Allied Chemical - Willis Avenue Site

Subsite of the Onondaga Lake Superfund Site

Geddes, Onondaga County, New York

July 2019 *Region 2*

PURPOSE OF THIS DOCUMENT

This Proposed Plan describes the remedial alternatives considered for soil/fill material and shallow and intermediate groundwater at the Willis Avenue subsite (Subsite) and identifies the preferred remedial alternative with the rationale for this preference.

This Proposed Plan was developed by the New York State Department of Environmental Conservation (NYSDEC) and the U.S. Environmental Protection Agency (EPA) in consultation with the New York State Department of Health (NYSDOH). NYSDEC and EPA are issuing this Proposed Plan as part of their public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, and Sections 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), as well as the New York State Environmental Conservation Law (ECL) and Title 6 New York Code of Rules and Regulations (NYCRR) Part 375. The nature and extent of the contamination at the Subsite is described in the *Remedial Investigation Willis Avenue Chlorobenzene Site* (RI) and the remedial alternatives summarized in this Proposed Plan are described in the *Willis Avenue Site Feasibility Study Report* (FS), contained in the Administrative Record file for this Subsite. NYSDEC and EPA encourage the public to review these documents to gain a more comprehensive understanding of the Subsite and the Superfund activities that have been conducted at the Subsite.

This Proposed Plan is being provided as a supplement to the reports listed above to inform the public of NYSDEC and EPA's preferred remedy and to solicit public comments pertaining to all the remedial alternatives evaluated, including the preferred alternative.

NYSDEC and EPA's preferred alternative includes the installation of a one-foot thick soil cover that would be protective for current and/or reasonably anticipated future land uses where shallow soil concentrations are above 6 NYCRR Part 375 Soil Cleanup Objectives (SCOs) for commercial use and targeted shallow/intermediate groundwater hydraulic control and mercury hot spot treatment/removal at the former mercury cell building. Dense non-aqueous phase liquid (DNAPL) evaluation and recovery (if present), development of a Site Management Plan (SMP), implementation of institutional controls, and long-term maintenance and monitoring are also components of the remedy.

The remedy described in this Proposed Plan is the preferred remedy for the Subsite. Changes to the preferred remedy, or a change from the preferred remedy to another remedy, may be made if public comments or additional data indicate that such a change will result in a more appropriate remedial action. The final decision regarding the remedy will be made after NYSDEC and EPA have taken into consideration all public comments. NYSDEC and EPA are soliciting public comment on all the alternatives considered in the Proposed Plan and in the detailed analysis section of the *Willis Avenue Feasibility Study* report because NYSDEC and EPA may select a remedy other than the preferred remedy.

MARK YOUR CALENDAR

July 21, 2019 – August 20, 2019: *Public comment period on the Proposed Plan.*

Public Meeting
Tuesday August 6, 2019 at 7:00 PM
Open House *from 5:00 - 6:00 PM*

Geddes Town Hall Courtroom
1000 Woods Road, Solvay, NY 13209 (enter through atrium doors

Community Role in the Selection Process

NYSDEC and EPA rely on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. To this end, this Proposed Plan has been made available to the public for a public comment period which begins on July 21, 2019 and concludes on August 20, 2019.

As noted above, a public meeting and an open house will be held during the comment period to elaborate on the reasons for recommending the preferred remedy and to receive public comments. The public meeting will include a formal presentation by NYSDEC of the preferred remedy and other cleanup options for the Subsite.

The open house will be less formal and provides the public a chance to receive printed information and discuss the cleanup options with NYSDEC and EPA representatives on a one-on-one basis.

Comments received at the public meeting and in writing during the comment period will be documented in the Responsiveness Summary Section of the Record of Decision (ROD), the document that formalizes the selection of the remedy.

Written comments on this Proposed Plan should be addressed to:

Tracy A. Smith
NYS Department of Environmental Conservation
625 Broadway
Albany, NY 12233-7013
E-mail: tracy.smith@dec.ny.gov

INFORMATION REPOSITORIES

The administrative record file, which contains copies of the Proposed Plan and supporting documentation are available at the following locations:

Onondaga County Public Library
Syracuse Branch at the Galleries
447 South Salina Street
Syracuse, NY 13204
315-435-1800

Solvay Public Library
615 Woods Road
Solvay, NY 13209
315-468-2441

Atlantic States Legal Foundation
658 West Onondaga Street
Syracuse, NY 13204
315-475-1170

New York State Department of Environmental Conservation
615 Erie Boulevard, West
Syracuse, NY 13204
315-426-7400

New York State Department of Environmental Conservation
Attn.: Tracy A. Smith
625 Broadway
Albany, NY 12233-7013
518-402-9676

SUBSITE BACKGROUND

On June 23, 1989, the Onondaga Lake site was added to the New York State Registry of Inactive Hazardous Waste Disposal Sites. On December 16, 1994, Onondaga Lake, its tributaries and the upland hazardous waste sites which have contributed or are contributing contamination to the lake (subsites) were added to EPA's National Priorities List (NPL). This NPL listing means that the lake system is among the nation's highest priorities for remedial evaluation and response under the federal Superfund law for sites where there has been a release of hazardous substances, pollutants, or contaminants.

In 1990, Honeywell and NYSDEC entered into an Administrative Consent Order (ACO) to conduct a remedial investigation/feasibility study (RI/FS) at the Subsite. The Subsite, which is a part of the Onondaga Lake NPL site and is listed as a Class "2" site in the New York State Registry of Inactive Hazardous Waste Disposal Sites (a Class 2 site represents a significant threat to public health or the environment; action is required), consists of media including soil/fill material and shallow and intermediate groundwater. Deep groundwater at this and adjacent subsites (*i.e.,* Wastebeds 1-8, Semet Residue Ponds, Wastebed B/Harbor Brook) are being evaluated by the potentially responsible party, Honeywell International Inc., and will be addressed separately as part of a regional unit.

Subsite Description and History

Location: The Subsite, which is located south of Onondaga Lake in Geddes, New York, consists, primarily, of the Willis Plant Area situated at the corner of State Fair Boulevard and Willis Avenue and the Lakeshore Property, a portion of property between I-690 and Onondaga Lake. Two other areas of the Subsite, the Chlorobenzene Hot-Spot Area (CHSA) and the Petroleum Storage Area (PSA), are located to the south of the Willis Plant Area. See Figure 1, Site Location.

Subsite Features: The Willis Plant Area includes a groundwater treatment plant (GWTP), staged soil piles, and fenced-in areas. The Lakeshore Property, CHSA, and PSA are currently vacant. A site plan is included as Figure 2. Surface water drainage structures and storm sewers related to I-690 are also present.

Subsite Geology and Hydrogeology: The local geology for the Willis Plant Area, Lakeshore Property, CHSA, and PSA consists of soil and fill material (including Solvay waste[1]) overlying marl/peat, silt, clay, fine-grained sand/basal sand, gravel, till, and bedrock.

[1] Solvay waste is an inorganic waste material from the production of soda ash [sodium carbonate] using the Solvay process.

The Subsite has three distinct groundwater zones:

- A shallow zone within the soil/fill layer and underlying Solvay waste (where present);
- An intermediate zone within the marl/peat layer; and
- A deep zone that encompasses the silt and fine-grained sand deposits and the basal sand and gravel deposits (when present) located below the silt and clay confining unit.

The elevation of the shallow zone ranges from a minimum elevation of approximately 350 feet (ft.) above mean sea level (amsl) along the lake shore to 405 ft. amsl at the CHSA. The maximum thickness of this unit is approximately 40 ft., with an average thickness of approximately 15 ft. The marl unit ranges from 330 ft. amsl to 365 ft. amsl. The maximum thickness of the marl is approximately 20 ft. near the lake and the average thickness is approximately 10 ft. The marl pinches out on the southern side of the Willis Plant Area and is not present at the PSA and CHSA. The deep sand and gravel zone ranges from 260 ft. amsl to 335 ft. amsl, with the deep elevations being closer to Onondaga Lake. This zone has a maximum thickness of approximately 10 ft. and an average thickness of approximately 5 ft. This layer pinches out moving away from the lake and is not present at the PSA or CHSA.

Shallow and intermediate groundwater generally flowed toward and discharged into Onondaga Lake prior to the installation of the Semet/Willis Barrier Wall Interim Remedial Measure (IRM).[2] Shallow groundwater also discharged to Tributary 5A prior to installation of the Shallow Groundwater Remedial Action in Tributary 5A under the Semet Residue Ponds 2002 ROD. That groundwater is now collected and treated prior to discharge.

There is an upward vertical gradient on the Lakeshore Property from the deep groundwater to the intermediate groundwater and Onondaga Lake; however, due to the low hydraulic conductivity of the silt and clay confining layer above the deep groundwater zone, there is little deep groundwater movement vertically through this confining layer to the intermediate groundwater and Onondaga Lake. Deep groundwater contains a naturally-occurring halite brine.

History of the Subsite: The approximately 19.6-acre former Willis Plant Area portion of the Subsite was used historically to produce chlorinated benzene products from benzene. The facility operated from 1918 to 1977. Additionally, the plant produced caustic potash (potassium hydroxide), caustic soda (sodium hydroxide), and chlorine gas by the electrolysis of brine solution in diaphragm and mercury cells. Former site buildings are shown on Figure 3.

The Lakeshore Property historically contained a causeway used as a docking facility for barges transporting products and supplies during plant operation and was recently used for the staging of capping materials for the remediation of Onondaga Lake.

The approximately 1.8-acre PSA is located to the southwest of the Willis Plant Area. From 1915 to 1970, a facility located on the PSA distilled coke light oil to produce benzene, toluene, xylenes, and naphthalene. The facility was demolished in 1973. Most recently, this area was used for the storage of No. 2 fuel oil in oil storage tanks by Honeywell (formerly Allied Chemical). These oil storage tanks were dismantled during the closure of the Main Plant in 1986.

The CHSA is an approximately 1.9-acre area situated to the south of the Willis Plant Area and the PSA along Industrial Drive. Historically, a former pipeline traversed this area and conveyed chlorobenzene residual waste from the Willis Plant Area to the former Main Plant Site Area. Benzenes and chlorobenzenes encountered in the CHSA are attributed to leakage from this former pipeline.

The PSA and CHSA are in an area surrounded by other active chemical manufacturing/processing facilities, power plants, and an active railroad.

Interim Remedial Measures and Relevant Remedial Actions: Various IRMs have been implemented at the Subsite, commencing in the early 1990s. The IRMs and relevant remedial actions (e.g., Tributary 5A) related to this Subsite are detailed below and are presented on Figure 4. The IRMs and remedial actions described below primarily prevent migration

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[2] The term “IRM” describes an activity that is necessary to address either emergency or non-emergency site conditions, which in the short term, need to be undertaken to prevent, mitigate or remedy environmental damage or the consequences of environmental damage attributable to a site. An IRM is equivalent to a non-time critical removal under the CERCLA removal program pursuant to 40 CFR Part 300.415(b)(2).

of DNAPL and/or contaminated groundwater to Onondaga Lake. In addition, contaminated soils from these IRMs and remedial actions were excavated and disposed off-site or placed on the Willis Plant Area in piles. Following consolidation, these soil piles were graded and seeded (see Staged Soil Piles section below). The IRMs and remedial actions included:

- Onondaga Lakeshore Property Chlorinated Benzenes Recovery IRM – A chlorinated benzene DNAPL collection system that includes recovery wells was installed in 1995 at the Lakeshore Property to prevent DNAPL migration to Onondaga Lake. This system was upgraded in 2002 and then upgraded again in 2012. Additional upgrades are being performed. DNAPL collected in this system is disposed of off-site at a permitted hazardous waste facility.
- Willis-Semet Lakeshore Hydraulic Containment System IRM – The Willis Avenue segment of the Willis-Semet Lakeshore Hydraulic Containment System (LHCS) IRM was installed in 2008 and 2009 to prevent migration of impacted shallow and intermediate groundwater to Onondaga Lake. The Willis Avenue portion of this IRM consists of approximately 1,300-ft of barrier wall and groundwater collection system along the Onondaga Lake shoreline. Groundwater collected from this system is treated at the Willis Avenue GWTP. The Willis Avenue GWTP, installed in 2006 and upgraded three times since then, treats groundwater collected from this and nearby Onondaga Lake subsites.
- I-690 Storm Drainage System Investigation and Rehabilitation (Eastern and Western Portions) IRM – Groundwater observed to be infiltrating into storm water sewers along I-690 and State Fair Boulevard was mitigated by the I-690 Storm Drainage System IRM. Work included separating groundwater and storm water; cleaning and inspection of pipes; epoxy coating of catch basins/manholes; and lining of pipes. Groundwater collected by this system is treated at the Willis Avenue GWTP.
- East Flume IRM – This IRM redirected, via a new 48-inch outfall pipe, storm water and non-contact cooling water that previously discharged to the East Flume directly to Onondaga Lake (the East Flume was subsequently backfilled under IRMs associated with the Wastebed B/Harbor Brook Subsite). In addition, an historical storm sewer that traversed the Subsite and discharged to Onondaga Lake was re-routed around the Subsite and redirected into this 48-inch outfall. The discharge from this outfall is regulated under a State Permit Discharge Elimination System permit.
- Willis-Semet Berm Site Improvements IRM – In 2012, berm material from select impacted areas was excavated and replaced with clean fill/topsoil prior to application of 6-inches of topsoil. In total, between 12- and 24-inches of clean fill and topsoil was placed. Native species (*e.g.,* grass, trees and shrubs) were introduced after the topsoil was applied.
- Tributary 5A (Semet Residue Ponds Shallow Groundwater Remedial Action) – Although investigated as part of the Subsite, to remedy impacts to sediment and surface water in a drainage ditch called Tributary 5A that discharges to Onondaga Lake, a shallow groundwater collection system was installed in 2010 to 2012 adjacent to and beneath Tributary 5A in connection with the remedy selected in a 2002 ROD for the adjacent Semet Residue Ponds Subsite. As part of this remedial action, sediment in Tributary 5A was removed and an isolation layer was installed. Groundwater collected by this system is treated at the Willis Avenue GWTP. Monitoring of sediments and surface water in the tributary is being performed under the Tributary 5A remedy.

Current Zoning and Land Use: The Subsite is zoned for industrial use and is bounded by commercial and industrial properties. The current and reasonably anticipated future land uses for the Subsite are industrial and commercial (including passive recreational[3]). The anticipated future use of the Lakeshore Property (north of I-690) will include construction of paved roads and trails for passive recreational use as part of the Onondaga County West Shore Trail Extension and future access/use of the Southwest Lakeshore Area. It is reasonably anticipated that the portions of the property south of I-690 (Willis Plant Area, CHSA, and PSA) will continue to be used for commercial (*e.g.,* parking for the State Fair) or industrial purposes.

[3] Based on NYSDEC's *Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation* (DER-10) passive recreation includes recreational uses with limited potential for soil contact (*e.g.,* artificial surface fields; outdoor tennis or basketball courts; other paved recreational facilities used for roller hockey, roller skating, shuffleboard, etc.; outdoor pools; indoor sports or recreational facilities; golf courses; and paved bike or walking paths).

RESULTS OF THE REMEDIAL INVESTIGATION

To delineate the nature and extent of contamination, the analytical results from the RI sampling (collected prior to the construction of the IRMs) were compared to the respective SCOs provided in 6 NYCRR Part 375 *Environmental Remediation Programs* applicable to each land use type, including the Commercial-Use SCOs (which includes passive recreational uses, such as walking trails), Industrial-Use SCOs, and Unrestricted-Use SCOs. The Unrestricted-Use SCOs represent the concentrations of constituents in soil which, when achieved at a site, are sufficiently low so that no restrictions for soil are required on the site for the protection of public health, groundwater and ecological resources. Additional information can be found in the RI Report. Tables 1 through 6 summarize the Commercial-Use SCOs and Industrial-Use SCOs exceedances in shallow and subsurface soil/fill material for the Subsite areas.

Former Mercury Cell Building

Floor trenches associated with operations at the Former Mercury Cell Building remain in the subsurface. These consist of four trenches that conveyed spent mercury to a fifth trench, which in turn, conveyed the spent mercury to a sump located in a former pump room. These features exist between approximately 3 and 6 ft below ground surface (bgs). During test pitting conducted as part of a treatability study in May 2019, the floor trenches were observed to contain fill material exhibiting free elemental mercury. Approximately 450 cubic yards of contaminated material is associated with the floor trenches.

Shallow Soil/Fill Material (0 to 2 ft. bgs)

Volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans (PCDD/Fs), and inorganics were detected in shallow soil/fill material on the Subsite as described below. The data were compared to the SCOs for Industrial, Commercial, and Unrestricted Uses.

<u>Willis Plant Area</u>

VOCs, SVOCs, pesticides, PCBs, PCDD/Fs, and inorganics were detected in shallow soil/fill material on-site. The contaminants of concern (COCs) that exceed the Unrestricted-Use SCOs predominantly include polycyclic aromatic hydrocarbons (PAHs) such as benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene and indeno(1,2,3-cd)pyrene, chlorinated benzenes, mercury, and arsenic, as well as PCBs, assorted pesticides, and additional inorganics. These were observed in samples throughout the Willis Plant Area. PCDD/Fs were detected in samples of the shallow soil/fill material collected on the Willis Plant Area, and the highest concentrations were observed in samples collected within the footprint of the Former Chlorination Building.

The COCs exceeding the Industrial and Commercial-Use SCOs include 1,4-dichlorobenzene, hexachlorobenzene, PAHs, PCBs, mercury, and arsenic. The PAHs and chlorinated benzenes were detected in shallow soil samples across the Willis Plant Area. Mercury exceedances in the shallow soil/fill material were present throughout the Willis Plant Area, including on the berm located within the Subsite outside the fenced portion of the Willis Plant Area along State Fair Boulevard. The highest concentrations were observed at the Northwest Ditch, Outfall 004, and Outfall 006. Soil removals were conducted as part of the Willis-Semet Berm Site Improvements IRM. Upon completion of excavation, some of the mercury results in samples collected exceeded the Industrial and Commercial-Use SCOs for mercury, as well as the corresponding Unrestricted SCO.

Elemental mercury in Willis Plant Area subsurface soil is present as residual droplets. The estimated area of soil containing elemental mercury in the vicinity of the Former Mercury Cell Building is approximately 5,500 square feet.

<u>Chlorobenzene Hot-Spot Area</u>

VOCs, SVOCs, pesticides, PCBs, and inorganics were detected in shallow soil/fill material on the CHSA. The COCs that exceeded the SCOs for Unrestricted Use included PAHs, 1,2- and 1,4-dichlorobenzene, PCBs, and several inorganics.

PAHs (e.g., benzo(a)pyrene, benzo(b)fluoranthene), PCBs, arsenic, and mercury exceeded the SCOs for Commercial Use. PAHs and arsenic exceeded the SCOs for Industrial Use.

<u>Petroleum Storage Area</u>

VOCs, SVOCs, pesticides, PCBs, and inorganics were detected in shallow soil/fill material on the PSA. The COCs that exceeded the SCOs for Unrestricted Use included PAHs, PCBs, and inorganics.

Four PAHs, arsenic, and mercury exceeded the SCOs for Commercial Use. Two PAHs, arsenic and mercury, were found at concentrations in exceedance of the Industrial-Use SCOs.

Subsurface Soil/Fill Material (at depths greater than 2 ft. bgs)

VOCs, SVOCs, pesticides, PCBs, PCDD/Fs, and inorganics were detected in subsurface soil/fill material on the Subsite as described below. The data were compared to the SCOs for Industrial, Commercial, and Unrestricted Uses.

Willis Plant Area and Lakeshore Property

VOCs, SVOCs, pesticides, PCBs, PCDD/Fs, and inorganics were detected in subsurface soil/fill material on the Subsite. The COCs that exceeded the SCOs for Unrestricted Use predominantly included benzene, chlorinated benzenes (chlorobenzene, 1,2-, 1.3-, and 1,4-dichlorobenzene), hexachlorobenzene, PCBs, mercury and arsenic, and additional inorganics. These COCs were observed in samples throughout the Willis Plant Area.

The COCs exceeding the Industrial and Commercial-Use SCOs predominantly included benzene, toluene, xylenes, PAHs, chlorinated benzenes (chlorobenzene, 1,2-, 1,3-, and 1,4-dichlorobenzene), PCBs (Commercial-Use SCOs only), mercury, and arsenic. The PAHs and chlorinated benzenes, as well as the benzene, toluene, ethylbenzene, and xylene (BTEX) compounds, were detected in samples across the northern half of the Willis Plant Area, including within the Subsite on the berm along State Fair Boulevard. Chlorobenzenes on the Lakeshore Property are related to the presence of DNAPL that migrated from the Willis Plant Area.

Mercury exceedances were observed at various locations within the Willis Plant Area, including Outfall 006, Northwest Ditch, Outfall 004, and the berm along State Fair Boulevard before the soil removal conducted as part of the Willis-Semet Berm Subsite Improvements IRM. In one area, within and near the footprint of the Former Mercury Cell Building, elemental mercury droplets were observed in the subsurface soil. During the subsurface boring investigation completed in 1997, elemental mercury droplets were observed to a maximum depth below grade of approximately 32 ft. in this area.

As described in the RI Report, elevated mercury concentrations have been detected in shallow and intermediate groundwater throughout the Willis Plant Area, with the highest concentrations in intermediate depth groundwater downgradient of the Former Mercury Cell Building.

PCDD/Fs were detected in the samples collected on the Willis Plant Area; the highest concentrations were observed in samples collected within the footprint of the Former Chlorination Building.

Chlorobenzene Hot-Spots Area

The COCs that exceeded the SCOs for Unrestricted Use included benzene, chlorinated benzenes (chlorobenzene; 1,2-, 1,3- and 1,4-dichlorobenzene), PAHs, 4,4'-DDD, PCBs, and assorted inorganics (including mercury).

VOCs, SVOCs, pesticides, PCBs, and inorganics were detected in surface soil/fill material in the CHSA. 1,4-Dichlorobenzene, 1,2-dichlorobenzene, PAHs, PCBs, and mercury were the only COCs to exceed the Industrial and Commercial-Use SCOs in subsurface soil/fill material at the CHSA.

Petroleum Storage Area

Based on Subsite data, VOCs, SVOCs, pesticides, PCBs, and inorganics were detected in subsurface soil/fill material in the PSA. PAHs, PCBs, and assorted inorganics (including arsenic and mercury) exceeded the Unrestricted-Use SCOs. One PAH, PCBs, arsenic, and cyanide exceeded the Commercial-Use SCOs and one PAH and arsenic exceeded the Industrial-Use SCOs.

Staged Soil Piles

Approximately 25,000 cubic yards of soil excavated during the Willis-Semet Hydraulic Containment System IRM, East Flume IRM, Willis-Semet Berm Site Improvements IRM, and Semet Ponds Shallow Groundwater Remedial Action (Tributary 5A sediment removal) were consolidated into two piles located on the Subsite. Characterization sampling and analysis were performed throughout the duration of the placement of materials to document that the materials did not exceed hazardous characteristics. Data for samples collected from Pile #1 and Pile #2 soils are summarized in Appendix B-3 of the RI Report. For Commercial-Use SCOs, PAHs, PCBs, arsenic, barium, nickel, and mercury exceeded the SCOs for Pile #1 and 1,4-dichlorobenzene and mercury for Soil Pile #2. Material placed in both piles contained COC concentrations that exceeded the Industrial-Use SCOs for PAHs, mercury, and arsenic for Soil Pile #1 and mercury for Soil Pile #2; 1,4-dichlorobenzene in Pile #2 did not exceed but equaled its Industrial-Use SCO. It is anticipated that some or all of the soil pile material will be beneficially reused at the adjacent Semet Residue Ponds subsite consistent with the OU2 remedy for that subsite. Any surplus material would be used as part of the remedial actions that will be conducted at the Willis Avenue Subsite.

Shallow and Intermediate Groundwater

Shallow and intermediate groundwater discharges to storm sewers and Onondaga Lake were addressed by IRMs. Prior to the IRMs, groundwater quality was evaluated for the Subsite during two rounds of RI groundwater sampling, when shallow, intermediate, and deep groundwater samples were collected from the Willis Plant Area and Lakeshore Property, and shallow groundwater samples were collected from the PSA and CHSA. Due to the groundwater flow direction and the location of the Subsite adjacent to the Semet Residue Ponds Subsite, the contaminated shallow and intermediate groundwater plumes from these subsites are comingled, as discussed in the 2002 and 2019 RODs for the Semet Residue Ponds site. The analytical data were compared to the NYS Class GA groundwater standards and guidance values (SGVs). See Tables 7-9 for the groundwater results.

<u>Willis Plant Area and Lakeshore Property</u>

VOCs, SVOCs, and inorganics were detected in the Willis Plant Area shallow and intermediate groundwater. The COCs detected and exceeding the Class GA SGVs for shallow and intermediate groundwater included:

- VOCs: Benzene, chlorobenzene, toluene, and acetone
- SVOCs: Chlorinated benzenes, assorted phenols, and naphthalene
- Inorganics: Sodium, mercury, iron, arsenic, and lead.

VOC and SVOC concentrations (primarily benzene, toluene, and chlorinated benzenes) exceeding the Class GA SGVs were observed at locations on the Lakeshore Property and the northern portion of the Willis Plant Area. Inorganic exceedances were present throughout the Willis Plant Area. Mercury exceeds the Class GA standard near Outfall 006 (shallow groundwater) and near Soil Pile #1 and the western corner of this area (shallow and intermediate groundwater) and near the GWTP (intermediate groundwater), with the highest concentrations in intermediate depth groundwater detected downgradient of the Former Mercury Cell Building.

<u>Chlorinated Hot-Spots Area</u>

VOCs, SVOCs, and inorganics were detected in the CHSA shallow groundwater. VOCs (chlorinated benzenes and benzene), SVOCs (assorted phenols and chlorinated benzenes), and inorganics (sodium, iron, manganese, chromium, arsenic, mercury, and magnesium) exceeded the Class GA SGVs in CHSA shallow groundwater.

<u>Petroleum Storage Area</u>

VOCs, SVOCs, and inorganics were detected in PSA shallow groundwater. The COCs exceeding the Class GA SGVs included BTEX compounds, naphthalene, assorted phenols, sodium, magnesium, iron, chromium, lead, manganese, and mercury. The highest concentrations of BTEX compounds are located on the eastern portion of the PSA, which is where the former distillation facility, benzene pipeline, and former storage tanks for No. 2 fuel oil were located. However, BTEX compounds were detected throughout the PSA. Naphthalene was highest in the western corner of this area. The inorganics were detected throughout the PSA without any dominant locations on-site.

DNAPL and Elemental Mercury

> **"What is a Principal Threat?"**
>
> The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a Site wherever practicable (NCP Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to ground water, surface water, or air, or acts as a source for direct exposure. Contaminated ground water generally is not considered to be a source material; however, Non-Aqueous Phase Liquids (NAPLs) in groundwater may be viewed as source material.
>
> Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

DNAPL and elemental mercury were encountered in soil borings and test pits advanced during the investigations and other remedial work performed at the Subsite. In general, there is an area of elemental mercury present on the Willis Plant Area and chlorobenzene DNAPL present along the lakeshore, in the northern portion of the Willis Plant Area and potentially at the CHSA. Potential migration of the DNAPL and mercury has been addressed by IRMs. Some of these materials exhibit characteristics of principal threat waste (for an explanation of a principal threat waste, see the textbox, "What is a Principal Threat?"). These areas are discussed in detail in the RI and FS Reports.

Conclusions

Based on the results of the RI and prior investigations, the contamination at the Subsite is summarized as:

- COCs in groundwater and surface/subsurface soil include BTEX, chlorinated benzenes, PAHs, phenolic compounds, PCBs, dioxins/furans,[4] and mercury.
- Within and near the footprint of the Former Mercury Cell Building, elemental mercury was observed in the subsurface soil. Elemental mercury was observed as droplets to a maximum depth below grade of approximately 32 ft.
- DNAPL is present along the Lakeshore Property, in the northern portions of the Willis Plant Area and potentially at the CHSA.

Waste Management Area

The NCP preamble language sets forth the EPA's policy that, for groundwater, "remediation levels generally should be attained throughout the contaminant plume, or at and beyond the edge of the waste management area when waste is left in place." The NCP preamble also indicates that, in certain situations, it may be appropriate to address the contamination as one waste management area (WMA) for purposes of the groundwater point of compliance (POC). The groundwater POCs for meeting applicable or relevant and appropriate requirements (ARARs) are established at the WMA boundary.

Due to the presence of historical fill materials deposited at the Subsite and the adjacent Semet Residue Ponds subsite, the area within these two subsites (excluding the CHSA and PSA) will be treated as a WMA (see Figure 5) with the groundwater restoration POC being the WMA boundary (*i.e.,* outside of the barrier walls). The material within the WMA includes Solvay waste and fill material comingled with hazardous substances that are contaminants of concern for the site. The management of the waste within the WMA includes meeting Resource Conservation and Recovery Act (RCRA) municipal landfill capping requirements. In some areas, existing covers and/or soil/fill material is expected to meet the $1x10^{-5}$ centimeters per second (cm/sec) permeability rate required under the Subtitle D standards. Buildings/asphalt parking lots are expected to achieve and exceed the infiltration requirements. In areas where existing covers or soil/fill material do not meet the standard, cover material will include materials needed to achieve the required infiltration rate requirements. The WMA boundary is conceptual and may be refined during remedial design.

Based on the results of a study to assess degradation in groundwater (see Appendix C in FS Report), monitored natural attenuation (MNA) may be a viable option to address contaminated shallow/intermediate groundwater at and beyond the

[4] Dioxins/furans refer to a group of compounds that include 2,3,7,8-tetrachlorodibenzo-para-dioxin, as well as other dioxin-like compounds that have similar chemical structures and toxicological characteristics.

POC. The basis for MNA is supported by an evaluation of the shallow and intermediate groundwater using data collected in 2017 to support an investigation of deep groundwater. Based on multiple lines of evidence, degradation of organic constituents is occurring in shallow and intermediate groundwater. Further evaluation of MNA would need to be conducted as part of the preliminary remedial design and/or operation and maintenance (O&M).

The time needed to achieve the respective Class GA standards at the POC have been conservatively estimated. The table below presents a summary of the results. Estimates range from zero to 700 years. It should be noted that the Willis Avenue barrier wall and collection system prevents the migration of contaminated shallow/intermediate groundwater to the groundwater beneath Onondaga Lake, the lake is not being used as a drinking water source, the lake bottom cap will prevent contaminated groundwater and sediment porewater from impacting the lake, and the upper end of the estimated range (700 years) to achieve groundwater standards is less than the 1,000-year cap design for the lake remedy.

Outboard Area Years to Class GA Standard	
Using Porewater Median Concentration	
Benzene	100-200 Years
Toluene	Zero Toluene porewater median concentration is below the respective Class GA standard.
Chlorobenzene	100-200 Years
Using Porewater 90% Upper Confidence Limit Mean Concentration[5]	
Benzene	200-400 Years
Toluene	40-50 Years
Chlorobenzene	400-700 Years

Similar to benzene, toluene, and chlorobenzene, other site-related compounds *(i.e.,* phenolic compounds, naphthalene and other PAHs) are likely to degrade in the outboard shallow and intermediate groundwater. These organic compounds can be degraded under aerobic and anaerobic conditions, and the degradation rate will vary between locations along the shoreline depending on the location-specific conditions present. It is not anticipated that groundwater standards would be achievable within the WMA within a reasonable timeframe. For the CHSA and PSA areas groundwater standards would need to be achieved.

SCOPE AND ROLE OF ACTION

In addition to this Subsite, eleven other subsites, Onondaga Lake Bottom; LCP Bridge Street; Geddes Brook/Ninemile Creek; Semet Residue Ponds; Wastebed B/Harbor Brook; Wastebeds 1-8; General Motors (GM)-Inland Fisher Guide (IFG); Salina Landfill; Ley Creek PCB Dredgings; Lower Ley Creek; and Niagara-Mohawk Hiawatha Blvd, are being addressed as part of the Onondaga Lake NPL site.

Dredging and capping activities for the Onondaga Lake Bottom Subsite commenced in 2012. Dredging and capping activities in the lake were completed in 2014 and 2016, respectively. Habitat restoration activities associated with the remedy were completed in 2017. The dredged material is being managed at a sediment consolidation area (SCA) constructed on a former Solvay wastebed, Wastebed 13. Construction activities at the SCA, which included the placement of an engineered cap, were completed in 2017. The site is undergoing long-term maintenance and monitoring.

Remedies have been fully implemented at the LCP Bridge Street, Geddes Brook/Ninemile Creek, Salina Landfill and Ley Creek PCB Dredgings Subsites. These subsites are undergoing long-term maintenance and monitoring. Remedial activities for portions of, or environmental media at, the Semet Residue Ponds, Wastebed B/Harbor Brook, Wastebeds 1-8, GM-IFG and Niagara-Mohawk Subsites have been completed or are in progress. Other portions of, or media at, these subsites are in the remedial design or RI/FS phase. The Lower Ley Creek Subsite is in the remedial design phase.

The scope of the action for the Subsite is to address the soil/fill material and shallow and intermediate groundwater not addressed under the IRMs discussed above and to implement additional actions, where needed, in areas previously addressed under the IRMs. NYSDEC and EPA expect this remedy to be a final, comprehensive remedy for the soil/fill material and shallow and intermediate groundwater.

[5] Similar timeframes were estimated when the porewater 95% Upper Confidence Limit mean concentration was used.

Because the shallow and intermediate groundwater outboard of the IRM hydraulic containment system at the shore of Onondaga Lake is comingled with the shallow and intermediate groundwater of the adjacent Semet Residue Ponds subsite, this shallow and intermediate groundwater is being collectively addressed in this Proposed Plan.

Deep groundwater will be evaluated and addressed separately as part of a regional unit.

Summary of Quantitative Subsite Risk Assessments

As part of the RI process, baseline quantitative risk assessments were conducted for the Subsite to estimate the potential risks to human health and the environment (see the "What is Human Health Risk and How is it Calculated?" and "What is Ecological Risk and How is it Calculated?" textboxes below). Baseline risk assessments, consisting of a human health risk assessment (HHRA), which evaluates potential risks to people, and a baseline ecological risk assessment (BERA), which evaluates potential risks to ecological receptors, analyze the potential for adverse effects caused by hazardous substance releases from a site assuming no further actions to control or mitigate exposure to these hazardous substances are taken.

Human Health Risk Assessment

The site is zoned commercial/industrial, and exposure scenarios were developed based on this current and likely future land use. The baseline HHRA considered exposure to many different media through a number of current and future exposure scenarios for different potential receptors including adolescent and adult trespassers, utility worker, State Fair Boulevard

WHAT IS HUMAN HEALTH RISK AND HOW IS IT CALCULATED?

A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current- and future-land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the Contaminants of Potential Concern (COPCs) at the site in various media (*i.e.*, soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants in air, water, soil, etc. identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil and ingestion of and dermal contact with contaminated groundwater. Factors relating to the exposure assessment include, but are not limited to, the concentrations in specific media that people might be exposed to and the frequency and duration of that exposure. Using these factors, a "reasonable maximum exposure" (RME) scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures and the relationship between magnitude of exposure (dose) and severity of adverse effects (response) are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other non-cancer health hazards, such as changes in the normal functions of organs within the body (*e.g.*, changes in the effectiveness of the immune system). Some chemicals can cause both cancer risks and non-cancer health hazards.

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks for all COPCs. Exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a "one-in-ten-thousand excess cancer risk"; or one additional cancer may be seen in a population of 10,000 people because of exposure to site contaminants under the conditions identified in the Exposure Assessment. Current Superfund regulations for exposures identify the range for determining whether remedial action is necessary as an individual excess lifetime cancer risk of 10^{-4} to 10^{-6}, corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk. For non-cancer health effects, a "hazard index" (HI) is calculated. An HI represents the sum of the individual exposure levels compared to their corresponding reference doses. The key concept for a non-cancer HI is that a threshold (measured as an HI of less than or equal to 1) exists below which non-cancer health hazards are not expected to occur. The goal of protection is 10^{-6} for cancer risk and an HI of 1 for a non-cancer health hazard. Chemicals that exceed a 10^{-4} cancer risk or an HI of 1 are typically those that will require remedial action at the site and are referred to as COCs in the ROD.

transients, surveillance worker, industrial worker, construction worker, sewer worker, and child and adult residents.

Exposure scenarios were developed for these populations and considered exposure through incidental ingestion and inhalation of and dermal contact with surface soil, subsurface soil, and sediment; and ingestion of groundwater as a hypothetical drinking water source in the future. Human health risks associated with the ingestion of groundwater are based on groundwater data from the Willis Avenue Subsite. Human health risks associated with exposure to the Semet Residue Ponds Subsite groundwater can be considered to be similar to that for the Willis Avenue Subsite because the groundwater plumes for the two subsites are comingled. A summary of the cancer risks and noncancer hazards above threshold levels for each population in each of the areas of the site, along with the chemicals that contribute the most to the risk or hazard, or COCs, can be found in Tables 10 and 11.

The HHRA included a recommendation that, based on the vapor intrusion screening presented in the HHRA, a vapor intrusion evaluation should be conducted if buildings that will be occupied are constructed at the Subsite. The vapor intrusion screening identified chemicals with a potential to migrate to indoor air, based on factors such as the chemical-specific vapor pressure. Since these factors apply to chemicals present in media such as soil, fill material and groundwater, all media with these chemicals have the potential for future vapor intrusion concerns. Based on the vapor intrusion evaluation, measures may be included in the design and construction of buildings at the Subsite to mitigate the potential for exposure to constituents that may be present in soil vapor. Such measures may include an active sub-slab depressurization system, use of a vapor barrier or the installation of a venting system.

A full discussion of the HHRA evaluation and conclusions is presented in the HHRA Report.

WHAT IS ECOLOGICAL RISK AND HOW IS IT CALCULATED?

A Superfund baseline ecological risk assessment is an analysis of the potential adverse health effects to biota caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current and future land and resource uses. The process used for assessing site-related ecological risks includes:

Problem Formulation: In this step, the contaminants of potential ecological concern (COPECs) at the site are identified. Assessment endpoints are defined to determine what ecological entities are important to protect. Then, the specific attributes of the entities that are potentially at risk and important to protect are determined. This provides a basis for measurement in the risk assessment. Once assessment endpoints are chosen, a conceptual model is developed to provide a visual representation of hypothesized relationships between ecological entities (receptors) and the stressors to which they may be exposed.

Exposure Assessment: In this step, a quantitative evaluation is made of what plants and animals are exposed to and to what degree they are exposed. This estimation of exposure point concentrations includes various parameters to determine the levels of exposure to a chemical contaminant by a selected plant or animal (receptor), such as area use (how much of the site an animal typically uses during normal activities); food ingestion rate (how much food is consumed by an animal over a period of time); bioaccumulation rates (the process by which chemicals are taken up by a plant or animal either directly from exposure to contaminated soil, sediment or water, or by eating contaminated food); bioavailability (how easily a plant or animal can take up a contaminant from the environment); and life stage (*e.g.,* juvenile, adult).

Ecological Effects Assessment: In this step, literature reviews, field studies or toxicity tests are conducted to describe the relationship between chemical contaminant concentrations and their effects on ecological receptors, on a media-, receptor- and chemical-specific basis. To provide upper and lower bound estimates of risk, toxicological benchmarks are identified to describe the level of contamination below which adverse effects are unlikely to occur and the level of contamination at which adverse effects are more likely to occur.

Risk Characterization: In this step, the results of the previous steps are used to estimate the risk posed to ecological receptors. Individual risk estimates for a given receptor for each chemical are calculated as a hazard quotient (HQ), which is the ratio of contaminant concentration to a given toxicological benchmark. In general, an HQ above 1 indicates the potential for unacceptable risk. The risk is described, including the overall degree of confidence in the risk estimates, summarizing uncertainties, citing evidence supporting the risk estimates and interpreting the adversity of ecological effects.

Ecological Risk Assessment

The Subsite BERA identified current and future habitat use and potential ecological receptors at the Subsite. Based on the ecological receptors identified, potentially unacceptable risk was present for the following constituents and media:

- Constituents in soil accounting for most of the potential risk to ecological receptors at the Willis Plant Area included mercury, methyl mercury, zinc, chromium, iron, lead, manganese, selenium, 4,4-DDE, 1,4-dichlorobenzene, chlorobenzene, total PCBs, and dioxins.
- Constituents in soil accounting for most of the potential risk to ecological receptors at the PSA included mercury, methyl mercury, iron, selenium, endrin, endrin ketone, aldrin, and 4-methylphenol.
- Constituents in soil that accounted for most of the potential risk to ecological receptors at the CHSA included mercury, iron, endrin aldehyde, endrin ketone, aldrin, hexachlorobenzene, and total PCBs.

The Lakeshore Property and Tributary 5A were not evaluated as part of the BERA because there are no current or future ecological exposure pathways due to the IRMs and/or remedial actions performed on these areas. The Lakeshore Property is close to I-690 and paved roads and trails for recreational use are planned as part of the Onondaga County West Shore Trail Extension and to access the Southwest Lakeshore area.

A full discussion of the BERA's evaluation and conclusions is presented in the BERA Report.

Summary of Human Health and Ecological Risks

The results of the human health risk assessment indicate that the contaminated soil, indoor air, and groundwater present current and/or potential future unacceptable exposure risk and the ecological risk assessment indicates that the contaminated soils pose an unacceptable exposure risk. While some of the risks associated with contaminated soil have been mitigated in part by the implemented IRMs, the calculated risks are still considered to be valid as the IRM components relating to placement of clean cover materials did not address all site areas and are not necessarily final actions. Moreover, while potential ecological and human health risks have been mitigated by Subsite IRMs, conditions which could potentially result in a return to unacceptable risks may occur should O&M related to the IRMs be discontinued.

Based upon the results of the RI and the risk assessments, EPA and NYSDEC have determined that actual or threatened releases of hazardous substances from the Subsite, if not addressed by the preferred remedy or one of the other active measures considered, may present a current or potential threat to human health and the environment.

REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are specific goals to protect human health and the environment. These objectives are based on available information and standards, such as ARARs, to-be-considered guidance, and site-specific risk-based levels established using the risk assessments.[6] The following RAOs have been established for the Subsite:

- Prevent, or reduce to the extent practicable, ingestion/direct contact with contaminated soil/fill material to be protective under the current and reasonably anticipated future land uses.
- Prevent, or reduce to the extent practicable, inhalation of or exposure to contaminants volatilizing from contaminated soil/fill material and unacceptable inhalation exposure associated with soil vapor.
- Prevent, or reduce to the extent practicable, potential unacceptable risks to human health associated with ingestion of shallow and intermediate groundwater with contaminant levels exceeding drinking water standards.
- Restore groundwater outside of the WMA to levels that meet state and federal standards within a reasonable time frame.
- Prevent, or reduce to the extent practicable, potential unacceptable risks to human health associated with contact with, or inhalation of, volatiles from contaminated shallow and intermediate groundwater.
- Prevent, or reduce to the extent practicable, the release of Subsite-related contaminants to groundwater, surface water and sediment that may cause unacceptable adverse effects on shallow and intermediate groundwater, surface water or sediment quality in Onondaga Lake.

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[6] While a BERA was performed for these areas under current conditions, the reasonably anticipated future use for the Subsite is industrial and commercial, which is not suitable habitat for ecological receptors.

NYSDEC's SCOs have been identified as remediation goals for soil to attain these RAOs. SCOs are risk-based criteria that have been developed by the State following methods consistent with EPA's methods/protocols/guidance and they are set at levels consistent with EPA's acceptable levels of risk that are protective of human health, ecological exposure, or the groundwater depending upon the existing and anticipated future use of the Subsite. While the land use of the Subsite has historically been industrial, current and anticipated future uses of some areas could include commercial use (including recreational use). Cleanup goals were not specifically developed for surface water and sediment throughout the Subsite but maintenance of the IRMs is expected to achieve the RAOs. Groundwater remedial goals, outside the WMA, are the New York State Ambient Water Quality Standards.

SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA § 121(b)(1), 42 U.S.C. § 9621(b)(1), mandates that remedial actions must be protective of human health and the environment, cost-effective, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants and contaminants at a site. CERCLA § 121(d), 42 U.S.C. § 9621(d), further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants, which at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA § 121(d)(4), 42 U.S.C. § 9621(d)(4).

Based on anticipated future development of the Subsite, expectations of the reasonably anticipated land use, as described above, were considered in the FS to facilitate the development and evaluation of remedial alternatives. The reasonably anticipated land use includes commercial use (passive recreational use) for the Lakeshore Property, and industrial/commercial use for portions of the property south of I-690 (Willis Plant Area, PSA and CHSA).

All the alternatives other than Alternative 1 - No Further Action include the continuation of the O&M for the IRMs, which would include monitoring to document that success criteria are met and to identify the need for corrective action(s), as warranted. It would also consist of cover repair in areas of disturbance or reapplication of vegetation in areas of non-survival.[7] For all the alternatives other than the No-Further-Action alternative, all of the RAOs, except restoring the groundwater outside the WMA (*i.e.,* outboard of the barrier wall/groundwater collection systems at the Subsite) to levels that meet state and federal standards, would be met following construction and implementation of appropriate institutional controls (*e.g.,* approximately 1 to 8 years). The estimated time to restore the groundwater outside the WMA to state and federal standards for all the alternatives, other than the No-Further-Action alternative, is approximately 700 years. These estimates, which are discussed above, used available data for groundwater and porewater collected from beneath the lake and were based on conservative assumptions. Additional data (*e.g*., groundwater) would be collected to refine the estimated timeframe for restoration and long-term monitoring will be performed.

The remedial alternatives are as follows:

Alternative 1 - No Further Action

The Superfund program requires that the "no action" alternative be considered as a baseline for comparison with the other alternatives. The no further action remedial alternative would not include any additional remedial measures that address the soil/fill material and shallow and intermediate groundwater contamination at the Subsite.

Because this alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Subsite be reviewed at least once every five years. If justified by the review, remedial actions may be implemented to remove, treat, or contain the contaminated media.

The estimated capital, annual, and present-worth costs of this alternative are as follows:

Capital Cost:	$0
Annual O&M Cost:	$0

[7] The annual O&M cost estimates are included in the cost estimates for each of the action alternatives.

Present-Worth Cost: $0

Alternative 2 – Engineered Cover System

Alternative 2 includes the placement of a cover system on surface soils that exceed the SCOs for commercial use at the Subsite (see Figure 6). This alternative also includes DNAPL evaluation and recovery, if recoverable DNAPL is encountered, continuation of O&M for the IRMs that have been implemented at the Subsite and institutional controls.

A minimum 1-ft thick soil/granular cover (or maintained paved surfaces and buildings) would be placed over approximately 20 acres to minimize erosion and mitigate potentially unacceptable exposure of human receptors to constituents exceeding Commercial-Use SCOs in surface soil/fill material. The need for a demarcation layer between the soil cover and the underlying substrate would be evaluated during the design. The design of the cover would take into consideration development plans that are available for the Subsite at that time. A 1-ft excavation would precede construction of the cover in the CHSA, such that the final cover grade would match the existing grades, with the excavated material being placed on the Willis Plant Area and graded before the placement of the cover at that portion of the Subsite. Some or all of the existing soil piles will be beneficially reused at the adjacent Semet Residue Ponds subsite. Any surplus material would be used during grading prior to the placement of a cover at the Willis Plant Area. Any fill material brought to the Subsite would need to meet the requirements for the identified Subsite use as set forth in 6 NYCRR Part 375-6.7(d). Native species would be used for the vegetative component of covers, as appropriate. Structures, such as buildings, pavement, or sidewalks, as part of future development, could also serve as acceptable substitutes for the vegetated cover either upon the implementation of the remedy or at a future time. The conceptual extent of the cover system is depicted on Figure 6. The extent, thickness, and permeability of covers would be revisited during the design phase and/or during site management, if site uses change, as necessary.

As summarized in Section 2.2 of the FS Report, the vertical hydraulic conductivity of Solvay waste that may be present at the Subsite is generally less than 1×10^{-5} cm/sec. The proposed cover materials in combination with the underlying soil/fill material (*e.g.,* Solvay waste) and continued O&M of the groundwater collection system (*i.e.,* the Willis-Semet Lakeshore Hydraulic Containment System IRM) for Subsite groundwater would meet the requirements for containment under RCRA Subtitle D, which would be an ARAR for this action.

Evidence of chlorobenzene DNAPL was observed in borings at the Willis Plant Area and the CHSA. While evidence of pooled DNAPL is limited to the Lakeshore Property, where DNAPL is currently being collected by a DNAPL recovery system, a field study would be conducted as part of this alternative to evaluate the potential for the presence of recoverable chlorobenzene DNAPL in the northern portion of the Willis Plant Area and the CHSA. If recoverable DNAPL is encountered during the DNAPL investigation, the DNAPL would be removed (*e.g.,* using recovery wells) and sent off-site for disposal. If no recoverable DNAPL is encountered, *in-situ* treatment (*e.g.,* via chemical oxidation) for residual DNAPL encountered in discrete areas and in substantial quantity would be evaluated to determine if mass reduction of contamination could be achieved. A treatability study would be performed to verify the effectiveness and implementability of *in situ* treatment, and to facilitate the remedial design.

This alternative includes restoration of shallow/intermediate groundwater at the POC via MNA. An evaluation of the shallow and intermediate groundwater using data collected in 2017 to support an investigation of deep groundwater indicated that natural attenuation is occurring within the shallow and intermediate groundwater. Based on multiple lines of evidence, it has been concluded that degradation of groundwater organic constituents is occurring in the shallow and intermediate groundwater. Further evaluation of MNA would need to be conducted as part of the preliminary remedial design and/or O&M. Because the shallow/intermediate groundwater at and beyond the POC is comingled with the shallow/intermediate groundwater from the adjacent Semet Residue Ponds subsite, the shallow/intermediate groundwater from both subsites would be addressed via MNA.

Institutional controls in the form of environmental easements and/or restrictive covenants would be used to limit land use to commercial (including passive recreational)/industrial, as appropriate, prevent the use of groundwater without approved treatment, and require that any intrusive activities in areas where contamination remains be conducted in accordance with a NYSDEC-approved SMP, which would include the following:

- Institutional and Engineering Control Plan that identifies institutional and engineering controls (*i.e.,* environmental easement and/or restrictive covenants, cover systems) for the Subsite and details the following steps and media-specific requirements necessary to ensure that they remain in place and are effective:

  - an excavation plan that details the provisions for management of future excavations in areas of remaining contamination;
  - descriptions of the provisions of the institutional controls including any land use or groundwater use restrictions;
  - a provision that future on-site buildings should be evaluated for the potential for vapor intrusion and may include vapor intrusion sampling and/or installation of mitigation measures, if necessary;
  - Subsite access and NYSDEC notification; and
  - periodic reviews and certification of the institutional and/or engineering controls.
- Monitoring Plan to assess the performance and effectiveness of the remedy. The final monitoring program would be established during the design.

This alternative also includes continued monitoring and maintenance associated with the IRM elements noted above that pertain to the Lakeshore Property, I-690 Storm Drainage System, East Flume, the Willis Avenue section of the Willis-Semet Berm Improvements, and Willis Barrier Wall and groundwater collection system. Maintenance and monitoring for the IRMs would include monitoring to document that success criteria are met and to identify the need for corrective action(s), as warranted.

Because this alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Subsite be reviewed at least once every five years.

The estimated construction time for this alternative is 1 year.

The estimated capital, annual, and present-worth costs of this alternative are as follows:

Capital Cost:	$5,200,000
Annual O&M Cost:	$392,685
Present-Worth Cost:	$10,100,000

Alternative 3 – Engineered Cover System with Targeted Shallow/Intermediate Groundwater Treatment at the Former Mercury Cell Building

Under this alternative, the same components as Alternative 2 would be implemented, along with targeted treatment of dissolved mercury in shallow and intermediate groundwater in the vicinity of the Former Mercury Cell Building. This treatment would be accomplished through a combination of physical/chemical processes, including precipitation, coprecipitation, and sorption. Treatability study testing would be required to identify the additives and dosages to achieve the best removal. For cost estimate development, treatment was assumed by injection of carbon dioxide in a treatment zone downgradient from the Former Mercury Cell Building. The carbon dioxide would lower groundwater pH, which would promote precipitation of mercury with dissolved sulfide present in site groundwater. Carbon dioxide addition leaves a residual saturation of gas that would continue to treat the groundwater after injections have stopped. However, reinjection of carbon dioxide would be necessary on a specified frequency, which would be identified during the treatability testing to maintain treatment zone pH. The approximate area of the cover system and a conceptual configuration for the groundwater treatment is illustrated on Figure 7.

Because this alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Subsite be reviewed at least once every five years.

The estimated construction time of this alternative is 1 year.

The estimated capital, annual, and present-worth costs of this alternative are as follows:

Capital Cost:	$7,100,000
Annual O&M Costs:	$548,935
Present-Worth Cost:	$13,900,000

Alternative 4 – Engineered Cover System with Targeted Shallow/Intermediate Groundwater Hydraulic Control at the Former Mercury Cell Building

This alternative is the same as Alternative 2, along with installation of a vertical barrier hydraulic containment system to isolate contaminated shallow and intermediate groundwater in the vicinity of the Former Mercury Cell Building. Excavation of debris associated with installation of the vertical barrier is assumed to be limited to building foundations that may be necessary to be removed to install the barrier, as the installation of the vertical barrier is intended to surround the Former Mercury Cell Building. The surface of this area would be covered with a low permeability cover. For cost estimating purposes, the vertical barrier is assumed to consist of grouted sheet piles driven to an approximate depth of 35 ft bgs (*i.e.,* into the confining unit beneath the intermediate groundwater unit). In addition, this alternative is assumed to incorporate a high-density polyethylene geomembrane and an extraction well system within the vertical barrier to address potential infiltration. Collected groundwater would be treated at the Willis Avenue GWTP. A conceptual configuration for the vertical barrier is illustrated on Figure 8.

Because this alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Subsite be reviewed at least once every five years.

The estimated construction time of this alternative is 1 year.

The estimated capital, annual, and present-worth costs of this alternative are as follows:

Capital Cost:	$7,100,000
Annual O&M Costs:	$396,405
Present-Worth Cost:	$12,000,000

Alternative 5 – Engineered Cover System with Targeted Shallow/Intermediate Groundwater Hydraulic Control and Mercury Hot Spot Treatment/Removal at the Former Mercury Cell Building

Under this alternative, the same components as Alternative 4 would be implemented, along with targeted treatment and/or removal and disposal of mercury hot spots associated with the former floor trenches in the Former Mercury Cell Building. However, the presence of free elemental mercury and low-level PCBs may limit disposal options. Pre-design investigations would need to be conducted to characterize this material to assess whether *in-situ* treatment and/or off-site management of these materials would be most practicable to address the floor trenches and associated elemental mercury.

In-situ treatment could employ *in-situ* solidification/stabilization, which may include cement-based additives in the reagent mix to solidify the material, reducing contact with infiltrating surface water. Sulfur-based reagents could be used for conversion of elemental mercury to a less soluble, less volatile, less toxic form (*i.e.,* mercury sulfide). The specific type of reagents/mix would be identified through a treatability study that would be conducted during the design phase. Treatment or removal of the elemental mercury-impacted soil/fill material would address approximately 450 cubic yards of contaminated material associated with the floor trenches. This alternative is illustrated on Figure 9.

Because this alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Subsite be reviewed at least once every five years.

The estimated construction time of this alternative is 1 year.

The estimated capital, annual, and present-worth costs of this alternative are as follows:

Capital Cost:	$7,300,000
Annual O&M Costs:	$396,405
Present-Worth Cost:	$12,300,000

Alternative 6 – Engineered Cover System with In-Situ Treatment (to 32 feet) at Former Mercury Cell Building

This alternative is the same as Alternative 2, along with *in-situ* treatment of soil/fill material at the Former Mercury Cell Building, to address elemental mercury in the soil/fill material. Specifically, soil/fill material containing elemental mercury would be treated by mixing solidification/stabilizing agents *in situ*. *In-situ* solidification/stabilization would be applied to a 5,500 square ft. area using an auger for mixing. Debris associated with the former floor trenches in the Former Mercury Cell Building would be crushed to allow *in-situ* treatment. Because key performance criteria are dependent on multiple factors, such as Subsite conditions and reagent use, the type of reagents would be selected following a treatability study and would be specified in the design as discussed in Alternative 5. *In-situ* treatment would address approximately 3,450 cubic yards of soil/fill material impacted with elemental mercury. The approximate area of *in-situ* treatment is illustrated on Figure 10.

Because this alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Subsite be reviewed at least once every five years.

The estimated construction time of this alternative is 2-3 years.

The estimated capital, annual, and present-worth costs of this alternative are as follows:

Capital Cost:	$7,400,000
Annual O&M Costs:	$392,685
Present-Worth Cost:	$12,300,000

Alternative 7 – Full Excavation with Off-Site Disposal

Under this alternative, the Subsite would be restored to pre-disposal conditions through the full excavation of all soil/fill material exhibiting concentrations above Unrestricted-Use SCOs.[8] This would include the removal and replacement of a 0.5-mile section of I-690 and State Fair Boulevard. If necessary, institutional controls, an SMP, and periodic reviews as described in Alternative 2 would be included. Currently operating IRMs and/or Remedial Actions that are not removed as part of excavation, or are integral to other Honeywell remedies (*e.g.,* Onondaga Lake Remedy or Semet Subsite Remedy), would continue to be operated and maintained.

Mechanical excavation would be conducted to remove site-wide soil/fill material. Both the PSA and CHSA would be excavated to a depth of approximately 20 ft. below the existing grade. Material to be removed ranges in thickness from 6 to 45 ft. between the Lakeshore Property and Willis Plant Area. Excavation would be conducted to achieve a minimum temporary slope of 1:2 where possible, with sheet piling installed along select portions, such as the Lakeshore Property. Based on these approximate elevations, the total volume of soil/fill material to be excavated under this alternative is estimated at 1,120,000 cubic yards. No soil removal is assumed within 30 ft. of rail structures to protect their stability. Due to the required setbacks and sloping from adjacent features (*e.g.,* railways, GWTP), some impacted material would likely remain following excavation.

It is estimated that 4,600 cubic yards (to 32 ft. bgs) of material would need to be excavated to address the 3,450 cubic yards of soil/fill that is assumed to be impacted with elemental mercury near the Former Mercury Cell Building. It is anticipated that this soil/fill material would be classified as “high mercury RCRA waste.” As is noted in footnote 8, above, under RCRA hazardous waste regulations, this soil would require treatment to meet the land disposal restriction alternate soil treatment standard, which is 90% reduction or ten times the Universal Treatment Standard prior to landfill disposal or would require retorting or roasting in a thermal processing unit capable of volatilizing mercury and subsequently condensing the volatilized mercury for recovery. The presence of elemental mercury droplets may preclude acceptance at off-site U.S. commercial facilities for solidification/stabilization to meet alternative soil treatment standards prior to landfill disposal. Therefore, soil containing elemental mercury droplets may need to be treated at a retort facility for the U.S. off-site disposal option. Different treatment options (*e.g.,* solidification/stabilization) may be utilized if this soil were to be sent outside the U.S. for disposal.

This alternative also would include removal of approximately 165,000 square ft. of existing building foundations/slabs,

[8] A partial removal alternative was not evaluated since, in addition to similar short-term impacts as Alternative 7, groundwater collection and treatment and, potentially, cover systems would still be necessary, negating much of the benefit from the partial removal of contamination.

resulting in approximately 18,500 tons of construction and debris (C&D) material. As described above, this alternative would also include the removal of a portion of I-690 and State Fair Boulevard, which would include the installation and subsequent removal of an approximately 1.5-mile temporary I-690 bypass, resulting in an additional quantity of approximately 126,000 tons of C&D material for disposal.

In addition to the soil/fill material described above, approximately 43,000 cubic yards of soil/fill material located beneath Tributary 5A would be excavated to meet unrestricted SCOs. Following excavation, the Tributary 5A groundwater collection system, isolation layer, and substrate would need to be replaced.

Under this alternative, an estimated 1,100,000 cubic yards of clean backfill would be transported via trucks (approximately 61,000 truck trips) from an off-site borrow source to the Subsite, to restore excavated areas to near existing grades. It is also anticipated that a portion of the LHCS would need to be reinstalled following construction. I-690 and State Fair Boulevard would be rebuilt in the existing alignment under this alternative, resulting in an additional approximately 8,700 truck trips to deliver the approximately 130,000 cubic yards of materials to restore those facilities to match adjacent grades. Onondaga County sanitary sewers would also need to be replaced as part of restoration activities following excavation. It is anticipated that some repair to the existing in-lake cap associated with the Onondaga Lake Remedy would be required in connection with installation of a temporary bulkhead wall in Onondaga Lake to support excavation activities and subsequent removal of the bulkhead wall. A conceptual depiction of the components of this alternative is presented in Figure 11.

This alternative includes restoration of shallow/intermediate groundwater within the Subsite boundary and beyond the POC of the adjacent Semet Residue Ponds subsite by MNA. The basis for MNA is supported by an evaluation of the shallow and intermediate groundwater using data collected in 2017 to support an investigation of deep groundwater. Based on multiple lines of evidence, degradation of organic constituents is occurring in shallow and intermediate groundwater. Further evaluation of MNA would need to be conducted as part of the preliminary remedial design and/or O&M.

The estimated construction time of this alternative is 7-8 years.

The estimated capital, annual, and present-worth costs of this alternative are as follows:

Capital Cost:	$717,300,000
Annual O&M Costs:	$254,805
Present-Worth Cost:	$720,500,000

COMPARATIVE ANALYSIS OF ALTERNATIVES

The detailed analysis consists of an assessment of the individual alternatives against each of the nine evaluation criteria (see box below) and a comparative analysis focusing upon the relative performance of each alternative against those criteria.

A comparative analysis of these alternatives based upon the evaluation criteria noted below follows.

NINE EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES
Overall protection of human health and the environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
Compliance with ARARs evaluates whether the alternative would meet all the applicable or relevant and appropriate requirements of federal and state environmental statutes and other requirements that pertain to the site, or provide grounds for invoking a waiver.
Long-term effectiveness and permanence considers the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of toxicity, mobility, or volume through treatment is the anticipated performance of the treatment technologies an alternative may employ.
Short-term effectiveness considers the period of time needed to implement an alternative and the risks the alternative may pose to workers, residents, and the environment during implementation.
Implementability is the technical and administrative feasibility of implementing the alternative, including the availability of materials and services.
Cost includes estimated capital and annual O&M costs, as well as present-worth costs. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

State acceptance considers whether NYSDOH (the support agency for NYSDEC) concurs with, opposes, or has no comments on the preferred remedy.	
Community acceptance will be assessed in the ROD and refers to the public's general response to the alternatives described in the Proposed Plan and the RI/FS reports. Comments received on the Proposed Plan are an important indicator of community acceptance.	

Overall Protection of Human Health and the Environment

Alternative 1, the no further action alternative, would not provide protection of human health due to the absence of controls, resulting in the continued potential for exposure to soil/fill material and shallow and intermediate groundwater. Alternative 1 would not provide protection of the environment or meet the RAOs, as this alternative would not address the discharge of Subsite-related contaminants in groundwater or the potential for erosion and migration of soil/fill material. Alternatives 2 through 7 would be protective of human health and the environment to varying degrees following their implementation. Protection of human health and the environment relative to shallow and intermediate groundwater discharge is also provided in Alternatives 2 through 7 through continued O&M of the existing groundwater and DNAPL collection system IRMs. Alternative 2 would also provide protectiveness through institutional controls and covers. Alternative 3 would provide protectiveness through institutional controls, covers, and treatment of shallow and intermediate groundwater in the vicinity of the Former Mercury Cell Building. Alternatives 4 and 5 would provide protectiveness through institutional controls, covers, and hydraulic control (*i.e*., a vertical barrier and low permeability cover with groundwater extraction) in the vicinity of the Former Mercury Cell Building. Alternative 5 also provides protectiveness through treatment and/or removal of a mercury hot spot in the vicinity of the Former Mercury Cell Building. Alternative 6 would provide protectiveness through institutional controls, covers and *in-situ* elemental mercury treatment in the vicinity of the Former Mercury Building. Alternative 7 would provide protectiveness through institutional controls and site-wide removal of soil/fill material.

Consistent with 6 NYCRR 375-1.8(f) and DER-10 4.2(i), the current, intended, and reasonably anticipated future use of the Subsite was considered when selecting SCOs. The engineered cover system in Alternatives 2 through 6 would address soil/fill material exceeding SCOs consistent with current, intended, and reasonably anticipated future use of the Subsite. Alternative 1 would not be consistent with current, intended, and reasonably anticipated future use of the Subsite. Specifically, effects from soil/fill material on human health and the environment would not be controlled under this alternative.

Alternatives 2 through 6 would be protective of human health and the environment through the use of engineered cover systems that would control erosion of, and direct contact with, contaminated soil/fill material, as well as by preventing the inhalation of contaminated dust. Alternatives 2 through 6 would also address DNAPL through recovery or treatment. Institutional controls, a SMP, monitoring, and continued inspection and maintenance of the existing groundwater and DNAPL collection system IRMs would provide for continued protection of the environment and provide a means to evaluate continued protectiveness in Alternatives 2 through 7. Alternative 7 would be protective of the environment through removal of soil/fill material and would allow for unrestricted use of the site by addressing soil/fill material exceeding SCOs for unrestricted use.

In summary, Alternatives 2 through 7 would be protective of human health and the environment, would address the RAOs, and are consistent with current, intended, and reasonably anticipated future use of the Subsite. The added risks to workers/community/environment and environmental footprint associated with implementation of Alternative 7, highlight significant shortfalls related to the overall protectiveness of this alternative and are further described below under the effectiveness and implementability criteria. Alternative 2 provides adequate and reliable protection of human health and the environment, without the added effort associated with Alternatives 3 through 7. Alternatives 4 and 5, which both include hydraulic control in the Former Mercury Cell Building at the Willis Plant Area, provide added localized protection of the environment.

Compliance with ARARS

Chemical-, location-, and action-specific ARARs identified for consideration are summarized in Table 4-1 of the *FS Report*. As is noted above, consistent with the NCP, groundwater remediation levels generally should be attained throughout the contaminant plume, or at and beyond the edge of the WMA when waste is left in place, with attainment of chemical-specific groundwater ARARs at the edge of a WMA. Thus, the POC for the Willis Plant Area and the adjacent Semet Residue Ponds subsite is its northern boundary, coincident with the LHCS. The Willis Plant Area and the adjacent Semet Residue Ponds subsite is part of a WMA because the waste is a solid waste (*e.g.,* Solvay waste and historic fill) containing COCs and would meet the requirements for containment under RCRA Subtitle D, which would be an action-specific ARAR under Alternatives 2 through 6. The proposed cover materials in combination with continued O&M of the hydraulic controls for Subsite groundwater would meet the requirements for containment under RCRA Subtitle D. For the CHSA and PSA areas, groundwater standards would need to be achieved.

Although off-site shallow and intermediate groundwater (only present under Tributary 5A and Onondaga Lake) is not currently or anticipated to be used, it is classified as potable water by the State of New York. Alternatives 2 through 7 would address chemical-specific ARARs through hydraulic control afforded by the IRMs via reduced loading and control of site shallow and intermediate groundwater discharge to off-site resources, coupled with natural attenuation processes. Alternative 1 would not actively address chemical-specific ARARs relative to potential releases from or exposure to soil/fill material nor would it address restoration of shallow and intermediate groundwater. Alternatives 2 through 7 would address the discharge of shallow and intermediate groundwater exceeding chemical-specific ARARs to Onondaga Lake through continued O&M of the IRMs. Additionally, potential exposures to shallow and intermediate groundwater exceeding chemical-specific ARARs would be addressed by institutional controls and natural attenuation under Alternatives 2 through 7. For Alternatives 2 through 6, chemical-specific ARARs would be addressed through limiting potential for exposures to soil/fill material exceeding chemical-specific ARARs through the use of engineered cover systems, a SMP, and institutional controls. Alternatives 2 through 6 would also address recoverable pooled DNAPL (identified as potential principal threat waste), if present, through DNAPL recovery or treatment. In addition to the measures included in Alternative 2, Alternatives 5 and 6 include treatment and/or removal of elemental mercury to address chemical-specific ARARs in the vicinity of the Former Mercury Cell Building at the Willis Plant Area. Based on recent test pit activities, free elemental mercury was found to be associated with the former floor trenches. This material would be targeted for treatment/removal under Alternative 5 and for *in-situ* treatment under Alternative 6. Alternative 7 would address chemical-specific ARARs through site-wide removal of soil/fill material and elemental mercury.

No action- or location-specific ARARs were identified for Alternative 1, the no further action alternative. Construction methods and safety procedures would be implemented to adhere to the location- and action-specific ARARS identified for Alternatives 2 through 7. Specifically, institutional controls would be implemented under Alternatives 2 through 7 in general conformance with NYSDEC's guidance DER-33, *Institutional Controls: A Guide to Drafting and Recording Institutional Controls* and EPA guidance (see https://www.epa.gov/superfund/superfund-institutional-controls-guidance-and-policy). Additionally, the engineered cover systems under Alternatives 2 through 6 would prevent erosion and exposure to contaminated soil/fill material. Engineered cover systems would be implemented in general conformance with NYSDEC's guidance DER-10, *Technical Guidance for Subsite Investigation and Remediation*. Procedures would be implemented to adhere to the location-specific ARARs related to federal and state requirements for cultural, archeological, and historical resources. Additionally, proposed actions would be conducted consistent with Fish and Wildlife Coordination Act requirements for protection of Onondaga Lake. With respect to action-specific ARARs, proposed engineered cover system and excavation activities would be conducted consistent with applicable standards, earth moving/excavation activities would be conducted consistent with air quality standards, and transportation and disposal activities would be conducted in accordance with applicable state and federal requirements by licensed and permitted haulers.

Long-Term Effectiveness and Permanence

Alternative 1 would involve no active remedial measures and, therefore, would not be effective in eliminating the potential exposure to contaminants and would allow the continued migration of contaminants to groundwater, surface water, and sediment. The other alternatives provide an effective means of addressing residual risks associated with soil/fill material and shallow and intermediate groundwater. Potential residual human health risks associated with soil/fill material exceeding ARARs would be addressed in Alternatives 2 through 6 through engineered cover systems, institutional controls, SMP, and periodic reviews. Additionally, potential exposures to shallow and intermediate groundwater exceeding chemical-specific ARARs would be addressed by institutional controls under Alternatives 2 through 7. While elemental mercury in the vicinity of the former Mercury Cell Building is immobile and IRM controls are in place, *in-situ* treatment and/or removal of soil/fill materials containing elemental mercury under Alternatives 5 and 6 in the vicinity of the Former Mercury Cell Building may provide some additional long-term effectiveness and permanence relative to Alternative 4.

The continuation of the IRMs under Alternatives 2 through 7 would provide an adequate and reliable means to support the long-term effectiveness and permanence of the Onondaga Lake remedy and are adequate and reliable means of addressing DNAPL and groundwater impacts. Implementation of an engineered cover system and institutional controls in Alternatives 2 through 7 would provide adequate and reliable means of controlling erosion of, exposure to, and direct contact with contaminated soil/fill material.

Reduction in Toxicity, Mobility, or Volume Through Treatment

There would be no reduction in toxicity, mobility, or volume in soil/fill material provided in Alternative 1. Alternatives 2 through 6 would result in a reduction in mobility (*i.e.,* erosion) of the COCs in soil/fill material through engineered cover systems. Alternatives 2 through 6 would provide for reduction in toxicity, mobility and volume through removal of DNAPL (potential principal threat waste), if recoverable. Alternatives 3, 4 and 5 would provide reduction in toxicity and limit potential mobility of dissolved mercury in groundwater in the vicinity of the Former Mercury Cell Building through treatment and isolation, respectively. Under Alternatives 2 through 6 groundwater discharge from the Subsite is currently controlled by the IRMs. Alternatives 5 and 6 would provide reduction in toxicity and limit potential mobility of elemental mercury (potential principal threat waste) in the subsurface in the vicinity of the Former Mercury Cell Building through *in-situ* treatment or removal. Alternative 7 would result in the reduction in volume of contaminated soil/fill material. Under each alternative, groundwater and DNAPL collection systems implemented as part of the IRMs would provide for reduction of mobility and treatment of COCs in the groundwater.

Under Alternatives 2 through 6, approximately 8,000 gallons per year of chlorinated benzene DNAPL would continue to be collected and disposed off-site under the existing IRMs. Additional DNAPL, if present, may be recovered and disposed off-site or treated under Alternatives 2 through 6. Elemental mercury-impacted soil/fill material would be isolated from site groundwater through hydraulic control under Alternatives 4 and 5. Treatment or removal of elemental mercury-impacted soil/fill material under Alternative 5 would address approximately 450 cubic yards of contaminated material associated with the former floor trenches, while *in-situ* treatment under Alternative 6 would solidify/stabilize approximately 3,450 cubic yards of soil/fill material impacted with elemental mercury. Under Alternative 7, excavation of soil/fill material exceeding unrestricted use SCOs would result in the removal and off-site disposal of approximately 1.1 million cubic yards of soil/fill material and approximately 4,600 cubic yards (to 32 ft. bgs) of soil/fill material to address the 3,450 cubic yards of soil/fill that is assumed to be impacted with elemental mercury in the vicinity of the Former Mercury Cell building. Minimal residuals associated with the treatment under Alternatives 3, 5, and 6 are anticipated.

Short-Term Effectiveness

Alternative 1 does not include physical measures in areas of contamination and, therefore, would not present potential adverse impacts to remediation workers or the community as a result of its implementation. Alternatives 2 through 7 would be implemented using proper protective equipment to manage potential risks to on-site workers and proper precautions and monitoring to be protective of the general public and the environment. Alternatives 2 through 5 would address RAOs related to soil/fill within one construction season. Alternative 6 would address RAOs related to soil/fill within approximately 1 to 2 construction seasons. Alternative 7 would address RAOs related to soil/fill within approximately 7 or 8 construction seasons.

Excavation of the soil/fill material containing elemental mercury included in Alternative 7 would result in a potential for worker and community exposures to elemental mercury. Subsurface disturbance in the Former Mercury Cell Building Area under Alternatives 4 through 6 has the potential to cause subsurface mobilization of the currently stable elemental mercury. However, the implementation of *in-situ* treatment starting around the perimeter of the treatment area in Alternatives 5 and 6 would serve to minimize the potential for remobilization of elemental mercury. The effectiveness of using soil mixing to introduce solidification/stabilization reagents into the subsurface (Alternatives 5 and 6) and the effectiveness of reagents would need to be evaluated. Similarly, the effectiveness of treatment of dissolved mercury in groundwater (Alternative 3) would need to be evaluated.

Impacts to the community resulting from the construction of Alternatives 2 through 4 would primarily be due to increased truck traffic and increased noise for the 1-year duration of cover system construction. Alternatives 5 and 6 would have similar traffic and noise impacts to the community as Alternatives 2 through 4, with the added potential for emissions resulting from the disturbance of contaminated soils within the Former Mercury Cell Building area. Measures would be taken to minimize the noted emissions. Short-term impacts as a result of the continued O&M of IRMs under Alternatives 2 through 7 are not anticipated as the remedial measures are currently constructed and operating. Impacts to the community resulting from the construction of Alternative 7 would include potential for mercury exposures associated with excavation and off-site management of soil/fill material in the vicinity of the Former Mercury Cell Building, substantially increased traffic, as well as increased noise for the 7 to 8-year duration of construction. Measures would be taken to minimize the noted emissions. In addition, Alternative 7 would involve temporary rerouting of a portion of I-690 and State Fair Boulevard to a temporary highway during construction for 3 to 4 years. Excavation of contaminated soil/fill material potentially included in Alternative 5 and included in Alternatives 6 and 7 present health and safety concerns for workers related to mercury exposures; these would be addressed through appropriate protective equipment and controls.

As it relates to traffic, transportation of excavated materials in Alternative 7 is anticipated to result in approximately 151,000 truck trips to and from the site as compared to 2,000 truck trips necessary for cover construction included in Alternatives 2 through 6.

The excavation and off-site disposal included under Alternative 7 would result in far greater direct emissions and fuel consumption as compared to importing construction materials and construction of the cover included under Alternative 2 and the cover and additional isolation, treatment, and/or removal options included under Alternatives 3 through 6. The transport of contaminated material under Alternative 7 would potentially adversely affect local traffic and may pose the potential for traffic accidents, which in turn could result in releases of hazardous substances. In addition to the potentially significant adverse effects on local air quality and community traffic patterns, traffic of this magnitude would be anticipated to result in significant adverse effects on the conditions of roadways.

Implementability

Alternative 1 would be the easiest alternative to implement, as there are no activities to undertake. Alternatives 2 through 6 could be readily constructed and operated; the materials necessary for the construction of these alternatives are reasonably available. The continued operation of the IRMs under Alternatives 2 through 6 would be readily implementable. The vegetated cover systems under Alternatives 2 through 6 would incorporate constructible and reliable technologies. The necessary equipment and specialists would be available to implement these alternatives. Monitoring the effectiveness of the covers included under Alternatives 2 through 6 would be accomplished through vegetated cover system inspections and maintenance to verify the continued cover integrity, visual signs of erosion, and condition of the vegetative cover.

The implementability of groundwater treatment under Alternative 3 and *in-situ* treatment under Alternatives 5 and 6 would need to be evaluated. The implementability of the *in-situ* treatment of bulk soil containing elemental mercury in Solvay waste material under Alternative 6 may present additional challenges due to the elevated pH of the Solvay waste. Implementability issues related to worker safety associated with excavation and/or treatment of elemental mercury are recognized for Alternatives 5 and 6. Alternatives 2 through 7 would also require coordination with other agencies, including New York State Department of Transportation, NYSDOH, EPA, the Town of Geddes, and Onondaga County. In addition, these alternatives would require coordination with the property owners for the implementation of institutional controls. Implementability of excavation (contemplated in Alternative 5) may be limited by capacity and acceptance criteria for the off-site management of soil/fill material exhibiting high levels of mercury. The two retort facilities that can accept bulk soil with elemental mercury are located in Pennsylvania and Wisconsin, and have capacities limited to 1 to 2 roll offs per week. One of these facilities cannot accept material containing PCBs. A solidification/stabilization facility located in Canada that can accept bulk soil with elemental mercury has significantly greater capacity than the retort facilities noted above, however, under Canadian regulations, material containing PCBs at or above 2 mg/kg cannot be transported to Canada.

Alternative 7 would be extremely difficult to implement for the following reasons:

- There are significant implementability limitations associated with the excavation, transportation, and obtaining appropriate disposal capacity of approximately 1,120,000 cubic yards of contaminated soil/fill material.
- The excavation would include challenging construction water management, slope stability concerns, and existing utilities. Construction water management is anticipated to be significant during the excavation because large volumes are anticipated due to the presence of permeable fill and excavations in proximity of Onondaga Lake. Construction water treatment capacity is not likely to be available at the Willis-Semet GWTP, therefore, a temporary treatment system would be required. Excavation in the vicinity of active railroads and the GWTP would require design, procurement, and the installation of shoring. Excavations at the Lakeshore Property in the vicinity of the LHCS is anticipated to further limit the implementability of Alternative 7 relative to the potential for damage or need to replace the collection systems and barrier walls along the lakeshore. Excavation of DNAPL to 45 ft bgs may adversely impact the LHCS and I-690. Installation of sheet piling to support excavations in this area would be required to depths that would penetrate the lower clay confining unit and, thus, potentially allow a pathway for the vertical migration of DNAPL. Excavation at the Lakeshore Property is also anticipated to be significantly limited by the presence of utilities in this area, including two active Onondaga County sewer force mains and a high-pressure gas line.
- It is anticipated that a portion of this soil/fill material would exhibit concentrations of mercury greater than 260 mg/kg, making it a high mercury waste requiring treatment by retort. The two retort facilities that can accept bulk soil with elemental mercury are located in Pennsylvania and Wisconsin and have limited capacities (approximately 20 to 30 cubic yards per week). A Canadian solidification/stabilization facility has greater capacity to accept bulk soil with elemental mercury, however, materials containing PCBs at or above 2 mg/kg cannot be transported to it from the United States under Canadian environmental regulations. A portion of the waste would be characterized as low mercury waste under RCRA and would likely require treatment to stabilize the mercury prior to landfilling. Due to worker and community health and safety concerns, it is assumed that treatment would be performed off-site.
- Based on anticipated bulking of the material as a result of excavation, the total estimated volume requiring disposal is 1,120,000 cubic yards (estimated to be approximately 1,300,000 tons). Based on a daily production rate of 2,400 cubic yards per day for 10 months of the year, it is estimated that up to approximately 580,000 cubic yards of material would be shipped off-site each year in 38,000 truckloads (160 truckloads per day) with an approximately equivalent number of trips being required for restoration. During a 10-hour work day, this would equate to approximately 1 truck entering or leaving the site every 4 minutes. In addition to the potentially significant adverse effects on local air quality

and community traffic patterns, traffic of this magnitude is anticipated to result in significant adverse effects on conditions of roadways.

Cost

The estimated present-worth costs were calculated using a discount rate of seven percent and a thirty-year time interval for post-construction monitoring and maintenance period. (Although O&M would continue as needed beyond the thirty-year period, thirty years is the typical period used when estimating costs for a comparative analysis.)

The estimated capital, annual O&M, and present-worth costs using a 7% discount factor for each of the alternatives are presented in the table below.

Alternatives	Capital	Annual O&M	Total Present Worth
1 – No Further Action	$0	$0	$0
2 – Engineered Cover System	$5.2 Million	$392,685	$10.1 Million
3 – Engineered Cover w/ Targeted Shallow/Intermediate Groundwater Treatment at Former Mercury Cell Building	$7.1 Million	$548,935392,685	$13.9 Million
4 – Engineered Cover System with Targeted Shallow/Intermediate Groundwater Hydraulic Control at Former Mercury Cell Building	$7.1 Million	$396,405	$12.0 Million
5 – Engineered Cover System with Targeted Shallow/Intermediate Groundwater Treatment and Mercury Hot Spot Treatment/Removal at Former Mercury Cell Building	$7.3 Million	$396,405	$12.3 Million
6 – Engineered Cover System with In-Situ Treatment at Former Mercury Cell Building	$7.4 Million	$392,685	$12.3 Million
7 – Full Excavation with Off-Site Disposal	$717.3 Million	$254,805	$720.5 Million

State Acceptance

NYSDOH has reviewed this Proposed Plan and concurs with the preferred remedy.

Community Acceptance

Community acceptance of the preferred alternative will be addressed in the ROD following review of the public comments received on the Proposed Plan.

PREFERRED REMEDY

Based upon an evaluation of the various alternatives, NYSDEC and EPA recommend Alternative 5 – Engineered Cover System with Targeted Shallow/Intermediate Groundwater Hydraulic Control and Mercury Hot Spot Treatment/Removal at the Former Mercury Cell Building, as the preferred alternative. The preferred alternative includes the placement of a cover system and targeted treatment and/or removal and disposal of mercury hot spots associated with the former floor trenches in the former Mercury Cell Building located in the Willis Plant Area. This alternative also includes DNAPL evaluation and recovery, if recoverable DNAPL is encountered, and continuation of O&M for the IRMs that have been implemented at the Subsite. A conceptual depiction of the preferred remedy is presented in Figure 9.

Some or all of the existing soil piles will be beneficially reused at the adjacent Semet Residue Ponds subsite. Any surplus material would be used during grading prior to the placement of a cover at the Willis Plant Area. A minimum 1-ft thick soil/granular cover (or maintained paved surfaces and buildings) would be constructed over approximately 20 acres to minimize erosion and mitigate potentially unacceptable exposure of human receptors to constituents exceeding Commercial-

Use SCOs in the surface soil/fill material. The need for a demarcation layer between the soil cover and the underlying substrate would be evaluated during the design. The design of the cover would take into consideration development plans that are available for the Subsite at that time. A one-foot excavation would precede the construction of the cover in the CHSA, such that the final cover grade would match the existing grades, with the excavated material being placed on the Willis Plant Area and graded before the placement of the cover at that portion of the Subsite. The surface in the area of the former Mercury Cell Building would be covered with a low permeability cover. Any fill material brought to the Subsite would need to meet the requirements for the identified Subsite use as set forth in 6 NYCRR Part 375-6.7(d). Native species would be used for the vegetative component of covers as appropriate. Structures, such as buildings, pavement, or sidewalks, as part of future development, could also serve as acceptable substitutes for the vegetated cover either at implementation of the remedy or at a future time.

Soil/fill material associated with the floor trenches exhibiting free elemental mercury would be addressed. The presence of free elemental mercury and low-level PCBs may limit disposal options. Pre-design investigations would need to be conducted to characterize this material to assess whether *in-situ* treatment and/or off-site management of these materials would be most practicable to address the floor trenches and associated elemental mercury.

In-situ treatment could employ *in-situ* solidification/stabilization, which may include cement-based additives in the reagent mix to solidify the material, reducing contact with infiltrating surface water. Sulfur-based reagents could be used for conversion of elemental mercury to a less soluble, less volatile, less toxic form (*i.e.,* mercury sulfide). The specific type of reagents/mix would be identified through a treatability study that would be conducted during the design phase.

A vertical barrier hydraulic containment system would be installed to isolate the contaminated shallow and intermediate groundwater in the vicinity of the Former Mercury Cell Building. Excavation of debris associated with the installation of the vertical barrier is assumed to be limited to building foundations that may be necessary to be removed to install the barrier, as the installation of the barrier is intended to surround the Former Mercury Cell Building. The surface of this area would be covered with a low permeability cover. For cost estimating purposes, the vertical barrier is assumed to consist of grouted sheet piles driven to an approximate depth of 35 ft bgs (*i.e.,* into the confining unit beneath the intermediate groundwater unit). In addition, this alternative is assumed to incorporate a high-density polyethylene geomembrane and an extraction well system within the vertical barrier to address potential infiltration. Collected groundwater would be treated at the Willis Avenue GWTP.

The vertical hydraulic conductivity of Solvay waste that may be present at the Subsite is generally less than 1×10^{-5} cm/sec. The proposed cover materials in combination with the underlying soil/fill material (*e.g.,* Solvay waste) and continued O&M of the groundwater collection system for Subsite groundwater would meet the requirements for containment under RCRA Subtitle D.

Evidence of chlorobenzene DNAPL was observed in borings at the Willis Plant Area and the CHSA. While evidence of pooled DNAPL is limited to the Lakeshore Property, where DNAPL is currently being collected by a DNAPL recovery system, a field study would be conducted to evaluate the potential for the presence of recoverable chlorobenzene DNAPL in the northern portion of the Willis Plant Area and the CHSA. If recoverable DNAPL is encountered during the DNAPL investigation, DNAPL would be removed (*e.g.,* using recovery wells) and sent off-site for disposal. If no recoverable DNAPL is encountered, *in-situ* treatment (*e.g.,* via chemical oxidation) for residual DNAPL encountered in discrete areas and in substantial quantity would be evaluated to determine if mass reduction of contamination could be achieved. A treatability study would be performed to verify effectiveness and implementability of *in situ* treatment, and to facilitate the remedial design.

The preferred remedy also includes the restoration of shallow/intermediate groundwater at the POC via MNA. An evaluation of the shallow and intermediate groundwater using data collected in 2017 to support an investigation of deep groundwater indicated that natural attenuation is occurring within the shallow and intermediate groundwater. Based on multiple lines of evidence, degradation of groundwater organic constituents is occurring in shallow and intermediate groundwater. Further evaluation of MNA would be conducted as part of the preliminary remedial design and/or O&M. Because the shallow/intermediate groundwater at and beyond the POC is comingled with the shallow/intermediate groundwater from the adjacent Semet Residue Ponds subsite, the shallow/intermediate groundwater from both sites would be addressed via MNA.

Institutional controls in the form of environmental easements and/or restrictive covenants would restrict the land use to commercial (including passive recreational)/industrial use, restrict groundwater use and require that intrusive activities in areas where contamination remains are in accordance with a NYSDEC-approved Subsite SMP, which would include the following:

- Institutional and Engineering Control Plan that identifies institutional and engineering controls (*i.e.,* environmental easement and/or restrictive covenants, cover systems) for the Subsite and details the following steps and media-specific requirements necessary to ensure that they remain in place and are effective:

  - an excavation plan that details the provisions for management of future excavations in areas of remaining contamination;
  - descriptions of the provisions of the institutional controls including any land use or groundwater use restrictions;
  - a provision that future on-site buildings should be evaluated for the potential for vapor intrusion and may include vapor intrusion sampling and/or installation of mitigation measures, if necessary;
  - Subsite access and NYSDEC notification; and
  - periodic reviews and certification of the institutional and/or engineering controls.

- Monitoring Plan to assess the performance and effectiveness of the remedy. The final monitoring program would be established during the design.

The preferred remedy also includes continued O&M associated with the IRMs that have been implemented at the Subsite. These include the Lakeshore Property, I-690 Storm Drainage System, East Flume, the Willis Avenue section of the Willis-Semet Berm Improvements, and Willis Barrier Wall and groundwater collection system and Willis Avenue GWTP. Maintenance and monitoring for the IRMs would include monitoring to document that they are performing effectively and efficiently and to identify the need for corrective action(s), as warranted. Corrective actions for covers may consist of cover repair in areas of disturbance or re-application of vegetation in areas of non-survival.[9] In addition, Tributary 5A remediation was completed during the shallow groundwater collection system installation performed under the Semet Residue Ponds OU-1 ROD. No additional work is anticipated and monitoring would continue under the Tributary 5A remedy.

Because this alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Subsite be reviewed at least once every five years.

Green remediation techniques, as detailed in NYSDEC's Green Remediation Program Policy-DER-31,[10] and EPA Region 2's Clean and Green Policy[11] would be considered for the preferred remedy to reduce short-term environmental impacts. Green remediation best practices such as the following may be considered:

- Use of renewable energy and/or purchase of renewable energy credits to power energy needs during construction and/or O&M of the remedy
- Reduction in vehicle idling, including both on and off-road vehicles and construction equipment during construction and/or O&M of the remedy
- Design of cover systems, to the extent possible, to be usable for alternate uses, require minimal maintenance (*e.g.,* less mowing), and/or be integrated with the planned use of the property
- Beneficial reuse of material that would otherwise be considered a waste
- Use of Ultra Low Sulfur Diesel.

BASIS FOR THE REMEDY PREFERENCE

The no further action alternative, Alternative 1, would not meet RAOs for the Subsite. While Alternatives 2 through 7 would address the chlorobenzene DNAPL that is present at the site, Alternative 2 would not address elemental mercury, a principal threat waste, that is also present at the site. Therefore, Alternative 2 would not be as effective in addressing the RAO to prevent, or reduce to the extent practicable, the release of Subsite-related contaminants to the groundwater, surface water, and sediment as would the other action alternatives. Alternative 3 includes targeted treatment of dissolved mercury in the shallow and intermediate groundwater in the vicinity of the Former Mercury Cell Building, but this alternative would not address elemental mercury directly. Under Alternative 4, the installation of a vertical hydraulic barrier and low permeability cover and groundwater extraction inside the hydraulic barrier to prevent groundwater infiltration would isolate the shallow and intermediate mercury impacted groundwater in the vicinity of the Former Mercury Cell Building. This alternative would not, however, include treatment of elemental mercury. Alternative 5 includes the same components as Alternative 4, but also includes targeted treatment and/or removal and disposal of mercury hot spots associated with the former floor trenches in

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[9] The annual O&M cost estimates associated with monitoring of the vegetative cover, for maintenance of the vegetative cover, and for monitoring and maintenance of the other IRM elements cited here are included in the cost estimates.
[10] See http://www.dec.ny.gov/docs/remediation_hudson_pdf/der31.pdf
[11] See http://epa.gov/region2/superfund/green_remediation

the Former Mercury Cell Building. Alternative 5 would, therefore, be more effective in isolating and addressing elemental mercury than would Alternatives 3 and 4. Alternative 6 does include *in-situ* treatment of soil/fill material at the Former Mercury Cell Building to address elemental mercury in the soil/fill material, but it is anticipated that *in-situ* solidification/stabilization under this alternative may be difficult to implement at depths in the subsurface below the floor trenches due to the elevated pH of Solvay waste material. For this reason, Alternative 6 may not be as effective as Alternative 5 in addressing elemental mercury at the site. Alternative 7 would be extremely difficult to implement, presents significant short-term impacts, would take longer to implement compared to other alternatives, and is the least cost-effective means of achieving the objectives.

Based on information currently available, NYSDEC and EPA believe that the preferred alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. NYSDEC and EPA expect the preferred alternative to satisfy the following statutory requirements of CERCLA §121(b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element (or justify not meeting the preference).

Table 1 - Willis Avenue Chlorobenzene Site Proposed Plan
Plant Area (including Lakeshore Property) - Surface Soils (0-2 ft bgs)
Summary of Detected Concentrations and Part 375 Restricted Use SCO Exceedances

Parameter	Number of Records	Minimum Detected Conc.	Maximum Detected Conc.	NYSDEC Part 375 Restricted Use - Commercial SCOs	Number of Commercial SCO Exceedances	NYSDEC Part 375 Restricted Use - Industrial SCOs	Number of Industrial SCO Exceedances
Semivolatile Organic Compounds (μg/kg)							
1,4-Dichlorobenzene	25	51.0	2,600,000	130,000	2	250,000	2
Benzo(a)anthracene	25	54.0	16,000	5,600	6	11,000	2
Benzo(a)pyrene	25	51.0	18,000	1,000	13	1,100	13
Benzo(b)fluoranthene	25	89.0	23,000	5,600	8	11,000	4
Dibenz(a,h)anthracene	25	85.0	5,800	560	7	1,100	6
Hexachlorobenzene	25	86.0	28,000	6,000	1	12,000	1
Indeno(1,2,3-cd)pyrene	25	57.0	18,000	5,600	2	11,000	1
Pesticides (μg/kg)							
Hexachlorobenzene	8	69.0	17,000	6,000	1	12,000	1
PCBs (μg/kg)							
Aroclor-1254	46	190	14,000	1,000	8	25,000	0
Aroclor-1260	46	27.0	35,000	1,000	9	25,000	2
Metals (mg/kg)							
Arsenic	25	3.10	65.7	16	7	16	7
Barium	25	19.2	673	400	4	10,000	0
Copper	25	10.0	326	270	1	10,000	0
Mercury	80	0.17	4,780	2.8	46	5.7	34
Nickel	25	8.30	4,040	310	1	10,000	0

NOTES

This table presents (1) the detected concentration data only and (2) only parameters that exceeded the Part 375 Commercial or Industrial SCOs.

The Plant Area data includes the Willis Plant Area (as defined in the *Willis Avenue Site Feasibility Study Report* [OBG, June 2018]), which does include the Lakeshore Property.

bgs = below ground surface

Table 2 - Willis Avenue Chlorobenzene Site Proposed Plan Plant Area (including Lakeshore Property) - Subsurface Soils (>2 ft bgs) Summary of Detected Concentrations and Part 375 Restricted Use SCO Exceedances							
Parameter	Number of Records	Minimum Detected Conc.	Maximum Detected Conc.	NYSDEC Part 375 Restricted Use - Commercial SCOs	Number of Commercial SCO Exceedances	NYSDEC Part 375 Restricted Use - Industrial SCOs	Number of Industrial SCO Exceedances
Volatile Organic Compounds (μg/kg)							
1,4-Dichlorobenzene	16	3.90	2,400,000	130,000	2	250,000	2
Benzene	36	1.00	7,600,000	44,000	1	89,000	1
Chlorobenzene	36	1.70	2,000,000	500,000	1	1,000,000	1
Naphthalene	14	1.70	3,200,000	500,000	1	1,000,000	1
Toluene	36	1.00	3,100,000	500,000	1	1,000,000	1
Xylene (Total)	36	2.00	1,700,000	500,000	1	1,000,000	1
Semivolatile Organic Compounds (μg/kg)							
1,2-Dichlorobenzene	20	180	6,800,000	500,000	3	1,000,000	3
1,3-Dichlorobenzene	20	200	2,000,000	280,000	3	560,000	2
1,4-Dichlorobenzene	20	290	5,500,000	130,000	8	250,000	7
Benzo(a)anthracene	22	1,000	9,600	5,600	1	11,000	0
Benzo(a)pyrene	22	5,500	5,500	1,000	1	1,100	1
PCBs (μg/kg)							
Aroclor-1242	15	690	1,100	1,000	1	25,000	0
Aroclor-1260	15	42.0	1,400	1,000	2	25,000	0
Metals (mg/kg)							
Arsenic	20	0.78	23.8	16	2	16	2
Barium	20	23.2	958	400	2	10,000	0
Mercury	76	0.20	1,370	2.8	28	5.7	24

NOTES

This table presents (1) the detected concentration data only and (2) only parameters that exceeded the Part 375 Commercial or Industrial SCOs.

The Plant Area data includes the Willis Plant Area (as defined in the *Willis Avenue Site Feasibility Study Report* [OBG, June 2018]), which does include the Lakeshore Property.

bgs = below ground surface

Table 3 - Willis Avenue Chlorobenzene Site Proposed Plan
Chlorobenzene Hot-Spots Area - Surface Soils (0-2 ft bgs)
Summary of Detected Concentrations and Part 375 Restricted Use SCO Exceedances

Parameter	Number of Records	Minimum Detected Conc.	Maximum Detected Conc.	NYSDEC Part 375 Restricted Use - Commercial SCOs	Number of Commercial SCO Exceedances	NYSDEC Part 375 Restricted Use - Industrial SCOs	Number of Industrial SCO Exceedances
Semivolatile Organic Compounds (μg/kg)							
Benzo(a)anthracene	7	320	17,000	5,600	1	11,000	1
Benzo(a)pyrene	7	270	14,000	1,000	5	1,100	4
Benzo(b)fluoranthene	7	450	22,000	5,600	3	11,000	1
Dibenz(a,h)anthracene	7	260	3,000	560	4	1,100	3
Indeno(1,2,3-cd)pyrene	7	180	7,900	5,600	1	11,000	0
PCBs (μg/kg)							
Aroclor-1254	7	710	120,000	1,000	5	25,000	1
Metals (mg/kg)							
Arsenic	7	3.50	18.6	16	1	16	1
Mercury	7	0.53	3.50	2.8	1	5.7	0

NOTES

This table presents (1) the detected concentration data only and (2) only parameters that exceeded the Part 375 Commercial or Industrial SCOs.

bgs = below ground surface

Table 4 - Willis Avenue Chlorobenzene Site Proposed Plan
Chlorobenzene Hot-Spot Area - Subsurface Soils
Summary of Detected Concentrations and Part 375 Restricted Use SCO Exceedances

Parameter	Number of Records	Minimum Detected Conc.	Maximum Detected Conc.	NYSDEC Part 375 Restricted Use - Commercial SCOs	Number of Commercial SCO Exceedances	NYSDEC Part 375 Restricted Use - Industrial SCOs	Number of Industrial SCO Exceedances
Volatile Organic Compounds (μg/kg)							
1,4-Dichlorobenzene	8	74.0	800,000	130,000	1	250,000	1
Semivolatile Organic Compounds (μg/kg)							
1,2-Dichlorobenzene	6	110	1,400,000	500,000	1	1,000,000	1
1,4-Dichlorobenzene	6	68.0	2,000,000	130,000	1	250,000	1
Benzo(a)anthracene	14	85.0	17,000	5,600	1	11,000	1
Benzo(a)pyrene	14	67.0	12,000	1,000	1	1,100	1
Benzo(b)fluoranthene	14	94.0	17,000	5,600	1	11,000	1
Dibenz(a,h)anthracene	14	97.0	2,300	560	1	1,100	1
Hexachlorobenzene	14	220	13,000	6,000	1	12,000	1
PCBs (μg/kg)							
Aroclor-1254	6	44.0	92,000	1,000	1	25,000	1
Metals (mg/kg)							
Mercury	6	0.22	5.80	2.8	1	5.7	1

NOTES

This table presents (1) the detected concentration data only and (2) only parameters that exceeded the Part 375 Commercial or Industrial SCOs.

bgs = below ground surface

Table 5 - Willis Avenue Chlorobenzene Site Proposed Plan Petroleum Storage Area - Surface Soils (0-2 ft bgs) Summary of Detected Concentrations and Part 375 Restricted Use SCO Exceedances							
Parameter	Number of Records	Minimum Detected Conc.	Maximum Detected Conc.	NYSDEC Part 375 Restricted Use - Commercial SCOs	Number of Commercial SCO Exceedances	NYSDEC Part 375 Restricted Use - Industrial SCOs	Number of Industrial SCO Exceedances
Semivolatile Organic Compounds (μg/kg)							
Benzo(a)anthracene	4	1,600	7,300	5,600	1	11,000	0
Benzo(a)pyrene	4	1,700	7,000	1,000	4	1,100	4
Benzo(b)fluoranthene	4	2,700	10,000	5,600	2	11,000	0
Dibenz(a,h)anthracene	4	590	1,700	560	4	1,100	1
Indeno(1,2,3-cd)pyrene	4	1,600	6,100	5,600	1	11,000	0
Metals (mg/kg)							
Arsenic	4	7.40	67.6	16	3	16	3
Mercury	4	0.82	14.2	2.8	2	5.7	2

NOTES

This table presents (1) the detected concentration data only and (2) only parameters that exceeded the Part 375 Commercial or Industrial SCOs.

bgs = below ground surface

Table 6 - Willis Avenue Chlorobenzene Site Proposed Plan
Petroleum Storage Area - Subsurface Soils (>2 ft bgs)
Summary of Detected Concentrations and Part 375 Restricted Use SCO Exceedances

Parameter	Number of Records	Minimum Detected Conc.	Maximum Detected Conc.	NYSDEC Part 375 Restricted Use - Commercial SCOs	Number of Commercial SCO Exceedances	NYSDEC Part 375 Restricted Use - Industrial SCOs	Number of Industrial SCO Exceedances
Semivolatile Organic Compounds (µg/kg)							
Benzo(a)pyrene	4	290	1,300	1,000	1	1,100	1
PCBs (µg/kg)							
Aroclor-1260	4	11.0	1,100	1,000	1	25,000	0
Metals (mg/kg)							
Arsenic	4	3.50	22.9	16	1	16	1
Total Cyanide	4	61.0	61.0	27	1	10,000	0

NOTES

This table presents (1) the detected concentration data only and (2) only parameters that exceeded the Part 375 Commercial or Industrial SCOs.

bgs = below ground surface

Table 7 -Willis Avenue Chlorobenzene Site Proposed Plan Plant Area (including Lakeshore Property) - Shallow and Intermediate Groundwater Summary of Detected Concentrations and Class GA SGV Exceedances					
Parameter	Number of Records	Minimum Detected Conc.	Maximum Detected Conc.	NYSDEC Class GA SGVs	Number of Class GA Exceedances
Volatile Organic Compounds (μg/L)					
2-BUTANONE	13	8.00	190	50(G)	1
ACETONE	13	22.0	2,800	50(S)	5
BENZENE	26	1.00	62,000	1(S)	22
CARBON DISULFIDE	13	200	860	60(G)	3
CHLOROBENZENE	26	9.00	87,000	5(S)	18
CHLOROFORM	26	3.00	52.0	7(S)	1
ETHYLBENZENE	26	1.00	9.00	5(S)	1
METHYLENE CHLORIDE	26	2.00	1,300	5(S)	3
TOLUENE	26	0.60	80,000	5(S)	7
XYLENES, TOTAL	26	4.00	7.00	5(S)	1
Semivolatile Organic Compounds (μg/L)					
1,2,4-TRICHLOROBENZENE	13	19.0	1,000	5(S)	3
1,2-DICHLOROBENZENE	21	2.00	29,000	3(S)	8
1,3-DICHLOROBENZENE	26	17.0	9,500	3(S)	7
1,4-DICHLOROBENZENE	26	69.0	72,000	3(S)	13
2,4,5-TRICHLOROPHENOL	13	19.0	19.0	1(S)	1
2,4,6-TRICHLOROPHENOL	13	3.00	3.00	1(S)	1
2,4-DICHLOROPHENOL	13	2.00	23.0	1(S)	5
2-CHLORONAPHTHALENE	13	8.00	15.0	10(G)	1
2-CHLOROPHENOL	13	4.00	180	1(S)	5
2-METHYLPHENOL	13	8.00	30.0	1(S)	4
2-NITROPHENOL	13	6.00	6.00	1(S)	1
4-CHLORO-3-METHYLPHENOL	13	3.00	4.00	1(S)	2
4-METHYLPHENOL	13	3.00	500	1(S)	7
4-NITROPHENOL	13	6.00	6.00	1(S)	1
BENZO(B)FLUORANTHENE	13	5.00	5.00	0.002(G)	1
BENZO(K)FLUORANTHENE	13	2.00	2.00	0.002(G)	1
BIS(2-ETHYLHEXYL)PHTHALATE	13	39.0	39.0	5(S)	1
CHRYSENE	13	2.00	4.00	0.002(G)	2
INDENO(1,2,3-CD)PYRENE	13	2.00	2.00	0.002(G)	2
NAPHTHALENE	13	2.00	140	10(G)	5
PHENANTHRENE	13	1.00	75.0	50(G)	1
PHENOL	13	4.00	740	1(S)	8
Metals (mg/L)					
ARSENIC	13	0.001	0.96	0.025(S)	3
BARIUM	13	0.06	1.82	1(S)	1
COPPER	13	0.03	0.38	0.2(S)	1
IRON	13	2.45	46.6	0.3(S)	8
LEAD	13	0.001	0.04	0.025(S)	2
MAGNESIUM	13	8.76	230	35(G)	3
MANGANESE	13	0.09	0.43	0.3(S)	3
MERCURY	15	0.0003	0.12	0.0007(S)	7

NOTES

This table presents (1) the detected concentration data only and (2) only parameters that exceeded the Class GA SGVs.

The Plant Area data includes the Willis Plant Area (as defined in the Willis Avenue Site Feasibility Study Report [OBG, June 2018]), which does include the Lakeshore Property.

Table 8 - Willis Avenue Chlorobenzene Site Proposed Plan Chlorobenzene Hot-Spot Area - Shallow Groundwater Summary of Detected Concentrations and Class GA SGV Exceedances					
Parameter	Number of Records	Minimum Detected Conc.	Maximum Detected Conc.	NYSDEC Class GA SGVs	Number of Class GA Exceedances
Volatile Organic Compounds (μg/L)					
1,1,1-TRICHLOROETHANE	36	14.0	14.0	5(S)	1
1,2,4-TRICHLOROBENZENE	21	0.20	5,100	5(S)	4
1,2-DICHLOROBENZENE	21	0.19	14,100	3(S)	10
1,3-DICHLOROBENZENE	21	0.47	800	3(S)	7
1,4-DICHLOROBENZENE	21	0.17	26,500	3(S)	16
BENZENE	36	0.34	6,060	1(S)	17
CHLOROBENZENE	36	1.00	35,800	5(S)	20
Semivolatile Organic Compounds (μg/L)					
1,2,4-TRICHLOROBENZENE	7	240	240	5(S)	1
1,2-DICHLOROBENZENE	13	170	170	3(S)	1
1,3-DICHLOROBENZENE	14	26.0	26.0	3(S)	1
1,4-DICHLOROBENZENE	14	240	1,100	3(S)	2
2,4,5-TRICHLOROPHENOL	16	7.00	7.00	1(S)	1
2,4-DICHLOROPHENOL	16	4.00	88.0	1(S)	4
2-CHLOROPHENOL	16	1.00	38.0	1(S)	3
HEXACHLOROBENZENE	16	2.00	2.00	0.04(S)	1
PHENOL	16	2.00	5.00	1(S)	2
Metals (mg/L)					
ARSENIC	7	0.005	0.23	0.025(S)	2
CHROMIUM	7	0.02	2.11	0.05(S)	4
COPPER	7	0.02	0.51	0.2(S)	2
CYANIDE	7	0.21	0.64	0.2(S)	2
IRON	7	0.66	146	0.3(S)	7
LEAD	7	0.009	0.26	0.025(S)	3
MAGNESIUM	23	0.24	160	35(G)	4
MANGANESE	7	0.01	3.45	0.3(S)	5
MERCURY	11	0.0003	0.009	0.0007(S)	4
SODIUM	23	29.1	2,880	20(S)	23

NOTES

This table presents (1) the detected concentration data only and (2) only parameters that exceeded the Class GA SGVs.

There is no intermediate groundwater zone present at the Chlorobenzene Hot-Spots Area.

Table 9 - Willis Avenue Chlorobenzene Site Proposed Plan
Petroleum Storage Area - Shallow Groundwater
Summary of Detected Concentrations and Class GA SGV Exceedances

Parameter	Number of Records	Minimum Detected Conc.	Maximum Detected Conc.	NYSDEC Class GA SGVs	Number of Class GA Exceedances
Volatile Organic Compounds (μg/L)					
BENZENE	8	3.00	4,400	1(S)	8
ETHYLBENZENE	8	3.00	38.2	5(S)	1
ISOPROPYLBENZENE	2	1.87	33.1	5(G)	1
TOLUENE	8	1.02	64.0	5(S)	1
XYLENES, TOTAL	8	3.93	69.5	5(S)	2
Semivolatile Organic Compounds (μg/L)					
2-METHYLPHENOL	4	2.00	2.00	1(S)	1
4-METHYLPHENOL	4	6.00	6.00	1(S)	1
NAPHTHALENE	4	10.0	1,600	10(G)	2
PHENOL	4	1.00	44.0	1(S)	2
Metals (mg/L)					
CHROMIUM	3	0.008	0.07	0.05(S)	2
COPPER	3	0.13	0.21	0.2(S)	1
IRON	3	6.60	58.0	0.3(S)	3
LEAD	3	0.02	0.11	0.025(S)	2
MAGNESIUM	5	22	155	35(G)	3
MANGANESE	3	0.22	2.62	0.3(S)	2
MERCURY	3	0.002	0.003	0.0007(S)	2
SODIUM	5	73.7	176	20(S)	5

NOTES

This table presents (1) the detected concentration data only and (2) only parameters that exceeded the Class GA SGVs.

There is no intermediate groundwater zone present at the Petroleum Storage Area.

Table 10: Risk/Hazards Exceeding Threshold Levels Under Current Conditions					
Exposure Area	**Population**	**Exposure Media**	**COCs**	**Cancer Risk**	**Noncancer Hazard**
On-Site Ditches	Adolescent Trespasser	Surface Soil	Dioxins, Mercury	NA	6
	Adult Trespasser	Surface Soil	Dioxins, Mercury	NA	3
	Surveillance Worker	Surface Soil	Dioxins, Mercury	NA	3
Former Chlorination Building	Adolescent Trespasser	Surface Soil	Dioxins	4E-04	200
	Adult Trespasser	Surface Soil	Dioxins	7E-04	10
	Surveillance Worker	Surface Soil	Dioxins	5E-04	10
Southwest Off-Site/Outfall 006 Exposure Area	Adolescent Trespasser	Surface Soil	PCBs	NA	3
Lakeshore Property	Utility Worker	Shallow Groundwater	Benzene, Chlorobenzene	NA	10
Chlorobenzene Hot-Spot Area	Adolescent Trespasser	Surface Soil	PCBs	NA	4
	Adult Trespasser	Surface Soil	PCBs	NA	3
Tributary 5A	Adolescent Trespasser	Sediment	Chromium	NA	2
	Utility Worker	Upper Sediment	Chromium, Vanadium	NA	7

Notes

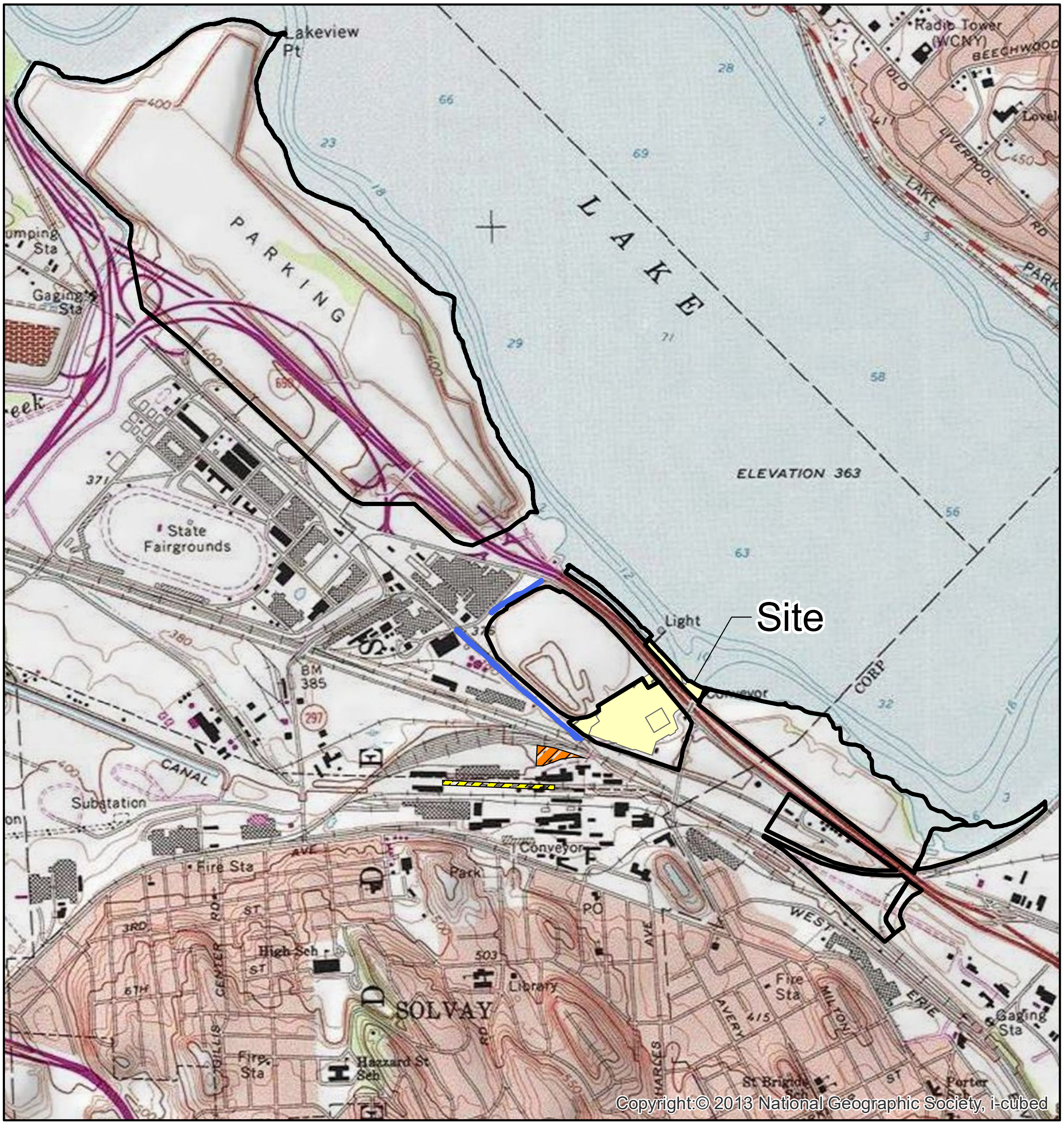
1. Surface Soil is defined as the top 2 feet.
2. Upper Soil is defined as the top 10 feet.
3. Intermediate Soil is defined as the top 20 feet.
4. Sediment is defined as the top 1 foot.
5. Upper Sediment is defined as the top 10 feet.
6. NA = Not Applicable.
7. Chemicals that exceed a 10^{-4} cancer risk or a non-cancer hazard index of 1 are typically those that will require remedial action at the site and are referred to as COCs. Further information on risks is provided in the text box, “What is Human Health Risk and How is it Calculated?”.

Table 11: Risks/Hazards Exceeding Threshold Levels Under Future Scenarios					
Exposure Area	**Population**	**Exposure Media**	**COCs**	**Cancer Risk**	**Noncancer Hazard**
Plant Area	Industrial Worker	Surface Soil	Mercury	NA	2
Plant Area	Construction Worker	Upper Soil	Manganese, Mercury, Nickel	NA	30
Plant Area	Utility Worker	Intermediate Soil, Intermediate Groundwater	Mercury	NA	5
On-Site Ditches	Adolescent Trespasser	Surface Soil	Dioxins, Mercury	NA	6
On-Site Ditches	Adult Trespasser	Surface Soil	Dioxins, Mercury	NA	3
On-Site Ditches	Surveillance Worker	Surface Soil	Dioxins, Mercury	NA	3
On-Site Ditches	Industrial Worker	Surface Soil	Dioxins, Mercury	2E-04	9
On-Site Ditches	Construction Worker	Upper Soil	Dioxins, Chromium, Manganese, Mercury, Nickel	NA	50
On-Site Ditches	Utility Worker	Intermediate Soil	Dioxins, Mercury, PCBs	NA	30
Former Chlorination Building	Adolescent Trespasser	Surface Soil	Dioxins	4E-04	20
Former Chlorination Building	Adult Trespasser	Surface Soil	Dioxins	7E-04	10
Former Chlorination Building	Surveillance Worker	Surface Soil	Dioxins	5E-04	10
Former Chlorination Building	Industrial Worker	Surface Soil	Dioxins	2E-03	30
Former Chlorination Building	Construction Worker	Upper Soil	Dioxins, Manganese	8E-04	400
Former Chlorination Building	Utility Worker	Intermediate Soil	Dioxins	7E-04	300
Southwest Off-Site/Outfall 006 Exposure Area	Adolescent Trespasser	Surface Soil	PCBs	NA	3
Southwest Off-Site/Outfall 006 Exposure Area	Industrial Worker	Surface Soil	Mercury, PCBs	NA	4
Southwest Off-Site/Outfall 006 Exposure Area	Construction Worker	Upper Soil	Benzene, Dioxins, Chromium, Manganese, Mercury, PCBs, Benzo(a)pyrene, Xylenes	2E-04	80
Lakeshore Property	Utility Worker	Shallow Groundwater	Benzene, Chlorobenzene	NA	10
Petroleum Storage Area	Construction Worker	Upper Soil, Shallow Groundwater	Manganese, Benzene	NA	8
Chlorobenzene Hot-Spot Area	Adolescent Trespasser	Surface Soil	PCBs	NA	4

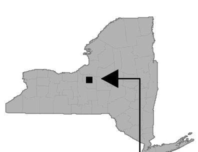
Table 11: Risks/Hazards Exceeding Threshold Levels Under Future Scenarios					
Exposure Area	**Population**	**Exposure Media**	**COCs**	**Cancer Risk**	**Noncancer Hazard**
	Adult Trespasser	Surface Soil	PCBs	NA	3
	Industrial Worker	Surface Soil	PCBs	NA	6
	Construction Worker	Surface Soil, Shallow Groundwater	Chromium, Manganese, PCBs, Benzene	NA	10
	Utility Worker	Upper Soil, Shallow Groundwater	PCBs, Benzene	NA	10
Tributary 5A	Adolescent Trespasser	Sediment	Chromium	NA	2
	Utility Worker	Upper Sediment	Chromium, Vanadium	NA	7
Potable Water	Child Resident	Site-wide Groundwater	Benzene, Benzo(b)fluoranthene, 1,4-Dichlorobenzene, Aluminum, Arsenic, Chromium, Iron, Manganese, Mercury, Vanadium, 1,2,4-Trichlorobenzene, 1,4-Dichlorobenzene, Chlorobenzene, Toluene	7E-03	400
	Adult Resident	Site-wide Groundwater	Benzene, Arsenic, Chromium, Iron, Mercury, Vanadium, 1,4-Dichlorobenzene, Chlorobenzene, Toluene	1E-02	200

Notes

1. Surface Soil is defined as the top 2 feet.
2. Upper Soil is defined as the top 10 feet.
3. Intermediate Soil is defined as the top 20 feet.
4. Sediment is defined as the top 1 foot.
5. Upper Sediment is defined as the top 10 feet.
6. NA = Not Applicable.
7. "Site-wide Groundwater" is based on groundwater data from the Willis Avenue subsite, but human health risks associated with exposure to Semet Residue Ponds subsite groundwater is similar to that for the Willis Avenue subsite because the groundwater plumes comingle at the two subsites.
8. Chemicals that exceed a 10^{-4} cancer risk or a non-cancer hazard index of 1 are typically those that will require remedial action at the site and are referred to as COCs. Additional information on risks is provided in the text box, "What is Human Health Risk and How is it Calculated?".



ADAPTED FROM: SYRACUSE WEST, NY USGS QUADRANGLE



MAP LOCATION

WILLIS AVENUE SITE
FEASIBILITY STUDY
GEDDES, NEW YORK

N

LEGEND

STUDY AREA

- WILLIS PLANT AREA
- CHLOROBENZENE HOT-SPOTS AREA
- PETROLEUM STORAGE AREA
- TRIBUTARY 5A

SITE LOCATION

0 1,000 2,000 4,000

Feet

1:24,000

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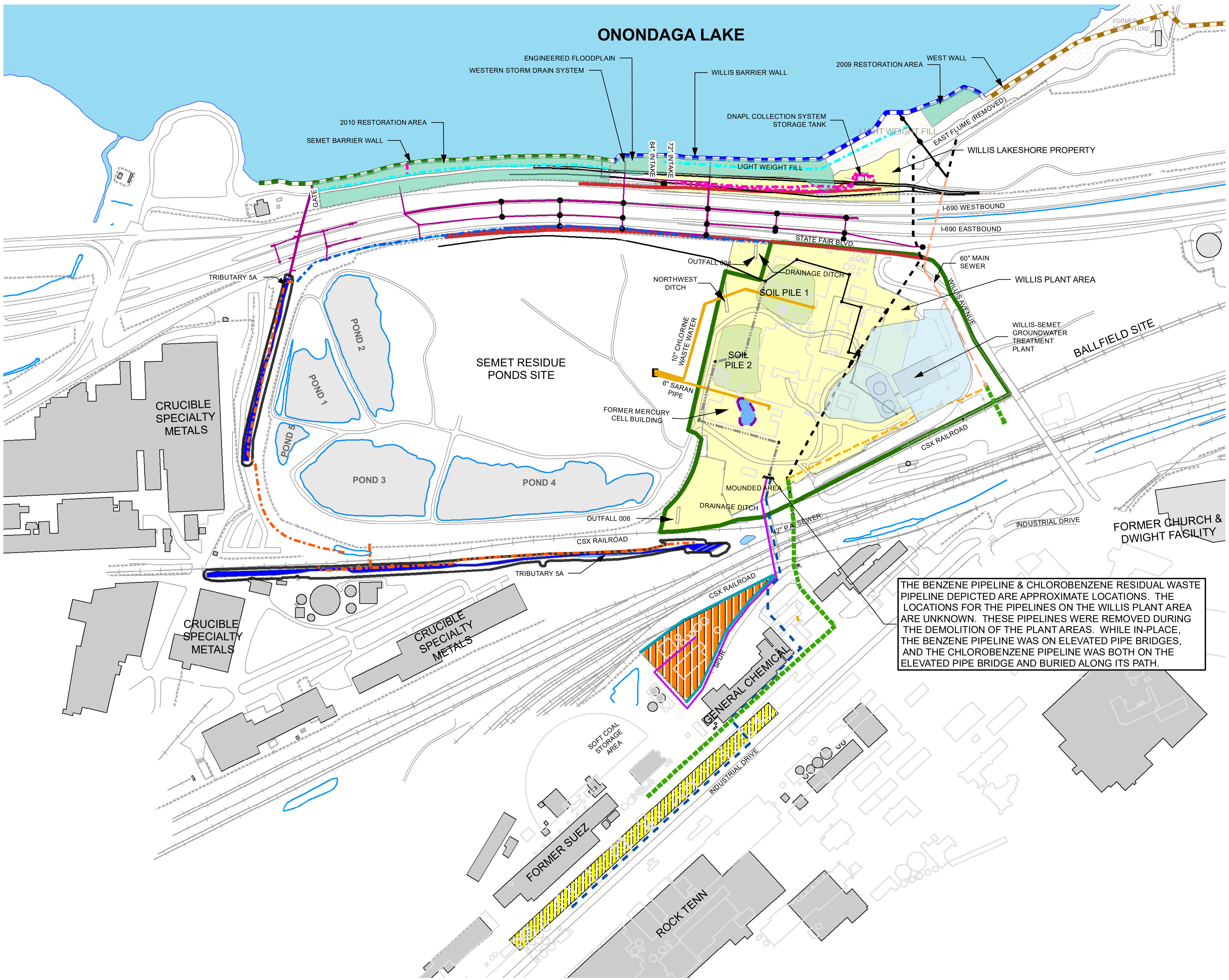
I:\Honeywell.1163\61010 Willis Ave Site FS\Docs\DWG\MXD\2019\Site_Location.mxd

FIGURE 2



LEGEND

IRMS
- STATE FAIR COLLECTION TRENCH
- LAKESHORE COLLECTION TRENCH
- DNAPL RECOVERY SYSTEM
- TRIB 5A COLLECTION TRENCH AND CAP
- EXISTING IRM COVER

UTILITY LINES
- CHLORINE WASTE WATER
- SANITARY SEWER
- OIL AND GAS LINES
- STORM DRAINS
- ABANDONED SEWER
- BENZENE PIPELINE
- CHLOROBENZENE PIPELINE
- SLIP LINED PIPE
- 24" HDPE FORCE MAIN
- EXISTING SEWER PIPE
- NEW 48" STEEL PIPE
- ABANDONED PA SEWER PIPE

- DRAINAGE DITCHES
- SEMET BARRIER WALL
- WILLIS BARRIER WALL
- WEST WALL
- APPROXIMATE HORIZONTAL EXTENT OF ELEMENTAL MERCURY
- TRIB 5A SEDIMENT REMOVAL
- WILLIS-SEMET GROUNDWATER TREATMENT PLANT FOOTPRINT
- WILLIS AVENUE PLANT BOUNDARY

STUDY AREA
- WILLIS PLANT AREA
- PETROLEUM STORAGE AREA
- CHLOROBENZENE HOT-SPOTS AREA
- TRIBUTARY 5A

WILLIS AVENUE SITE FEASIBILITY STUDY GEDDES, NEW YORK

SITE PLAN

0 200 400 800
Feet

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I:\Honeywell.1163\70277.Semet-2018-Ou-2\Docs\DWG\MXD\PRAP\FIGURE 2.mxd

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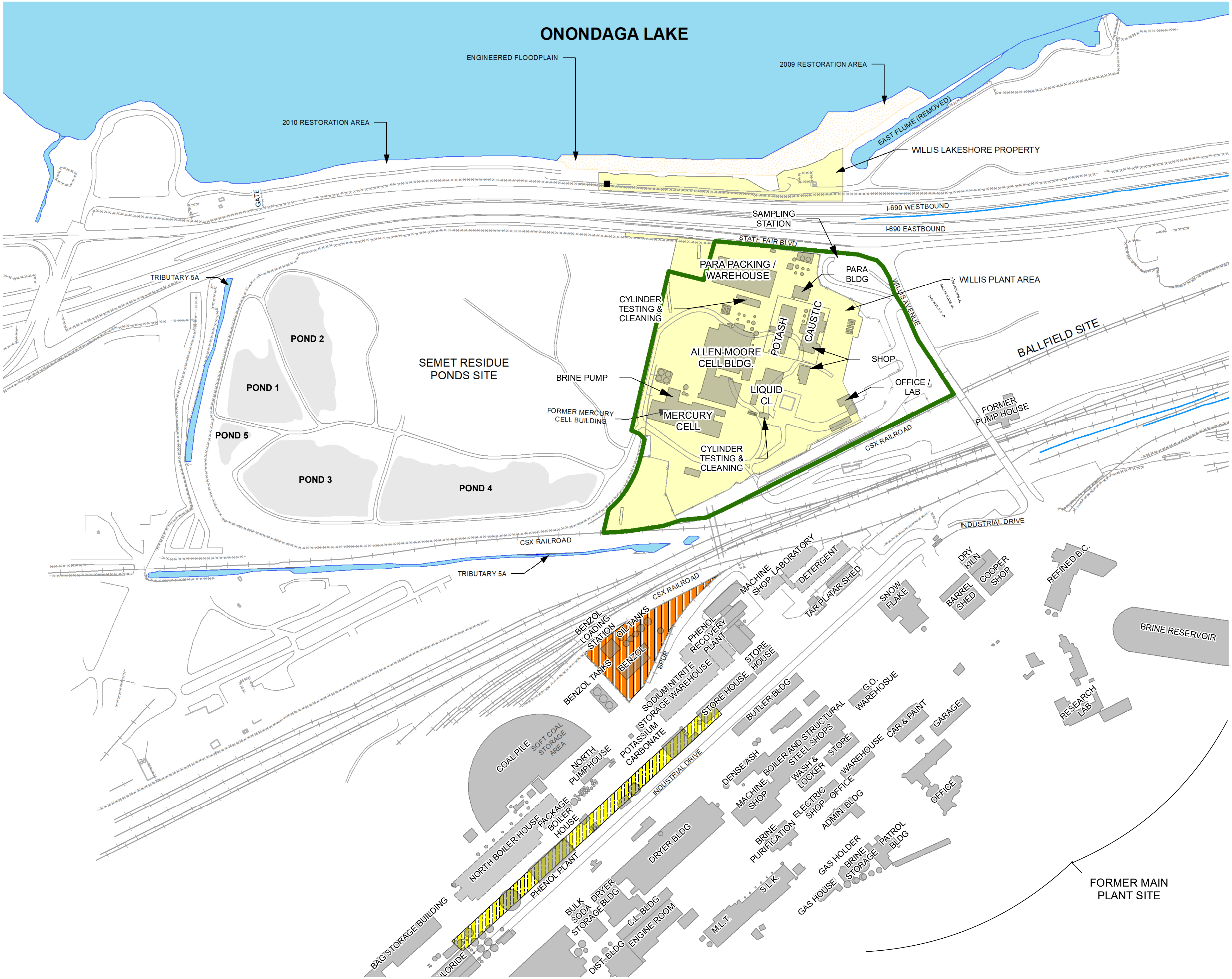
FIGURE 3



LEGEND

- HISTORICAL BUILDING
- WILLIS AVENUE PLANT BOUNDARY

STUDY AREA

- WILLIS PLANT AREA
- PETROLEUM STORAGE AREA
- CHLOROBENZENE HOT-SPOTS AREA
- TRIBUTARY 5A

WILLIS AVENUE SITE
FEASIBILITY STUDY
GEDDES, NEW YORK

FORMER SITE BUILDINGS

0 200 400 800
Feet

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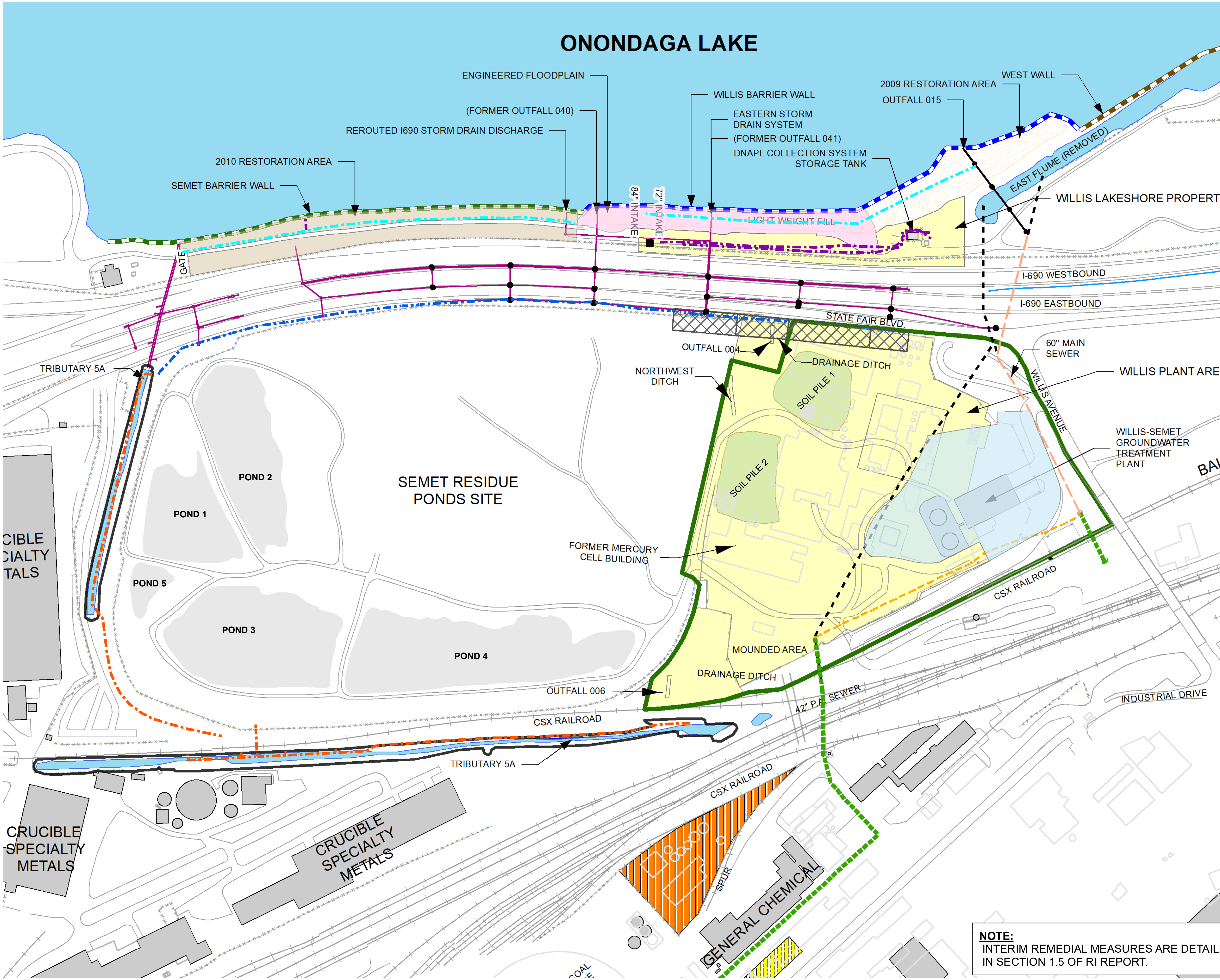
I:\Honeywell.1163\70277.Semet-2018-Ou-2\Docs\DWG\MXD\PRAP\FIGURE 3.mxd

FIGURE 4



NOTE:
INTERIM REMEDIAL MEASURES ARE DETAILED IN SECTION 1.5 OF RI REPORT.

LEGEND

- LAKESHORE COLLECTION TRENCH
- STATE FAIR COLLECTION TRENCH
- TRIB 5A COLLECTION TRENCH AND CAP
- DNAPL RECOVERY SYSTEM
- SLIP LINED PIPE
- 24" HDPE FORCE MAIN
- EXISTING SEWER PIPE
- NEW 48" STEEL PIPE
- ABANDONED PA SEWER PIPE
- WILLIS-SEMET BERM SITE IMPROVEMENTS
- TRIB 5A SEDIMENT REMOVAL
- WILLIS-SEMET GROUNDWATER TREATMENT PLANT FOOTPRINT
- WILLIS AVENUE PLANT BOUNDARY

EXISTING IRM COVER

- ENGINEERED FLOODPLAIN
- 2009 RESTORATION AREA
- 2010 RESTORATION AREA

STUDY AREA

- WILLIS PLANT AREA
- PETROLEUM STORAGE AREA
- CHLOROBENZENE HOT-SPOTS AREA
- TRIBUTARY 5A

WILLIS AVENUE SITE
FEASIBILITY STUDY
GEDDES, NEW YORK

INTERIM REMEDIAL MEASURES AND REMEDIAL ACTIONS

0 150 300 600
Feet

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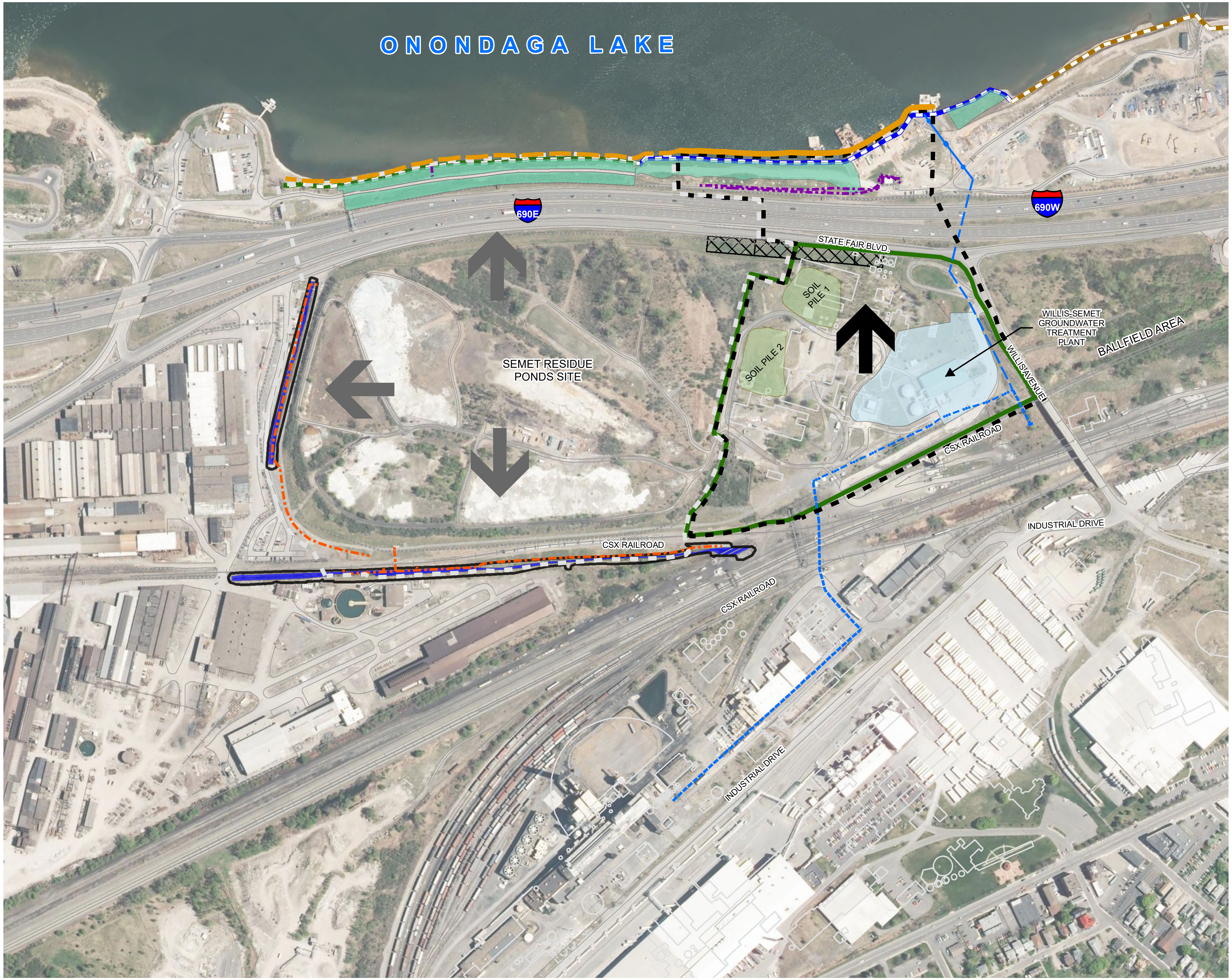
I:\Honeywell.1163\70277.Semet-2018-Ou-2\Docs\DWG\MXD\PRAP\FIGURE 4.mxd



LEGEND

- SEMET BARRIER WALL
- WILLIS BARRIER WALL
- WEST WALL
- TRIB 5A COLLECTION TRENCH AND CAP
- DNAPL RECOVERY SYSTEM
- SLIP LINED PIPE (PA SEWER)
- 24" HDPE FORCE MAIN (PA SEWER)
- NEW 48" STEEL PIPE (PA SEWER)
- EXISTING SEWER PIPE (PA SEWER)
- WILLIS POINT OF COMPLIANCE
- SEMET POINT OF COMPLIANCE
- SEMET WASTE MANAGEMENT AREA
- WILLIS WASTE MANAGEMENT AREA
- WILLIS-SEMET BERM SITE IMPROVEMENTS
- EXISTING IRM COVER
- TRIB 5A SEDIMENT REMOVAL
- WILLIS-SEMET GROUNDWATER TREATMENT PLANT FOOTPRINT
- TRIBUTARY 5A
- WILLIS AVENUE PLANT BOUNDARY
- WILLIS GENERAL GROUNDWATER FLOW DIRECTION
- SEMET GENERAL GROUNDWATER FLOW DIRECTION

WILLIS AVENUE SITE
PROPOSED REMEDIAL ACTION PLAN
GEDDES, NEW YORK

WASTE MANAGEMENT AREA AND GROUNDWATER POINT OF COMPLIANCE

0 200 400 800
Feet

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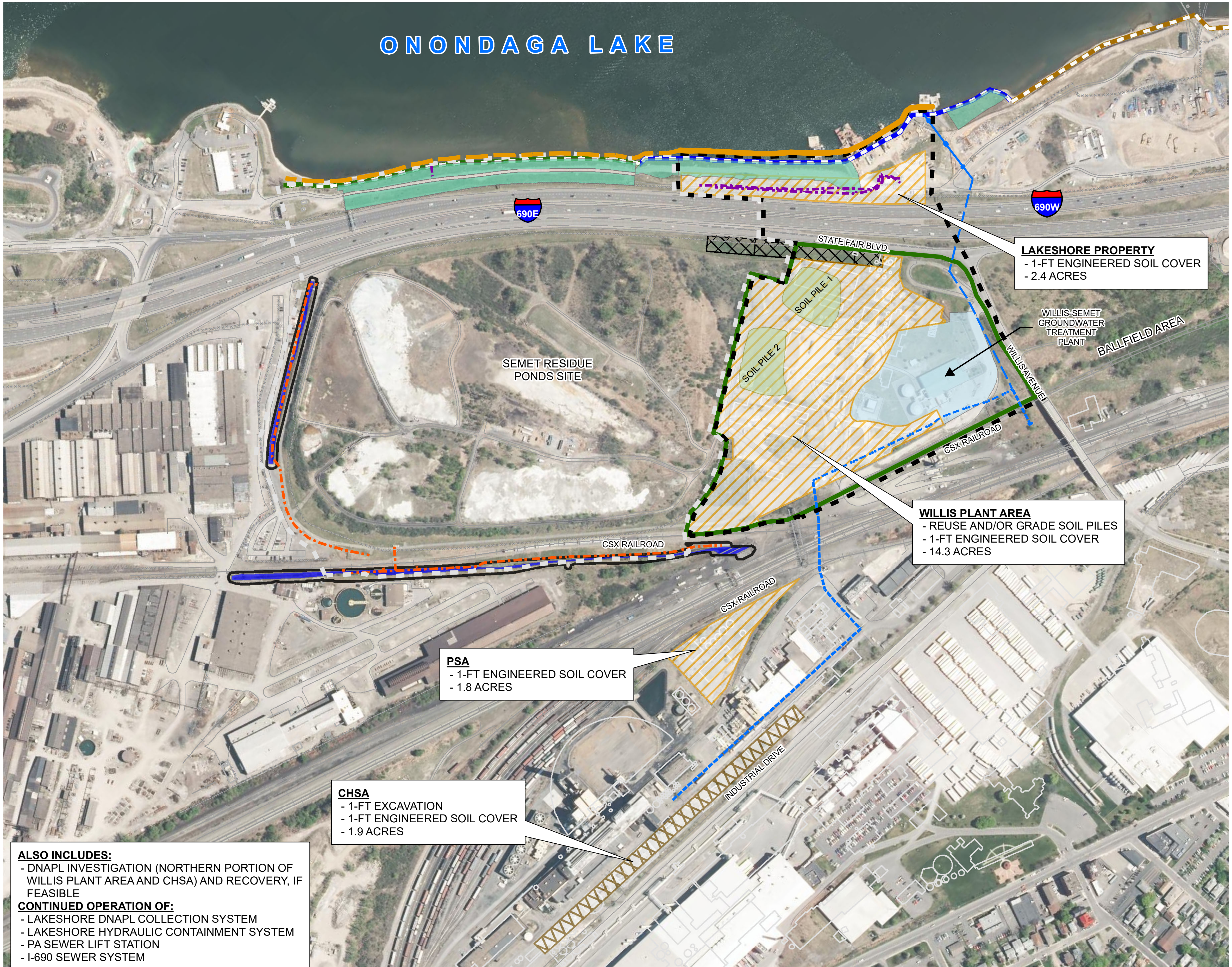
I:\Honeywell.1163\70277.Semet-2018-Ou-2\Docs\DWG\MXD\PRAP\FIGURE 5.mxd

FIGURE 6



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LEGEND

- SEMET BARRIER WALL
- WILLIS BARRIER WALL
- WEST WALL
- TRIB 5A COLLECTION TRENCH AND CAP
- DNAPL RECOVERY SYSTEM
- SLIP LINED PIPE (PA SEWER)
- 24" HDPE FORCE MAIN (PA SEWER)
- NEW 48" STEEL PIPE (PA SEWER)
- EXISTING SEWER PIPE (PA SEWER)
- SEMET POINT OF COMPLIANCE
- WILLIS POINT OF COMPLIANCE
- SEMET WASTE MANAGEMENT AREA
- WILLIS WASTE MANAGEMENT AREA
- WILLIS-SEMET BERM SITE IMPROVEMENTS
- 1-FT ENGINEERED SOIL COVER
- 1-FT EXCAVATION AND 1-FT ENGINEERED COVER
- EXISTING IRM COVER
- TRIB 5A SEDIMENT REMOVAL
- WILLIS-SEMET GROUNDWATER TREATMENT PLANT FOOTPRINT
- TRIBUTARY 5A
- WILLIS AVENUE PLANT BOUNDARY

WILLIS AVENUE SITE
FEASIBILITY STUDY
GEDDES, NEW YORK

ALTERNATIVE 2

0 200 400 800
Feet

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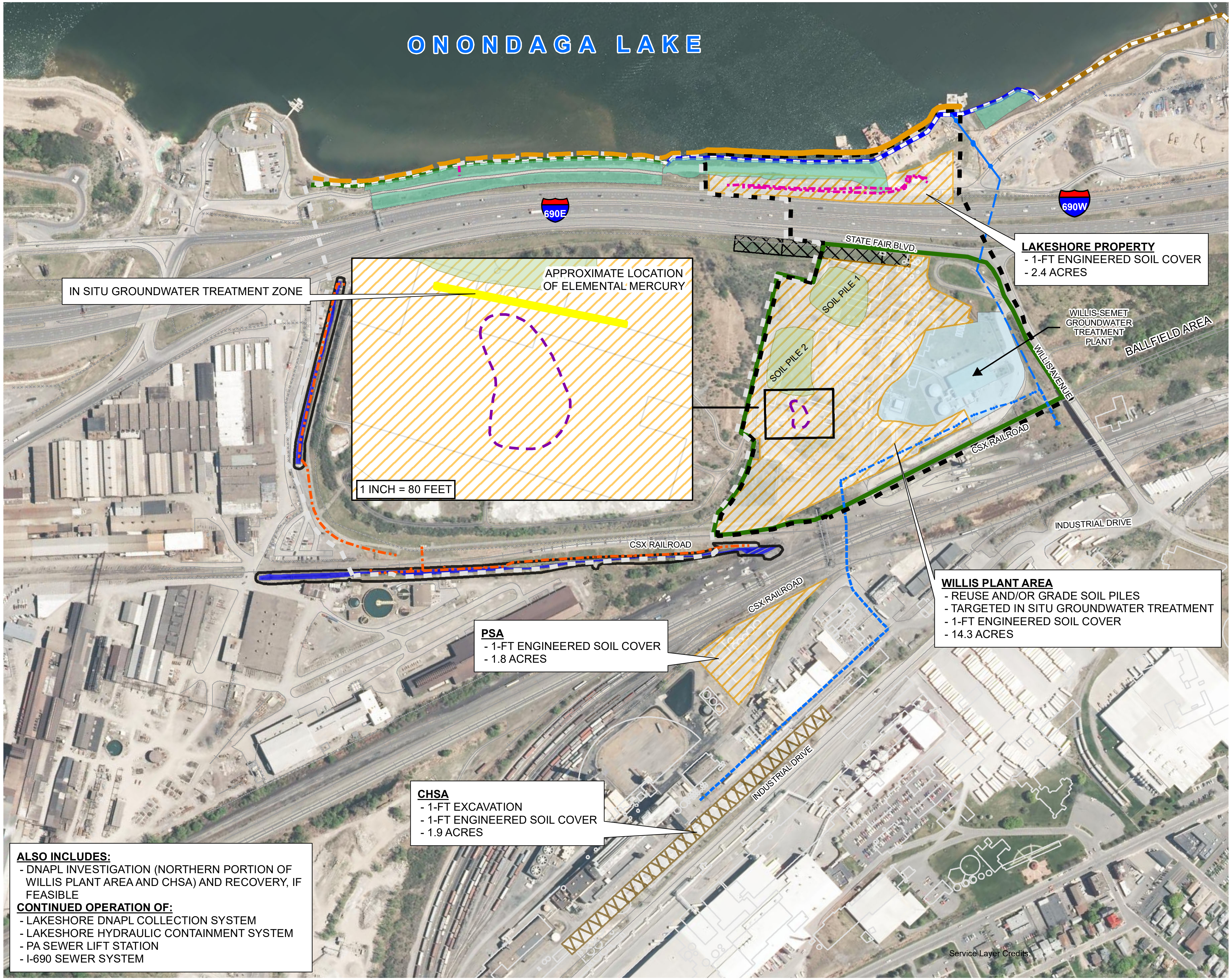
I:\Honeywell.1163\70277.Semet-2018-Ou-2\Docs\DWG\MXD\PRAP\FIGURE 6.mxd



LEGEND

- SEMET BARRIER WALL
- WILLIS BARRIER WALL
- WEST WALL
- DNAPL RECOVERY SYSTEM
- TRIB 5A COLLECTION TRENCH
- SLIP LINED PIPE (PA SEWER)
- 24" HDPE FORCE MAIN (PA SEWER)
- NEW 48" STEEL PIPE (PA SEWER)
- EXISTING SEWER PIPE (PA SEWER)
- SEMET POINT OF COMPLIANCE
- WILLIS POINT OF COMPLIANCE
- APPROXIMATE HORIZONTAL EXTENT OF ELEMENTAL MERCURY
- SEMET WASTE MANAGEMENT AREA
- WILLIS WASTE MANAGEMENT AREA
- WILLIS-SEMET BERM SITE IMPROVEMENTS
- 1-FT ENGINEERED SOIL COVER
- 1-FT EXCAVATION AND 1-FT ENGINEERED COVER
- IN SITU GROUNDWATER TREATMENT ZONE
- WILLIS-SEMET GROUNDWATER TREATMENT PLANT FOOTPRINT
- EXISTING IRM COVER
- TRIB 5A SEDIMENT REMOVAL
- TRIBUTARY 5A
- WILLIS AVENUE PLANT BOUNDARY

WILLIS AVENUE SITE
FEASIBILITY STUDY
GEDDES, NEW YORK

ALTERNATIVE 3

0 200 400 800
Feet

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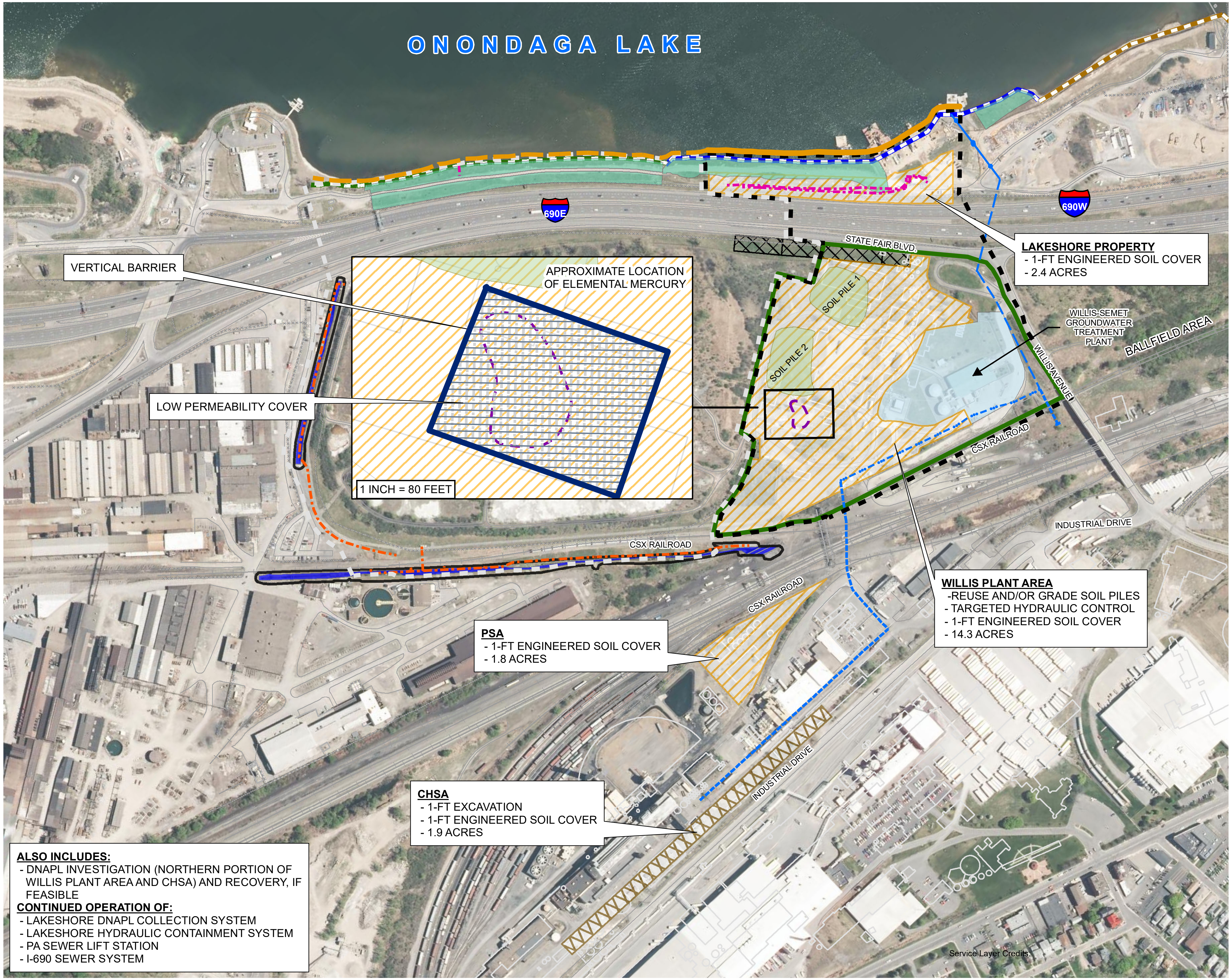
FIGURE 8



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LEGEND

- SEMET BARRIER WALL
- WILLIS BARRIER WALL
- WEST WALL
- DNAPL RECOVERY SYSTEM
- TRIB 5A COLLECTION TRENCH
- SLIP LINED PIPE (PA SEWER)
- 24" HDPE FORCE MAIN (PA SEWER)
- NEW 48" STEEL PIPE (PA SEWER)
- EXISTING SEWER PIPE (PA SEWER)
- SEMET POINT OF COMPLIANCE
- WILLIS POINT OF COMPLIANCE
- APPROXIMATE HORIZONTAL EXTENT OF ELEMENTAL MERCURY
- SEMET WASTE MANAGEMENT AREA
- WILLIS WASTE MANAGEMENT AREA
- WILLIS-SEMET BERM SITE IMPROVEMENTS
- 1-FT ENGINEERED SOIL COVER
- 1-FT EXCAVATION AND 1-FT ENGINEERED COVER
- WILLIS-SEMET GROUNDWATER TREATMENT PLANT FOOTPRINT
- LOW PERMEABILITY COVER
- VERTICAL BARRIER
- EXISTING IRM COVER
- TRIB 5A SEDIMENT REMOVAL
- TRIBUTARY 5A
- WILLIS AVENUE PLANT BOUNDARY

WILLIS AVENUE SITE
FEASIBILITY STUDY
GEDDES, NEW YORK

ALTERNATIVE 4

0 200 400 800
Feet

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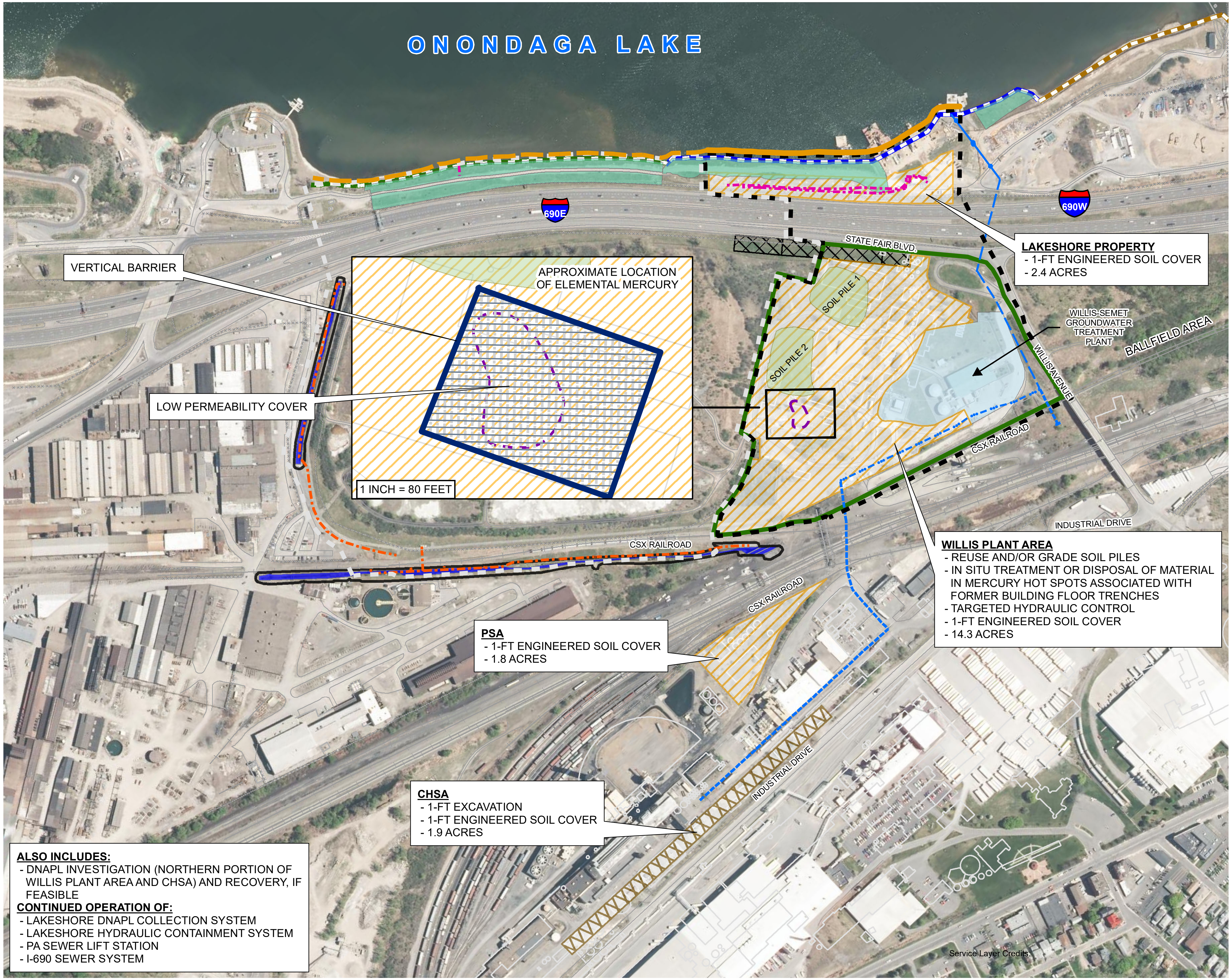
I:\Honeywell.1163\70277.Semet-2018-Ou-2\Docs\DWG\MXD\PRAP\FIGURE 8.mxd

FIGURE 9



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LEGEND

- SEMET BARRIER WALL
- WILLIS BARRIER WALL
- WEST WALL
- DNAPL RECOVERY SYSTEM
- TRIB 5A COLLECTION TRENCH
- SLIP LINED PIPE (PA SEWER)
- 24" HDPE FORCE MAIN (PA SEWER)
- NEW 48" STEEL PIPE (PA SEWER)
- EXISTING SEWER PIPE (PA SEWER)
- SEMET POINT OF COMPLIANCE
- WILLIS POINT OF COMPLIANCE
- APPROXIMATE HORIZONTAL EXTENT OF ELEMENTAL MERCURY
- SEMET WASTE MANAGEMENT AREA
- WILLIS WASTE MANAGEMENT AREA
- WILLIS-SEMET BERM SITE IMPROVEMENTS
- 1-FT ENGINEERED SOIL COVER
- 1-FT EXCAVATION AND 1-FT ENGINEERED COVER
- WILLIS-SEMET GROUNDWATER TREATMENT PLANT FOOTPRINT
- LOW PERMEABILITY COVER
- VERTICAL BARRIER
- EXISTING IRM COVER
- TRIB 5A SEDIMENT REMOVAL
- TRIBUTARY 5A
- WILLIS AVENUE PLANT BOUNDARY

WILLIS AVENUE SITE
FEASIBILITY STUDY
GEDDES, NEW YORK

ALTERNATIVE 5

0 200 400 800
Feet

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I:\Honeywell.1163\70277.Semet-2018-Ou-2\Docs\DWG\MXD\PRAP\FIGURE 9.mxd

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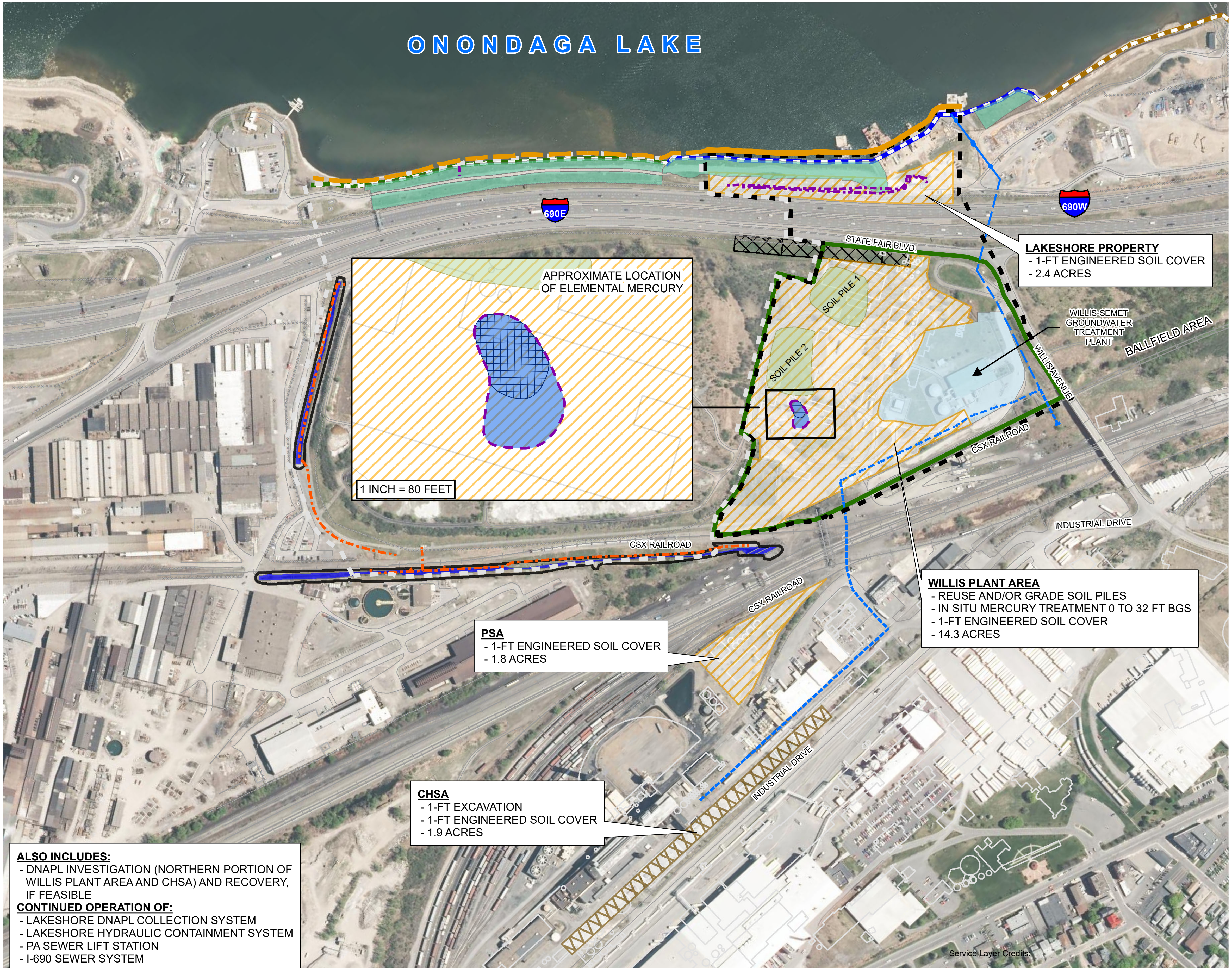
FIGURE 10



N

LEGEND

- SEMET BARRIER WALL
- WILLIS BARRIER WALL
- WEST WALL
- DNAPL RECOVERY SYSTEM
- TRIB 5A COLLECTION TRENCH
- SLIP LINED PIPE (PA SEWER)
- 24" HDPE FORCE MAIN (PA SEWER)
- NEW 48" STEEL PIPE (PA SEWER)
- EXISTING SEWER PIPE (PA SEWER)
- SEMET POINT OF COMPLIANCE
- WILLIS POINT OF COMPLIANCE
- SEMET WASTE MANAGEMENT AREA
- WILLIS WASTE MANAGEMENT AREA
- APPROXIMATE HORIZONTAL EXTENT OF ELEMENTAL MERCURY
- ELEMENTAL MERCURY REMEDY 0-15 FT
- ELEMENTAL MERCURY REMEDY 15-32 FT
- WILLIS-SEMET BERM SITE IMPROVEMENTS
- 1-FT ENGINEERED SOIL COVER
- 1-FT EXCAVATION AND 1-FT ENGINEERED COVER
- WILLIS-SEMET GROUNDWATER TREATMENT PLANT FOOTPRINT
- EXISTING IRM COVER
- TRIB 5A SEDIMENT REMOVAL
- TRIBUTARY 5A
- WILLIS AVENUE PLANT BOUNDARY

WILLIS AVENUE SITE PROPOSED REMEDIAL ACTION PLAN GEDDES, NEW YORK

ALTERNATIVE 6

0 200 400 800
Feet

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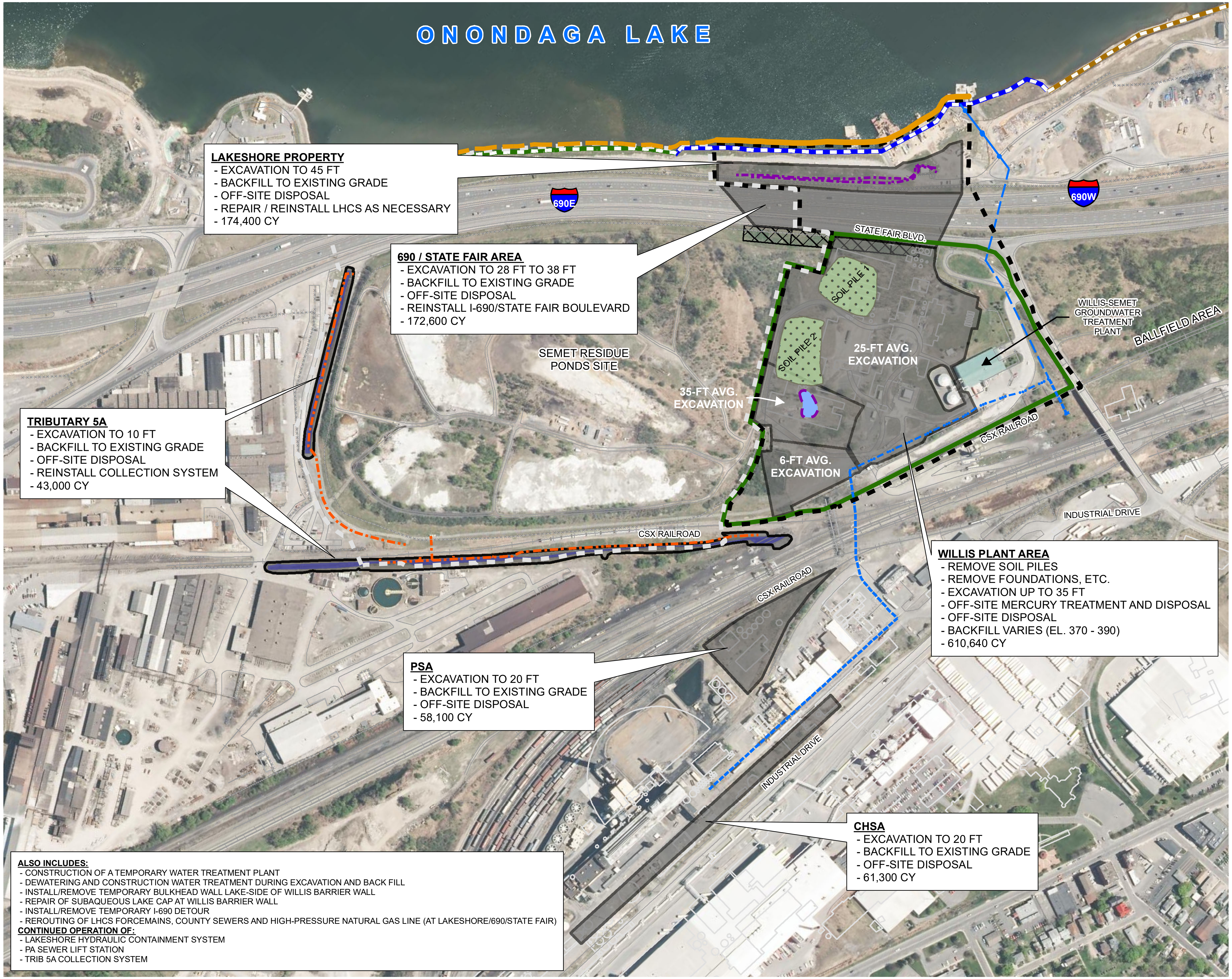
I:\Honeywell.1163\70277.Semet-2018-Ou-2\Docs\DWG\MXD\PRAP\FIGURE 10.mxd



N

LEGEND

- SEMET BARRIER WALL
- WILLIS BARRIER WALL
- WEST WALL
- DNAPL RECOVERY SYSTEM
- TRIB 5A COLLECTION TRENCH AND CAP
- SLIP LINED PIPE (PA SEWER)
- 24" HDPE FORCE MAIN (PA SEWER)
- NEW 48" STEEL PIPE (PA SEWER)
- EXISTING SEWER PIPE (PA SEWER)
- SEMET POINT OF COMPLIANCE
- WILLIS POINT OF COMPLIANCE
- SEMET WASTE MANAGEMENT AREA
- WILLIS WASTE MANAGEMENT AREA
- APPROXIMATE HORIZONTAL EXTENT OF ELEMENTAL MERCURY
- WILLIS-SEMET BERM SITE IMPROVEMENTS
- SOIL PILE REMOVAL
- TRIB 5A SEDIMENT REMOVAL IRM
- EXCAVATION AREA
- TRIBUTARY 5A
- WILLIS AVENUE PLANT BOUNDARY

WILLIS AVENUE SITE FEASIBILITY STUDY GEDDES, NEW YORK

ALTERNATIVE 7

0 200 400 800
Feet

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I:\Honeywell.1163\70277.Semet-2018-Ou-2\Docs\DWG\MXD\PRAP\FIGURE 11.mxd