Level IV (Category B) deliverables for: two rounds of groundwater sampling and surface water sampling; and for samples collected as part of the VI investigation.
  - Data validation will not be performed for CORE DFN (mobile lab analyses); packer test groundwater and waste characterization samples. Both the CORE DFN and packer test samples will be used as a screening tool to make field decisions. These results will not be used for compliance or risk assessment.

7.0 REFERENCES

CHA, 2011. Remedial Investigation/Remedial Alternatives Report Former Flex-O-Wire Industrial Site. Oswego, NY. ERP Site #E7-38-040 Prepared for: City of Oswego, Oswego, NY.

ENSR International, 2005. Phase I Environmental Site Assessment. Prepared for Oswego County Department of Planning and Community Development. Parcel 128.38-03-01 68 West 1st Street, Oswego, NY.

NYSDEC, November 2013. Record of Decision. 68 West First Street Operable Unit Number 2: Offsite Groundwater and Soil vapor Plumes Environmental Restoration Project. Oswego, Oswego County. Site No. E738040.

O'Brien and Gere, 2013. Supplemental Subsurface Investigation/Alternative Analysis Report Flex-O-Wire Industrial Site. 6. W. First St, Oswego, NY. ERP Site # E7-38-040.

Synapse, June 2018. Predesign Investigation Work Plan. Harbor View Square. 68 West First Street. Oswego, NY. NYS BCP Site No. C738040.

Attachment A = Generic NYSDOH Community Air Monitoring Plan included by reference but removed from this contract document for simplification.

Attachment B = Indoor Air Quality Questionnaire and Building Inventory included by reference but removed from this contract document for simplification.

TABLE 1: ANALYTICAL DATA SUMMARY, PRE-DESIGN INVESTIGATION

							QA/QC Samples								
Task	**Sample Type**	**Analysis**	**Method**	**Laboratory**	**Turn-Around-Time**	**Samples**	**Duplicate**	**Equipment Blank**	**Trip Blank**	**Field Blank**	**MS**	**MSD**	**Methanol Blank**	Total	Deliverable
[1]Core DFN	Rock Matrix	PCE	EPA Method 8260C	Pace Analytical (on-site)	Real-time, Field	120	6	6	0	0	6	6	6	150	Level IV (Category B)
	Rock Matrix	TCE	EPA Method 8260C	Pace Analytical (on-site)	Real-time, Field	120	6	6	0	0	6	6	6	150	Level IV (Category B)
	Rock Matrix	Vinyl Chloride	EPA Method 8260C	Pace Analytical (on-site)	Real-time, Field	120	6	6	0	0	6	6	6	150	Level IV (Category B)
	Rock Matrix	1,1-DCE	EPA Method 8260C	Pace Analytical (on-site)	Real-time, Field	120	6	6	0	0	6	6	6	150	Level IV (Category B)
	Rock Matrix	cis-1,2-DCE	EPA Method 8260C	Pace Analytical (on-site)	Real-time, Field	120	6	6	0	0	6	6	6	150	Level IV (Category B)
	Rock Matrix	trans-1,2-DCE	EPA Method 8260C	Pace Analytical (on-site)	Real-time, Field	120	6	6	0	0	6	6	6	150	Level IV (Category B)
	Rock Matrix	Bulk Density	ASTM Method D7263	Pace Analytical (subcontracted lab, off-site)	Standard	9	0	0	0	0	0	0	0	9	Level II
	Rock Matrix	Porosity	ASTM Method D7263	Pace Analytical (subcontracted lab, off-site)	Standard	9	0	0	0	0	0	0	0	9	Level II
	Rock Matrix	Water Content	ASTM Medod D2216	Pace Analytical (subcontracted lab, off-site)	Standard	9	0	0	0	0	0	0	0	9	Level II
	Rock Matrix	Total Organic Carbon (TOC)	Walkley and Black Wet Oxidation Method	Pace Analytical (subcontracted lab, off-site)	Standard	9	0	0	0	0	0	0	0	9	Level II
	Rock Matrix	Specific Gravity	ASTM Method D854	Pace Analytical (subcontracted lab, off-site)	Standard	9	0	0	0	0	0	0	0	9	Level II
[2]Packer Testing	Groundwater	TCL VOCs	EPA Method 8260C	Test America, Buffalo	Expedited, 24-hour	10	1	1	4	0	1	1	0	18	Level IV (Category B)
[3]Groundwater Sampling	Groundwater	TCL VOCs	EPA Method 8260C	Test America, Buffalo	Standard	24	2	2	10	0	2	2	0	42	Level IV (Category B)
	Groundwater	PFAS	Modified EPA Method 537	Test America, Buffalo	Standard	10	2	4	0	4	2	2	0	24	Level IV (Category B)
	Groundwater	1,4-dioxane	EPA Method SIM 8270D	Test America, Buffalo	Standard	10	2	2	0	0	2	2	0	18	Level IV (Category B)
Surface Water Sampling	Surface Water	TCL VOCs	EPA Method 8260C	Test America, Buffalo	Standard	4	2	2	2	0	2	2	0	14	Level IV (Category B)
[4]Vapor Intrusion	Vapor/Air	VOCs	EPA Method TO-15	Test America, Knoxville	Standard	48	3	0	0	0	0	0	0	51	Level IV (Category B)

TABLE 1: ANALYTICAL DATA SUMMARY, PRE-DESIGN INVESTIGATION

Task	Sample Type	Analysis	Method	Laboratory	Turn-Around-Time	Samples	QA/QC Samples: Duplicate	QA/QC Samples: Equipment Blank	QA/QC Samples: Trip Blank	QA/QC Samples: Field Blank	QA/QC Samples: MS	QA/QC Samples: MSD	Methanol Blank	Total	Deliverable
Waste Characterization	Soil	TCLP	EPA Method 1311	Test America, Buffalo	Expedited, 48-hour	3	0	0	0	0	0	0	0	3	Level II
	Soil	TCLP Volatiles	EPA Method 8260C	Test America, Buffalo	Expedited, 48-hour	3	0	0	0	0	0	0	0	3	Level II
	Soil	TCLP Semivolatiles	EPA Method 8270D	Test America, Buffalo	Expedited, 48-hour	3	0	0	0	0	0	0	0	3	Level II
	Soil	TCLP Pesticides	EPA Method 8081	Test America, Buffalo	Expedited, 48-hour	3	0	0	0	0	0	0	0	3	Level II
	Soil	TCLP Chlorinated Herbicides	EPA Method 8151	Test America, Buffalo	Expedited, 48-hour	3	0	0	0	0	0	0	0	3	Level II
	Soil	TCLP Metals	EPA Method 6010C/7470	Test America, Buffalo	Expedited, 48-hour	3	0	0	0	0	0	0	0	3	Level II
	Soil	PCBs	EPA Method 8082	Test America, Buffalo	Expedited, 48-hour	3	0	0	0	0	0	0	0	3	Level II
	Soil	Corrosivity	EPA Method 9045	Test America, Buffalo	Expedited, 48-hour	3	0	0	0	0	0	0	0	3	Level II
	Soil	Ignitability	EPA Method 1030	Test America, Buffalo	Expedited, 48-hour	3	0	0	0	0	0	0	0	3	Level II
	Soil	Reactivity	EPA Method 7.3.3.2/7.3.4.2	Test America, Buffalo	Expedited, 48-hour	3	0	0	0	0	0	0	0	3	Level II
	Water	TCL Volatiles	EPA Method 8260C	Test America, Buffalo	Expedited, 48-hour	3	0	0	0	0	0	0	0	3	Level II
	Water	TCL Semivolatiles	EPA Method 8270D	Test America, Buffalo	Expedited, 48-hour	3	0	0	0	0	0	0	0	3	Level II
	Water	Pesticides	EPA Method 8081	Test America, Buffalo	Expedited, 48-hour	3	0	0	0	0	0	0	0	3	Level II
	Water	Herbicides	EPA Method 8151	Test America, Buffalo	Expedited, 48-hour	3	0	0	0	0	0	0	0	3	Level II
	Water	Total Cyanide	SW 9012	Test America, Buffalo	Expedited, 48-hour	3	0	0	0	0	0	0	0	3	Level II
	Water	PCBs	EPA Method 8082	Test America, Buffalo	Expedited, 48-hour	3	0	0	0	0	0	0	0	3	Level II
	Water	TCL Metals	EPA Method 6010C/7460	Test America, Buffalo	Expedited, 48-hour	3	0	0	0	0	0	0	0	3	Level II
	Water	Corrosivity (pH)	EPA Method 9040	Test America, Buffalo	Expedited, 48-hour	3	0	0	0	0	0	0	0	3	Level II
	Water	Flashpoint	EPA Method 1010	Test America, Buffalo	Expedited, 48-hour	3	0	0	0	0	0	0	0	3	Level II
	Water	Reactivity	EPA Method 7.3.3.2/7.3.4.2	Test America, Buffalo	Expedited, 48-hour	3	0	0	0	0	0	0	0	3	Level II

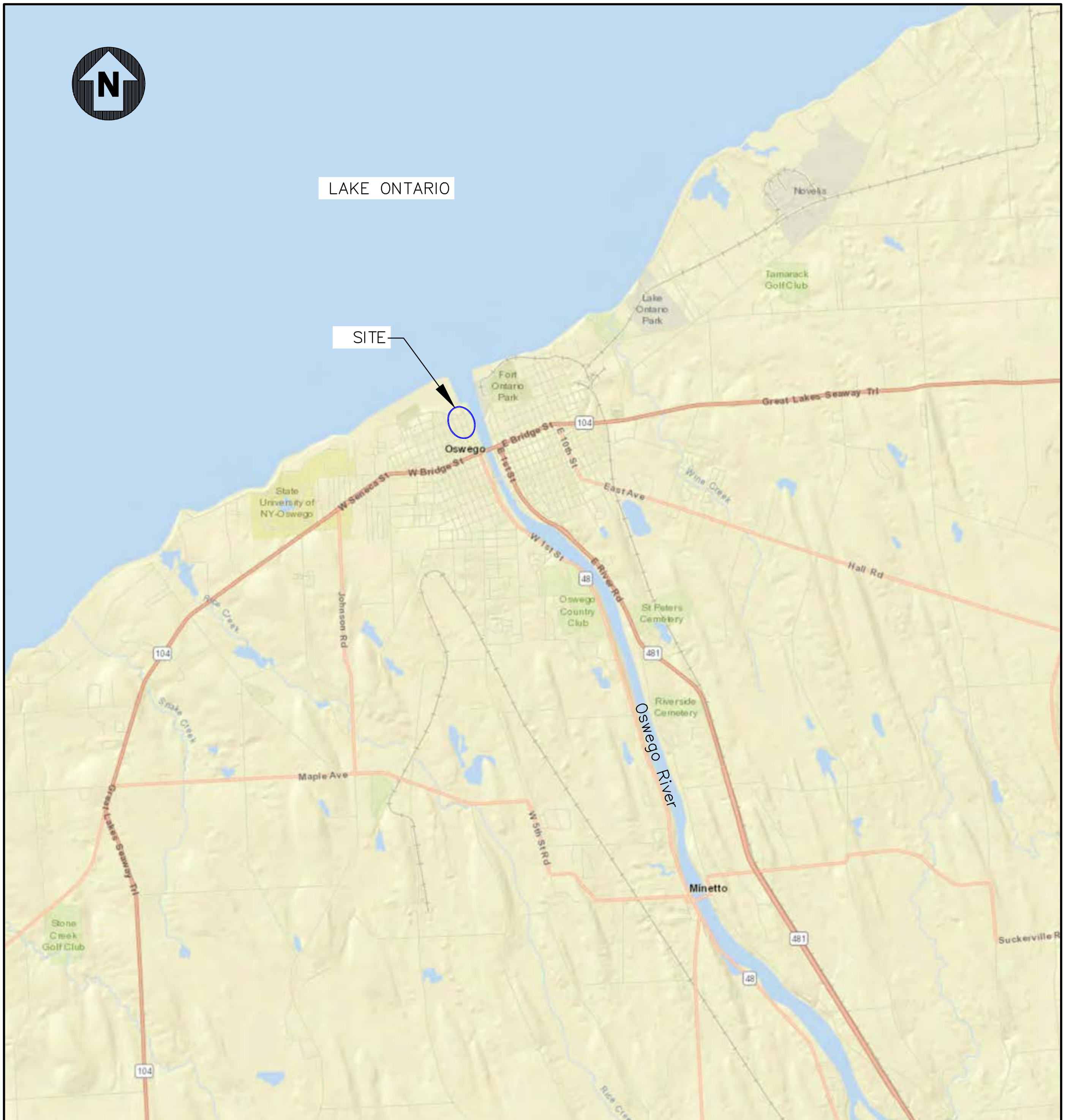
NOTES:

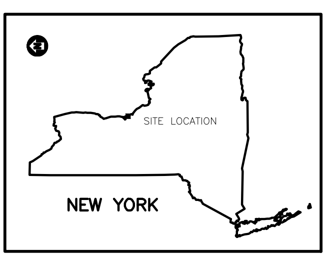
[1]Core DFN sample quantity based on one sample every 1.5 ft of bedrock core (approximately 57 ft total) at three locations for select VOCs and 1 sample every 20 feet for physical properties.

[2]Packer test sample quanity based on collecting five samples from two bedrock core locations.

[3]Groundwater sample quantity based on two sampling events, six months apart. Sampled wells will include existing shallow and deep well pairs (MW-10S/10D; MW-11S/11D; and MW-12S/12D) along with six new bedrock well locations.

[4]Vapor intrusion sample quantity based on one sub-slab vapor sample, one basement breathing zone sample, and one 1st floor breathing zone sample at each location, with approximately 12 locations. Sample count also includes seven outdoor air samples and five contingency samples.





7,000 3,500 0 3,500 14,000

SCALE: 1"=7,000'

FIGURE 1

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

HARBOR VIEW SQUARE OFF–SITE
SITE ID C738040A
OSWEGO COUNTY, NY

SITE LOCATION MAP

PARSONS

301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, NY 13212 * 315–451–9560

FILE NAME: P:\NYSDEC PROGRAM\451802 – WA #41 – HARBOR VIEW OS RD\10.0 TECHNICAL CATEGORIES\CAD\451802–SLM.DWG
PLOT DATE: 8/2/2019 12:40 PM PLOTTED BY: RUSSO, JILL

LEGEND:

- EXISTING SHALLOW BEDROCK MONITORING WELL
- EXISTING INTERMEDIATE BEDROCK MONITORING WELL
- HARBOR VIEW SQUARE OPERABLE UNIT No. 1 SITE BOUNDARY
- TAX PARCEL BOUNDARIES

NOTES:

1. HARBOR VIEW SQUARE– OFF–SITE IS CONSIDERED OPERABLE UNIT No. 2 AND IS LOCATED OUTSIDE THE LIMITS SHOWN FOR OU–1.

100 50 0 100 200

SCALE: 1"=100'

FIGURE 2

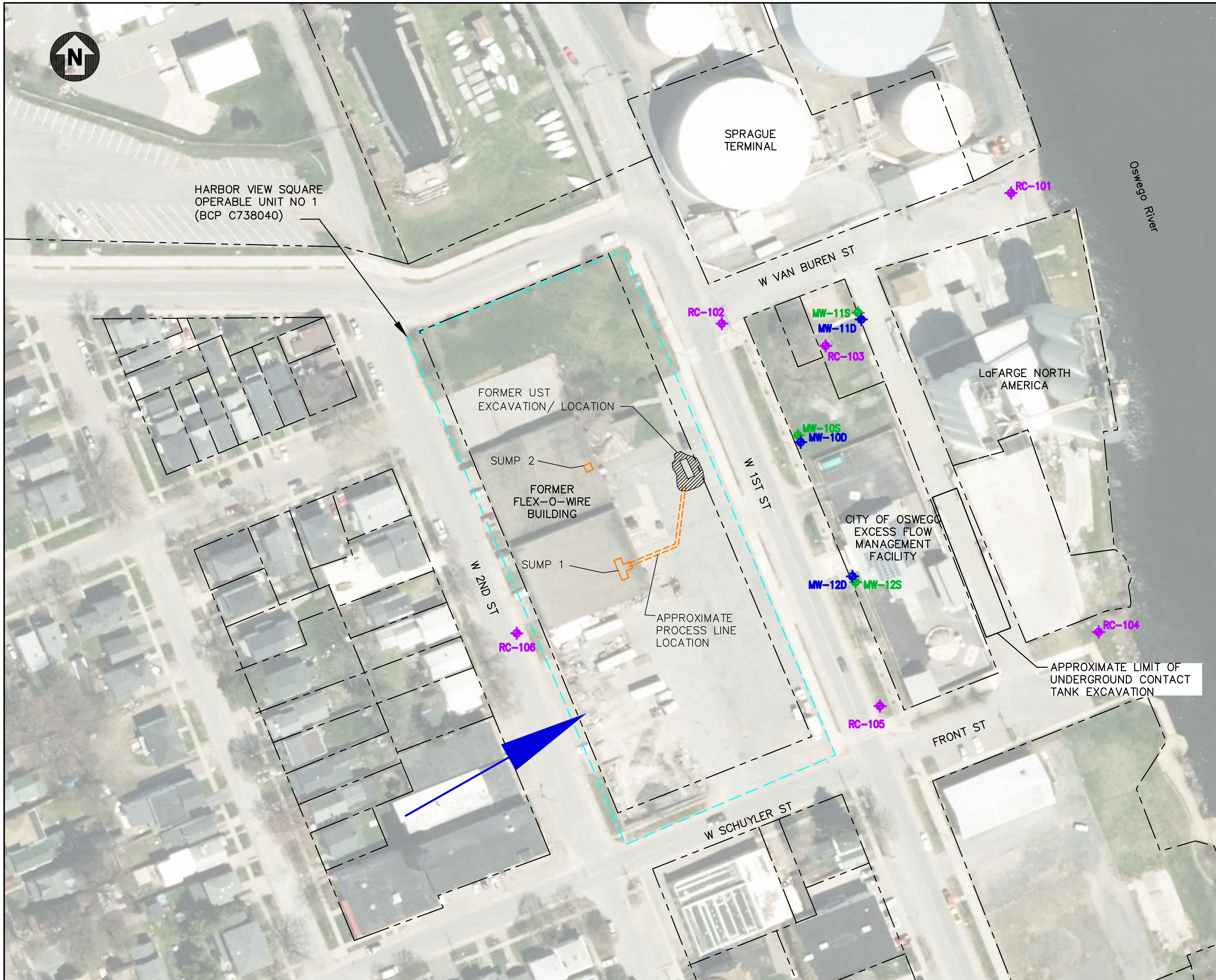
NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

HARBOR VIEW SQUARE OFF–SITE
SITE ID C738040A
OSWEGO COUNTY, NY

SITE MAP

PARSONS
301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, NY 13212 • 315–451–9560

FILE NAME: P:\NYSDEC PROGRAM\451802 – WA #41 – HARBOR VIEW OS RD\10.0 TECHNICAL CATEGORIES\CAD\451802–SK001.DWG
PLOT DATE: 8/9/2019 11:00 AM PLOTTED BY: RUSSO, JILL



LEGEND:

- PROPOSED BEDROCK BORING LOCATIONS
- EXISTING SHALLOW BEDROCK MONITORING WELL
- EXISTING INTERMEDIATE BEDROCK MONITORING WELL
- HARBOR VIEW SQUARE OPERABLE UNIT No. 1 SITE BOUNDARY
- TAX PARCEL BOUNDARIES
- GROUNDWATER FLOW DIRECTION

NOTES:

1. HARBOR VIEW SQUARE– OFF–SITE IS CONSIDERED OPERABLE UNIT No. 2 AND IS LOCATED OUTSIDE THE LIMITS SHOWN FOR OU–1.
2. FIELD CONDITIONS AND TESTING WILL BE USED TO DETERMINE THE FINAL DEPTH OF EACH LOCATION; THE DEPTH INTERVAL TO SET THE WELL SCREEN; AND THE NEED FOR ADDITIONAL SHALLOW, INTERMEDIATE AND/OR DEEP WELL PAIRS.

100 50 0 100 200

SCALE: 1"=100'

FIGURE 3

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

HARBOR VIEW SQUARE OFF–SITE
SITE ID C738040A
OSWEGO COUNTY, NY

PROPOSED BEDROCK BORING LOCATIONS

PARSONS
301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, NY 13212 * 315–451–9560

FILE NAME: P:\NYSDEC PROGRAM\451802 – WA #41 – HARBOR VIEW OS RD\10.0 TECHNICAL CATEGORIES\CAD\451802–SK001.DWG
PLOT DATE: 9/24/2019 1:05 PM PLOTTED BY: RUSSO, JILL

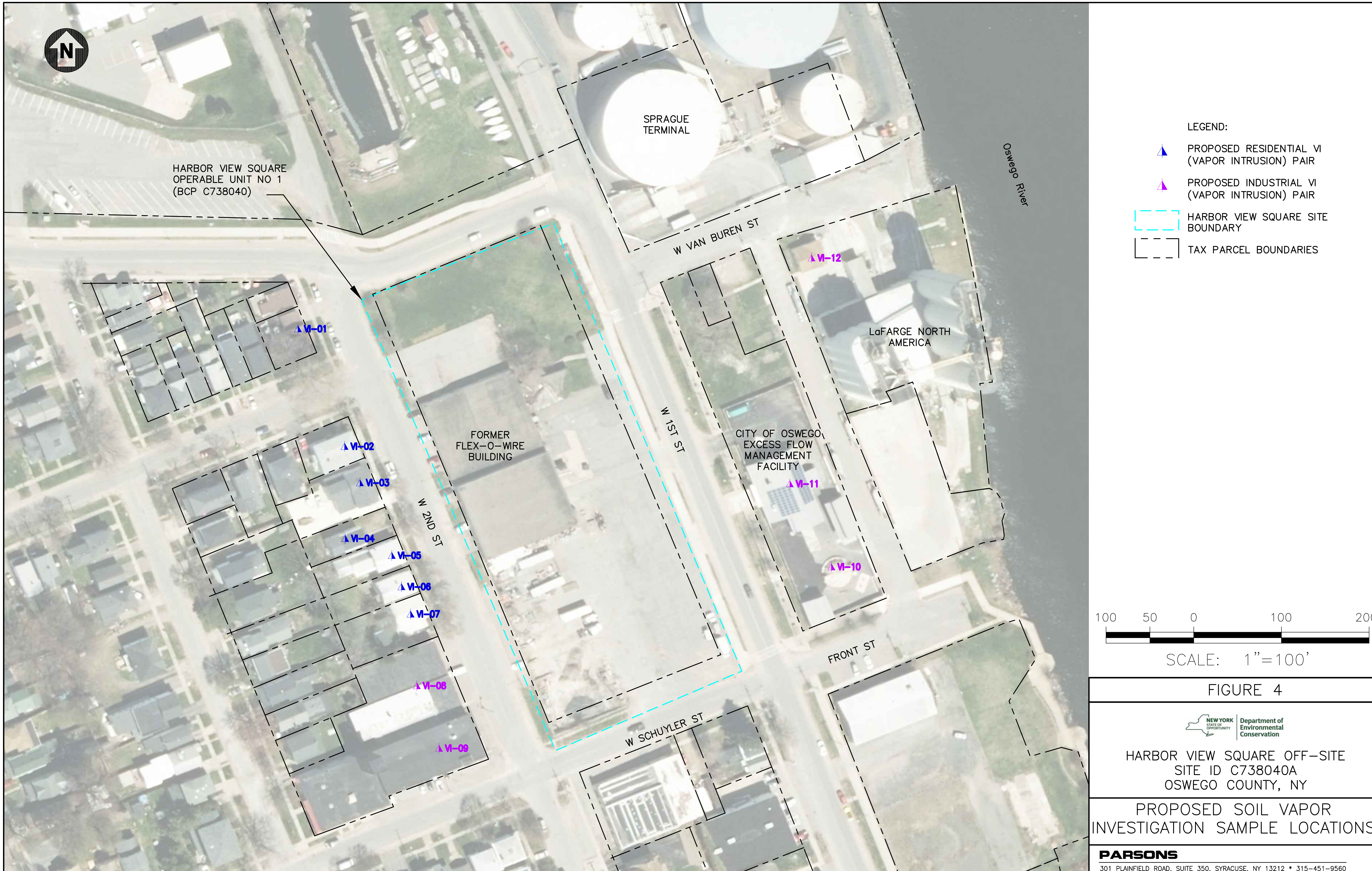


FIGURE 4

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

HARBOR VIEW SQUARE OFF–SITE
SITE ID C738040A
OSWEGO COUNTY, NY

PROPOSED SOIL VAPOR
INVESTIGATION SAMPLE LOCATIONS

PARSONS
301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, NY 13212 * 315–451–9560

FILE NAME: P:\NYSDEC PROGRAM\451802 – WA #41 – HARBOR VIEW OS RD\10.0 TECHNICAL CATEGORIES\CAD\451802-SK001.DWG
PLOT DATE: 8/9/2019 11:28 AM PLOTTED BY: RUSSO, JILL