RECORD OF DECISION

Allied Chemical - Willis Avenue Subsite
of the Onondaga Lake Superfund Site

Town of Geddes, Onondaga County, New York

New York State Department of Environmental Conservation
and
United States Environmental Protection Agency
Region II
September 2019

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Allied Chemical - Willis Avenue Subsite of the Onondaga Lake Superfund Site
Geddes, Onondaga County, New York
Superfund Site Identification Number: NYD986913580
Operable Unit: 3

STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) documents the New York State Department of Environmental Conservation (NYSDEC) and U.S. Environmental Protection Agency's (EPA's) selection of a remedy for the Allied Chemical - Willis Avenue subsite (Subsite) of the Onondaga Lake Superfund site, chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. § 9601-9675, and the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300 (NCP). This decision document explains the factual and legal basis for selecting a remedy to address the contaminated soil/fill materials, and shallow and intermediate groundwater associated with this Subsite. The attached index (see Appendix III) identifies the items that comprise the Administrative Record upon which the selected remedy is based.

The New York State Department of Health was consulted on the proposed remedy in accordance with CERCLA Section 121(f), 42 U.S.C. § 9621(f), and it concurs with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances at this Subsite, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy includes the following components:

- Placement of a minimum 1-foot thick vegetated soil/granular cover system (or maintained paved surfaces or buildings) over approximately 20 acres to minimize erosion and mitigate potentially unacceptable exposure of human receptors to constituents exceeding New York State Commercial-Use Soil Cleanup Objectives in surface soil/fill material. The need for a demarcation layer between the soil cover system and the underlying substrate will be evaluated during the design. The

design of the cover system will take into consideration development plans that are anticipated or available for this Subsite at that time. A 1-foot excavation will precede construction of the cover system in the Chlorobenzene Hot Spot Area (CHSA), such that the final cover grade will match the existing grades, with the excavated material being deposited at the Willis Plant Area and graded before the placement of the cover at that portion of this Subsite. Some or all of the material present in existing staged soil piles that were generated from prior Interim Remedial Measures (IRMs)[1] and the excavation of Tributary 5A are intended to be beneficially reused at the adjacent Semet Residue Ponds subsite. Any surplus material after that work is performed may be used during grading prior to the placement of a cover system at the Willis Plant Area. The surface area in the vicinity of the Former Mercury Cell Building will be covered with a low permeability cover (*i.e.,* high density polyethylene geomembrane). Structures, such as buildings, pavement, or sidewalks, as part of future development, could also serve as acceptable substitutes or replacements for the vegetated cover either upon the implementation of the remedy or at a future time. The extent, thickness, and permeability of covers will be revisited during the design phase and/or during site management, if Subsite uses change, as necessary.

- Targeted treatment and/or removal and disposal of mercury hot spots associated with the floor trenches in the Former Mercury Cell Building. As the presence of free elemental mercury and low-level polychlorinated biphenyls may limit disposal options, pre-design investigations will be conducted to characterize this material to assess whether *in-situ* treatment, off-site management, or a combination of these two, will be the most practicable approach to address materials in the floor trenches and associated elemental mercury.
- Installation of a vertical barrier hydraulic containment system to isolate contaminated shallow and intermediate groundwater in the vicinity of the Former Mercury Cell Building and an extraction well system within the vertical barrier to address potential infiltration. Excavation of debris associated with the installation of the vertical barrier is assumed to be limited to building foundations that may be necessary to remove to install the barrier, as the installation of the vertical barrier is intended to surround the Former Mercury Cell Building. Collected groundwater will be treated at the Willis Avenue Groundwater Treatment Plant, which was constructed under an IRM.
- Performance of a field study to evaluate the potential for the presence of recoverable chlorobenzene dense nonaqueous phase liquid (DNAPL) in the northern portion of the Willis Plant Area and the CHSA. If recoverable DNAPL is encountered during the DNAPL investigation, it will 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

[1] An IRM is an activity that addresses either emergency or non-emergency site conditions that, in the short-term, needs to be undertaken to prevent, mitigate, or address environmental damage or the consequences of environmental damage attributable to a site. An IRM under New York State law parlance and a removal action under CERCLA are one and the same response action.

encountered in discrete areas and in substantial quantity will be evaluated to determine if mass reduction of contamination could be achieved. A treatability study would be performed to determine the effectiveness and implementability of *in-situ* treatment, and to facilitate the remedial design.

- Continued operation and maintenance (O&M) associated with the IRMs that have been implemented at this Subsite. The IRMs include the Lakeshore Property Chlorinated Benzenes Recovery, I-690 Storm Drainage System Rehabilitation IRM, East Flume IRM, the Willis Avenue section of the Willis-Semet Berm Improvements IRM, and Willis Barrier Wall Hydraulic Containment System IRMs. O&M of the IRMs will include monitoring to document that established criteria are met and to identify the need for corrective action(s), as warranted.
- Monitored natural attenuation (MNA) of the shallow/intermediate groundwater at this Subsite point of compliance (POC) (outboard of the Willis Barrier Wall). Further evaluation of MNA will 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 at the POC of both subsites will be addressed via MNA.
- Institutional controls in the form of environmental easements and/or restrictive covenants will be used to restrict the land use to commercial (including passive recreational)/industrial use, prevent the use of groundwater without approved treatment and require that intrusive activities in areas where contamination remains are in accordance with a NYSDEC-approved Site Management Plan (SMP), which will include the following:

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

        - 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;
        - provision that future on-Subsite building construction should include either vapor intrusion sampling and/or installation of mitigation measures, if necessary;
        - maintaining Subsite access controls 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 will be established during design.

The Willis Plant Area/Lakeshore Area and the adjacent Semet Residue Ponds subsite is part of a waste management area (WMA) because the waste is a solid waste (*e.g.,* Solvay waste and historic fill) containing contaminants of concern and will meet the requirements for containment under Resource Conservation and Recovery Act (RCRA) Subtitle D. The vertical hydraulic conductivity of the Solvay waste unit present at this Subsite is generally less than 1 x 10^{-5} centimeters per second (cm/sec) (and the geometric mean of the vertical hydraulic conductivity is less than 1 x 10^{-5} cm/sec). The cover system materials in combination with the underlying soil/fill material (*e.g.,* Solvay waste) and continued O&M of the groundwater collection and treatment system for Subsite groundwater will meet the requirements for containment under RCRA Subtitle D.

The remedy includes the restoration of shallow/intermediate groundwater at the WMA's POC via MNA. Based on multiple lines of evidence, degradation of organic constituents is occurring in the shallow and intermediate groundwater via natural attenuation and degradation (*e.g.,* biodegradation). Some uncertainties exist with respect to the estimated timeframes developed to achieve groundwater criteria. Further evaluation of natural attenuation rates will be conducted as part of the preliminary remedial design and/or O&M. The evaluation may include collection of additional shallow and intermediate groundwater samples inboard and outboard of the hydraulic control system to confirm that natural attenuation is taking place and to refine estimated timeframes for contaminants in groundwater to achieve the established cleanup criteria.

Sampling will be performed, as necessary, to determine what the appropriate cover is for the various areas of this Subsite.

The cover system will require routine maintenance and inspections to maintain its integrity. Corrective actions for cover systems may consist of cover repair in areas of disturbance or reapplication of vegetation in areas of non-survival, as necessary.

Fill material brought to this Subsite will need to meet the relevant requirements for the identified Subsite use as set forth in 6 NYCRR Part 375-6.7(d).

As necessary, native species will be used for the vegetative component of covers. To develop cost estimates, the seed application is anticipated to consist of a grassland seed mix native to New York State and be selected for its ability to attain relatively high growth rates and ecological function.

The environmental benefits of the selected remedy may be enhanced by consideration, during the design, of technologies and practices that are sustainable in accordance with EPA Region 2's Clean and Green Energy Policy and NYSDEC's Green Remediation Policy.[2] This will include consideration of green remediation technologies and practices.

[2] See http://epa.gov/region2/superfund/green_remediation/ and http://www.dec.ny.gov/docs/remediation_hudson_pdf/der31.pdf

DECLARATION OF STATUTORY DETERMINATIONS

Part 1- Statutory Requirements

The selected remedy meets the requirements for remedial actions set forth in CERCLA in Section 121, 42 U.S.C. § 9621, because, as implemented, it : 1) is protective of human health and the environment; 2) meets a level of standard of control of the hazardous substances, pollutants, and contaminants which at least attains the legally applicable or relevant and appropriate requirements under the federal and State laws; 3) is cost-effective and 4) utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

Part 2- Statutory Preference for Treatment

CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous substances as a principal element (or provide a justification for not satisfying the preference). Under the selected remedy, targeted treatment and/or removal and disposal of mercury hot spots associated with the floor trenches in the Former Mercury Cell Building will be implemented. *In-situ* treatment can 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, and less toxic form (*i.e.,* mercury sulfide). The specific type of reagents/mix would be identified through a treatability study that will be conducted during the design phase. In addition, under the selected remedy, chlorobenzene DNAPL will continue to be collected through the Lakeshore Property Chlorinated Benzenes Recovery IRM and sent to a permitted off-site facility to undergo treatment/disposal. A predesign investigation will also be conducted to evaluate if recoverable chlorobenzene DNAPL in the northern portion of the Willis Plant Area and the CHSA is present. If recoverable DNAPL is encountered during the DNAPL investigation, the DNAPL will 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 will be evaluated to determine if mass reduction of contamination could be achieved. With respect to other areas where contaminated soil/fill materials are present at this Subsite, NYSDEC and EPA do not believe that treatment is practicable or cost effective given the widespread nature of the soil contamination and the high volume of contaminated soils that are present.

Part 3- Five-Year Review Requirements

Because this remedy is anticipated to result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the

remedial action and at five-year intervals thereafter to ensure that the remedy is, or will be, protective of human health and the environment.

ROD DATA CERTIFICATION CHECKLIST

The ROD contains the remedy selection information noted below. More details may be found in the Administrative Record file for this Subsite.

- Contaminants of concern and their respective concentrations (see ROD, pages 6-13 and Appendix II, Tables 1-9);
- Baseline risk represented by the contaminants of concern (see ROD, pages 16-22);
- Cleanup levels established for contaminants of concern and the basis for these levels (see ROD, page 23 and Appendix II, Tables 1-9);
- Manner of addressing source materials constituting principal threats (see ROD, page 52);
- Potential land and groundwater use that will be available at this Subsite as a result of the selected remedy (see ROD, pages 13-16);
- Estimated capital, annual operation and maintenance, and present-worth costs; discount rate; and the number of years over which the remedy cost estimates are projected (see ROD, page 51 and Appendix II, Table 14); and
- Key factors used in selecting the remedy (*i.e.*, how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision) (see ROD, pages 44-45).

AUTHORIZING SIGNATURES

Michael J. Ryan, P.E., Director
Division of Environmental Remediation
NYSDEC

9/26/19
Date

Pat Evangelista, Acting Director
Superfund and Emergency Management Division
EPA, Region 2

9/25/19
Date

RECORD OF DECISION FACT SHEET
EPA REGION II

Site

Site name:	Allied Chemical - Willis Avenue Subsite of Onondaga Lake Site
Subsite location:	Geddes, Onondaga County, New York
Site HRS score:	50.00
Listed on the NPL:	December 16, 1994

Record of Decision

Date signed:	September 26, 2019
Selected remedy:	Installation of one-foot thick cover system; treatment and/or excavation of mercury hot spots; targeted shallow/intermediate groundwater hydraulic control; evaluation and recovery/treatment of separate phase liquids (if present); monitored natural attenuation of groundwater at shallow/intermediate depths; continuation of the operation and maintenance related to Interim Remedial Measures that have been implemented at the Subsite; institutional controls; development of Site Management Plan; periodic reviews; and long-term maintenance and monitoring.
Capital cost:	$7.3 million
Annual operation and maintenance cost:	$396,405
Present-worth cost:	$12.3 million

Lead NYSDEC

Primary Contact:	Tracy Alan Smith, Project Manager, (518) 402-9676
Secondary Contact:	Donald Hesler, Section Chief, (518) 402-9676

Waste

Waste types:	Mercury and other inorganics, volatile organic compounds, semi-volatile organic compounds, pesticides, polychlorinated biphenyls, polychlorinated dibenzo-p-dioxins
Waste origin:	Local waste disposal activities
Contaminated media:	Soil and groundwater

DECISION SUMMARY

Allied Chemical - Willis Avenue Subsite
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Town of Geddes, Onondaga County, New York

New York State Department of Environmental Conservation
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September 2019

Table of Contents

ATTACHMENTS

SUBSITE NAME, LOCATION, AND DESCRIPTION

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 that have contributed or are contributing contamination to the lake (subsites) were added to the U.S. Environmental Protection Agency's (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 as defined under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund).

Because many Superfund sites are complex and have multiple contamination problems and/or areas, they are often divided into several operable units (OUs) to manage the various site-wide response actions. CERCLA's implementing federal regulations, known as the NCP, at 42 CFR § 300.5, defines an OU as "a discrete action that comprises an incremental step toward comprehensively addressing site problems. This discrete portion of a remedial response manages migration, or eliminates or mitigates a release, threat of a release, or pathway of exposure. The cleanup of a site can be divided into several OUs, depending on the complexity of the problems associated with the site. [OUs] may address geographical portions of a site, specific site problems, or initial phases of an action, or may consist of any set of actions performed over time or any actions that are concurrent but located in different parts of a site."

The New York State Department of Environmental Conservation (NYSDEC) and EPA have, to date, organized the work for the Onondaga Lake NPL site[1] into discrete subsites. Many of these subsites are also considered by EPA to be OUs of the NPL site. One of the subsites is the Allied Chemical - Willis Avenue Subsite (Subsite). In 1990, Honeywell's predecessor and NYSDEC entered into an administrative consent order to conduct a remedial investigation/feasibility study (RI/FS)[2] of this Subsite; the RI/FS has been completed. The selected remedy described in this Record of Decision (ROD) addresses contaminated soil/fill material and shallow and intermediate groundwater at this Subsite.

This Subsite, which is located south of Onondaga Lake in Geddes, New York, consists, primarily, of the approximately 19.6-acre 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 this Subsite, the approximately

[1] The Onondaga Lake Superfund Site's Superfund Site Identification Number is NYD986913580. NYSDEC is the lead agency; EPA is the support agency.

[2] An RI determines the nature and extent of the contamination at a site and evaluates the associated human health and ecological risks. An FS identifies and evaluates remedial alternatives to address the contamination at a site.

1.9-acre Chlorobenzene Hot-Spot Area (CHSA) and the approximately 1.8-acre Petroleum Storage Area (PSA), are located to the south of the Willis Plant Area. See Figure 1, Site Location.

The Willis Plant Area includes a groundwater treatment plant, 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 HISTORY

The former Willis Plant Area portion of this Subsite was used, historically, to produce chlorinated benzene products from benzene. The former Willis Plant 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. The former buildings, on-site ditches and outfalls on this portion of this Subsite 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 it was more recently used for the staging of capping materials for the remediation of Onondaga Lake.

The 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 and subsequently used for the storage of No. 2 fuel oil in oil storage tanks by Honeywell's predecessor, Allied Chemical. These oil storage tanks were dismantled during the closure of the Main Plant in 1986.

The CHSA is 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

Various IRMs have been implemented at this 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 purpose of the IRMs and remedial actions described below were primarily to prevent migration of DNAPL and/or

contaminated groundwater to Onondaga Lake. In addition, as a component of these IRMs and remedial actions, contaminated soils 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 the following:

- 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 was 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 feet of barrier wall and a groundwater collection system along the Onondaga Lake shoreline. Groundwater collected from this system is treated at the Willis Avenue Ground Water Treatment Plant (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 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 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 noncontact 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 this Subsite and discharged to Onondaga Lake was rerouted around this 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 planted after the topsoil was applied.

- Tributary 5A (Semet Residue Ponds Shallow Groundwater Remedial Action) – Although investigated as part of this Subsite, a shallow groundwater collection system was installed in 2010 to 2012 adjacent to and beneath a drainage ditch called Tributary 5A in connection with the remedy selected in a 2002 ROD for the adjacent Semet Residue Ponds subsite to address impacts to sediment and surface water in Tributary 5A that discharges to Onondaga Lake. As part of this remedial action, sediment in Tributary 5A was removed and an isolation layer was installed. Groundwater collected by this system is conveyed to and treated at the Willis Avenue GWTP. Monitoring of sediments and surface water in the tributary is being performed under the Tributary 5A remedy.

In summary, IRMs have been implemented that address contaminated media at this Subsite. Specifically, DNAPL and contaminated shallow and intermediate groundwater discharges to Onondaga Lake are being addressed by a DNAPL recovery system, barrier wall, and groundwater collection system. Monitoring and observations have confirmed that the discharges of contaminated shallow and intermediate groundwater and DNAPL have been mitigated and that IRM objectives related to discharges of groundwater and NAPL to Onondaga Lake have been met.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

The RI/FS reports and a Proposed Plan proposing a preferred alternative were released to the public for comment on July 21, 2019. These documents were made available to the public via NYSDEC's website and at information repositories maintained at the Solvay Library, the Onondaga County Public Library, Atlantic States Legal Foundation, and the NYSDEC Region 7 office, all located in Syracuse, New York, and the NYSDEC Division of Environmental Remediation office, located in Albany, New York. A notice notifying the public of the availability for the above-referenced documents, the comment period commencement and completion dates, and the date of the public meeting was published in the *Syracuse Post-Standard* on July 21, 2019. A NYSDEC listserv bulletin providing the same information was issued on July 22, 2019. The public comment period ran from July 21, 2019 to August 21, 2019.

On August 6, 2019, NYSDEC and EPA conducted a public meeting at the Geddes Town Hall Courtroom in Solvay, New York to inform local officials and interested citizens about the Superfund process, to present the Proposed Plan for this Subsite, including the preferred remedy, to respond to questions, and accept comments. There were two members of the public in attendance. Responses to the questions and comments received at the public meeting and to comments submitted in writing during the public

comment period are included in the Responsiveness Summary (see Appendix V).

SCOPE AND ROLE OF OPERABLE UNIT

In addition to this Subsite, the following eleven other subsites are being addressed as part of the Onondaga Lake NPL site: 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 Boulevard.

Dredging and capping activities for the Onondaga Lake Bottom subsite commenced in 2012 and were completed in 2014 and 2016, respectively. Habitat restoration activities associated with that 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. That subsite 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 operation and maintenance (O&M). Remedial activities for portions of, or environmental media at, the Semet Residue Ponds, Wastebed B/Harbor Brook, Wastebeds 1-8, General Motors-Inland Fisher Guide, 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 this Subsite is to address the contaminated 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.

Because the shallow and intermediate groundwater outboard of the IRM hydraulic containment system constructed at the shore of Onondaga Lake under the Willis-Semet Lakeshore Hydraulic Containment System IRM 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 at this and adjacent subsites (*i.e.,* Wastebeds 1-8, Semet Residue Ponds, Wastebed B/Harbor Brook) is being evaluated and will be addressed as part of a regional unit.

SUMMARY OF SUBSITE CHARACTERISTICS

The RI activities that were conducted at this Subsite included geological and hydrogeological investigations, an ecological assessment, and the collection of samples from the shallow soil (top two feet of soil), subsurface soil (below two feet), groundwater, and Tributary 5A surface water/sediment.

Based upon the results of the RI, the primary contaminants of concern (COCs) include mercury and other inorganics, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and polychlorinated dibenzo-p-dioxins (PCDD/Fs).

To delineate the nature and extent of contamination, the analytical results from the RI sampling were compared to the respective New York State Soil Cleanup Objectives (SCOs) set forth at 6 NYCRR Part 375 Environmental Remediation Programs for each land use type, including the Commercial-Use SCOs (which includes passive recreational uses, such as walking trails), the Industrial-Use SCOs, and the Unrestricted-Use SCOs. The Unrestricted-Use SCOs represent the concentrations of constituents in soil that when achieved at a site, are sufficiently low that New York State imposes no use restrictions 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- and Industrial-Use SCOs exceedances in shallow and subsurface soil/fill material for this Subsite areas. The results of the RI are summarized below.

Site Geology and Hydrogeology

The geology at the Willis Plant Area, Lakeshore Property, CHSA, and PSA consists of soil and fill material (including Solvay waste) overlying marl/peat, silt, clay, fine-grained sand/basal sand, gravel, till, and bedrock.

This 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 (where present) located below the silt and clay confining unit.

The elevation of the shallow zone ranges from a minimum elevation of approximately 350 feet above mean sea level (amsl) along the lake shore to 405 feet amsl at the CHSA. The maximum thickness of this unit is approximately 40 feet with an average thickness

around 15 feet. The marl unit ranges from 330 feet amsl to 365 feet amsl. The maximum thickness of the marl is approximately 20 feet near the lake and the average thickness is about 10 feet. The marl pinches out (becomes thinner) on the southern side of the Willis Plant Area and is not present at the PSA and CHSA. The deep sand and gravel ranges from 260 feet amsl to 335 feet amsl, with the deep elevations being closer to Onondaga Lake. This zone has a maximum and average thickness of approximately 10 feet and 5 feet, respectively. 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 IRM. Shallow groundwater also discharged to Tributary 5A prior to the performance of the Shallow Groundwater Remedial Action in Tributary 5A under the Semet Residue Ponds 2002 ROD. Groundwater collected under the Semet/Willis Barrier Wall IRM and from a shallow groundwater collection system constructed adjacent to and under Tributary 5A pursuant to the Semet 2002 ROD is conveyed to the Willis Avenue GWTP for pretreatment prior to undergoing further treatment at Onondaga County's Metropolitan Wastewater Treatment Plant in Syracuse before being discharged to Onondaga Lake.

There is an upward vertical gradient on the Lakeshore Property from the deep groundwater to the intermediate groundwater and Onondaga Lake; however, because of 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.

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 feet below ground surface (bgs). During test pitting conducted 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 Materials (0- to 2-feet bgs)

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

Willis Plant Area

VOCs, SVOCs, pesticides, PCBs, PCDD/Fs, and inorganics were detected in shallow soil/fill material on the Willis Plant Area. The 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. The highest concentrations of PCDD/Fs 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 this 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-Use SCO.

Chlorobenzene Hot-Spot Area

VOCs, SVOCs, pesticides, PCBs, and inorganics were detected in shallow soil/fill material at 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.

Petroleum Storage Area

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.

Five PAHs (*i.e.*, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene), arsenic, and mercury exceeded the SCOs for Commercial Use. Two PAHs (*i.e.*, benzo(a)pyrene, dibenz(a,h)anthracene), arsenic and mercury, were found at concentrations in exceedance of the Industrial-Use

SCOs.

Subsurface Soil/Fill Material (at depths greater than 2-feet bgs)

VOCs, SVOCs, pesticides, PCBs, PCDD/Fs, and inorganics were detected in subsurface soil/fill material at this 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 this 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 (*i.e.*, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene), 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 this 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 of approximately 32 feet bgs 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-Spot Area

The COCs that exceeded the SCOs for Unrestricted Use in subsurface soil/fill at the CHSA 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 subsurface soil/fill material in the CHSA. 1,2-Dichlorobenzene, 1,4-dichlorobenzene, PAHs (*i.e.* benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene), 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 (benzo(a)pyrene), PCBs, arsenic, and cyanide exceeded the Commercial-Use SCOs. Benzo(a)pyrene and arsenic also 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 this 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 (*i.e.* Resource Conservation and Recovery Act [RCRA] Toxicity Characteristic Leaching Procedure limits). 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 Soil Pile #1 contained COC concentrations that exceeded the Industrial-Use SCOs for PAHs, mercury, and arsenic, and mercury exceeded the Industrial-Use SCOs for Soil Pile #2; 1,4-dichlorobenzene in Pile #2 did not exceed but equaled the Industrial-Use SCO. It is anticipated that some or all of these soil pile materials will be beneficially reused at the adjacent Semet Residue Ponds subsite consistent with the OU2 remedy for that subsite, where they would be placed under a geomembrane cap. Any surplus material will be used as part of the remedial actions that will be conducted at this Subsite, consistent with the remedy.

Shallow and Intermediate Groundwater

Shallow and intermediate groundwater discharges to storm sewers and Onondaga Lake relating to this Subsite have been addressed by IRMs. Prior to the IRMs, groundwater quality was evaluated for this 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. Because of the groundwater flow direction and the presence of contaminated shallow and intermediate groundwater at the adjacent Semet Residue Ponds subsite, the contaminated shallow and intermediate groundwater plumes from both subsites are comingled, as discussed in the 2002 and 2019 RODs for the Semet Residue Ponds subsite. The analytical data were compared to the New York State Class GA groundwater standards and guidance values (SGVs). See Tables 7-9 for the groundwater results.

Willis Plant Area and Lakeshore Property

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.

Chlorobenzene Hot-Spot Area

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.

Petroleum Storage Area

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 location.

Tributary 5A Surface Water and Sediment

Surface water and sediment samples were collected from Tributary 5A as part of the RI and represent conditions prior to the installation of an isolation layer during the implemented Semet Ponds Shallow Groundwater Remedial Action. Contaminants detected in surface water at levels above NYSDEC Class C SGVs pre-remedial action included benzene, 2,4,5-trichlorophenol, pentachlorophenol, and bis(2-ethylhexyl)phthalate, aluminum, cobalt, cyanide, iron, selenium, and vanadium. As noted above, sediment in Tributary 5A was removed and an isolation layer was installed as part of the groundwater remedial action at the Semet Residue Ponds Subsite. Based on post-remedial action confirmation sampling in 2013 and 2014, VOCs and metals were detected in the surface water, but only metals exceeded the Class C SGVs. The metals exceeding the Class C SGVs included aluminum, cobalt, iron, selenium, and vanadium. These metals and organics indicated impacts to Tributary 5A from Crucible outfalls. NYSDEC and Crucible entered into an administrative consent order for these discharges, hence, these impacts will be addressed through other response actions. Tributary 5A sediment data are included in the analytical data for Soil Pile #1 because that is the present location of the sediments.

DNAPL and Elemental Mercury

DNAPL and elemental mercury were encountered in soil borings and test pits advanced during the investigations and other remedial work performed at this Subsite. Specifically, there is an area of elemental mercury present on the Willis Plant Area and chlorobenzene DNAPL present along the Lakeshore Property, in the northern portion of the Willis Plant Area and, potentially, at the CHSA. Potential migration of the DNAPL and mercury has been, to a large extent, addressed by prior IRMs. Some of these materials exhibit characteristics of principal threat waste. These areas are discussed in detail in the RI and FS reports. Further discussion is also provided below, in the Principal Threat Waste section of this document.

Conclusions

Based on the results of the RI and prior investigations, the following is a summary of contamination at this Subsite:

- COCs in groundwater and surface/subsurface soil include BTEX, chlorinated benzenes, PAHs, phenolic compounds, PCBs, dioxins/furans, 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 of approximately 32 feet bgs.
- 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 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 POC for meeting applicable or relevant and appropriate requirements (ARARs) is established at the WMA boundary.

Because of the presence of historical fill materials deposited at this 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 other hazardous substances that are COCs for this Subsite. The management of the waste within the WMA includes meeting RCRA municipal landfill capping requirements. In some areas, existing covers and/or soil/fill material is expected to meet the 1×10^{-5} centimeters per second (cm/sec) permeability rate required under the RCRA 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 the remedial design.

Contamination Fate and Transport

Natural attenuation is a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. These *in-situ*

processes include biodegradation, dispersion, dilution, sorption, volatilization, radioactive decay, and chemical or biological stabilization, transformation, or destruction of contaminants. As a remedial strategy, these conditions are monitored to ensure that natural attenuation is occurring. This strategy is known as monitored natural attenuation (MNA).

For this Subsite, site-specific data was used to estimate the rate of the attenuation processes and the anticipated time required to achieve the remedial action objectives (RAOs).[3] A three-tiered evaluation was utilized consistent with OSWER Directive 9200.4-17P. The three "lines of evidence" are (a) historical groundwater and/or soil chemistry data that demonstrate a clear and meaningful trend of decreasing contaminant mass and/or concentration over time at appropriate monitoring or sampling points, (b) hydrogeologic and geochemical data that can be used to demonstrate indirectly the type(s) of natural attenuation processes active at a site and the rate at which such processes will reduce contaminant concentrations to required levels, and (c) data from field or microcosm studies that directly demonstrate the occurrence of a particular natural attenuation process at this a site and its ability to degrade the contaminants of concern.

Based on the results of a 2017 field investigation to assess degradation in groundwater, it has been concluded that degradation of organic constituents is occurring in the shallow and intermediate groundwater at and beyond the POC. (See FS Report, Appendix C.) The multiple lines-of-evidence for this Subsite are summarized below.

O'Brien and Gere Engineers, Inc. evaluated shallow and intermediate groundwater contaminant data collected in 2017 (see Willis Avenue Feasibility Study Report, Appendix C, Shallow and Intermediate Groundwater Natural Attenuation Evaluation, O'Brien and Gere Engineers, Inc. July 2019). This evaluation included geochemical and analytical data, Compound Specific Isotope Analysis (CSIA) data, calculated fractions degraded and half-life ranges, and calculated times to achieve Class GA standards, as well as an additional line of evidence that included concentration trend plots and a regression analysis. These lines of evidence yielded the following conclusions:

- The geochemical and dissolved gases data for the shallow and intermediate groundwater are consistent with anaerobic and reducing conditions and potentially include sulfate-reducing, iron-reducing, and/or methane-reducing conditions.
- The statistical evaluation (Mann-Kendall test and regression analysis) of the trend plots showed multiple constituents and site-constituent pairs with statistically significant downward trends of concentrations over time.
- CSIA scatterplots and flow path evaluation demonstrate unequivocal evidence of degradation that follows the clear pattern of less degraded material found

[3] RAOs are specific goals to protect human health and the environment.

upgradient near source areas and more degraded material downgradient.

- The Onondaga Lake Bottom cap (including chemical isolation layer and amendment additions) was designed to be effective for at least 1,000 years, which is greater than the time needed to achieve the NYSDEC Class GA standards for benzene, toluene, and chlorobenzene.
- The hydraulic containment systems along the Onondaga Lake shoreline collect the shallow and intermediate groundwater for treatment prior to reaching the lake and provide a protective measure for future inputs from the inboard sites.
- The area outboard of the barrier wall and/or hydraulic containment systems was dredged, and much of the area was capped with clean fill during the lake remedy (including a ≥ 1,000-year cap), and shallow and intermediate groundwater have an upwelling velocity of less than 2 centimeters/year.

Based on the multiple lines of evidence, it has been concluded that degradation of groundwater organic constituents is occurring in the shallow and intermediate groundwater, and lake protectiveness is being achieved via hydraulic containment, natural attenuation and degradation (*e.g.*, biodegradation).

The time needed to achieve the respective Class GA standards has been conservatively estimated. Table 10 presents a summary of the results. Estimates range from zero to 700 years, with all results less than the 1,000-year Onondaga Lake Bottom cap design, which are considered reasonable timeframes given the site-specific conditions.

Similar to benzene, toluene, and chlorobenzene, other Subsite-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 the locations along the shoreline, depending on the location-specific conditions present.

Some uncertainties exist with respect to the estimated timeframes developed to achieve groundwater criteria. Further evaluation of MNA rates will need to be conducted as part of the preliminary remedial design and/or O&M. The evaluation may include collection of additional shallow and intermediate groundwater samples inboard and outboard of the hydraulic control system to confirm that natural attenuation is taking place and to refine estimated timeframes for contaminants in groundwater to achieve criteria.

It should also be noted that active measures to address contaminated groundwater were not considered beyond the FS screening evaluation because of low permeability conditions, the potential for injection well fouling, and the variability of geochemical conditions. The ability to implement active measures would also be limited within Onondaga Lake. As an example, groundwater upwelling velocity was a key variable in the design of the Lake Bottom cap. Implementing active measures, such as *in-situ* treatment or extracting contaminated groundwater using vertical or horizontal extraction

wells installed under the Lake may mobilize groundwater and produce conditions different than those used for the Lake Bottom cap modeling and design. Given this, it is not anticipated that a contingency remedy could or should be implemented even if MNA was determined not to be progressing as anticipated because doing so could potentially compromise the effectiveness of the Onondaga Lake Bottom cap.

CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES

Land Use

This Subsite is zoned for industrial use and is bounded by commercial and industrial properties. The current and reasonably-anticipated future land uses for this Subsite are industrial and commercial (including passive recreational). The anticipated future use of the Lakeshore Property (north of I-690) includes 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.

SUMMARY OF SUBSITE RISKS

As part of the RI, baseline quantitative risk assessments were conducted for this Subsite to estimate the risks to human health and the environment (under current and anticipated future land uses). Baseline risk assessments, consisting of a baseline human health risk assessment (BHHRA), which evaluates potential risks to people, and a baseline ecological risk assessment (BERA), which evaluates potential risks to the environment, analyze the potential for adverse effects caused by hazardous substance releases from a site assuming no further action to control or mitigate exposure to these hazardous substances are taken.

Human Health Risk Assessment

A BHHRA was conducted to estimate current and future effects of contaminants on human health. A BHHRA is an analysis of the potential adverse human health effects caused by hazardous substance exposure in the absence of any actions to control or mitigate these exposures under current and future site uses. If it is determined that an unacceptable risk exists, the BHHRA provides the basis for taking an action and identifies the contaminants and exposure pathways that need to be addressed through implementation of a remedial action. This section of the ROD summarizes the results of the BHHRA for this subsite.

A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios, as follows:

Hazard Identification – uses the analytical data collected to identify the contaminants of potential concern (COPCs) for each medium, with consideration of a number of factors explained below.

Exposure Assessment – estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways (*e.g.*, ingesting contaminated soil) by which humans are potentially exposed.

Toxicity Assessment – determines the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of effect (response).

Risk Characterization – summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site-related risks. The risk characterization also identifies contamination with concentrations that exceed acceptable levels, defined in the NCP as an excess lifetime cancer risk greater than 1 x 10^{-6} to 1 x 10^{-4} or a Hazard Index greater than 1.0 (discussed in more detail, below); contaminants at these concentrations are considered COCs and are typically those that will require remediation at a site. Also included in this section is a discussion of the uncertainties associated with these risks.

Hazard Identification

In this step, analytical data collected during the RI is used to identify COPCs in the surface and subsurface soil, surface and subsurface sediment, surface water, groundwater, indoor and outdoor air, and fish tissue at a site based on factors such as toxicity, frequency of occurrence, fate and transport of the contaminants in the environment, and concentrations of the contaminants, as well as their mobility and persistence.

Exposure Assessment

In this step, the different exposure scenarios and pathways through which people might be exposed to the contaminants identified in the previous step are evaluated. Consistent with Superfund policy and guidance, the BHHRA is a baseline human health risk assessment and therefore assumes a scenario where no remediation or institutional controls to mitigate or remove hazardous substance releases occurs. Cancer risks and noncancer hazard indices are calculated based on an estimate of the reasonable maximum exposure (RME) expected to occur under current and future conditions at a site. The RME is defined as the highest exposure that is reasonably expected to occur at a site.

The exposure assessment identified potential human receptors based on a review of

current and reasonably foreseeable future land use at this Subsite. As described previously, there are several distinct areas of this Subsite that were investigated. Exposure scenarios were developed taking into account how receptors currently and potentially in the future might access these areas through reasonable activities. Based on these considerations, the following exposure areas/media were developed: Willis Plant Area; on-site ditches; Former Chlorination Building; Outfall 006; Lakeshore Property; PSA; CHSA; Tributary 5A; and potable water.

Receptors evaluated in the BHHRA include the adolescent and adult trespasser, utility worker, State Fair Boulevard transients, construction worker, surveillance worker, industrial worker, sewer worker, and adult and child resident.

Exposure scenarios were developed for these populations and exposure was considered through incidental ingestion and inhalation of and dermal contact with surface soil, subsurface soil, and sediment, as well as 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 this Subsite. Human health risks associated with exposure to the Semet Residue Ponds subsite groundwater outboard of the Semet Barrier Wall, which is being addressed as part of this action, can be considered to be similar to that for this Subsite because the groundwater plumes for the two subsites are comingled.

Toxicity Assessment

In this step, the types of adverse health effects associated with contaminant exposures and the relationship between the magnitude of exposure and the severity of adverse health effects were determined. Potential health effects are contaminant-specific and may include the risk of developing cancer over a lifetime or other noncancer health effects, such as changes in the normal functions of organs within the body (*e.g.*, changes in the effectiveness of the immune system). Some contaminants are capable of causing both cancer and noncancer health effects.

Under current EPA guidelines, the likelihood of carcinogenic risks and noncancer hazards because of exposure to site chemicals are considered separately. Consistent with current EPA policy, it was assumed that the toxic effects of any site-related chemicals would be additive. Thus, cancer and noncancer risks associated with exposures to individual COPCs were summed to indicate the potential risks and hazards associated with mixtures of potential carcinogens and noncarcinogens, respectively.

Toxicity data for the human health risk assessment were taken from the Integrated Risk Information System database, the Provisional Peer Reviewed Toxicity Database, or another source that is identified as an appropriate reference for toxicity values consistent with EPA's directive on toxicity values.

Risk Characterization

This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of Subsite risks. Exposures were evaluated based on the potential risk of developing cancer and the potential for noncancer health hazards. For carcinogens, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a carcinogen, using the cancer slope factor (SF) for oral and dermal exposures and the inhalation unit risk (IUR) for inhalation exposures. Excess lifetime cancer risk for oral and dermal exposures is calculated from the following equation, while the equation for inhalation exposures uses the IUR, rather than the SF:

Risk = LADD x SF

where: Risk = a unitless probability (1×10^{-6}) of an individual developing cancer
LADD = lifetime average daily dose averaged over 70 years (milligrams per kilogram [mg/kg]-day)
SF = cancer slope factor, expressed as 1/(mg/kg-day)

The likelihood of an individual developing cancer is expressed as a probability that is usually expressed in scientific notation (such as 1×10^{-4}). For example, a 1×10^{-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 as a result of exposure to site contaminants under the conditions described in the exposure assessment. Current Superfund guidelines for acceptable exposures are an individual lifetime excess cancer risk in the range of 10^{-4} to 10^{-6} (corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk). For noncancer health effects, a hazard index (HI) is calculated. The HI is determined based on a comparison of expected contaminant intakes and benchmark comparison levels of intake (reference doses, reference concentrations). Reference doses (RfDs) and reference concentrations (RfCs) are estimates of daily exposure levels for humans (including sensitive individuals) that are thought to be safe over a lifetime of exposure. The estimated intake of chemicals identified in environmental media (*e.g.*, the amount of a chemical ingested from contaminated drinking water) is compared to the RfD or the RfC to derive the hazard quotient (HQ) for the contaminant in the particular medium. The HI is determined by adding the hazard quotients for all compounds within a particular medium that impacts a particular receptor population.

The HQ for oral and dermal exposures is calculated as shown below.

HQ = Intake/RfD

where: HQ = hazard quotient
Intake = estimated intake for a chemical (mg/kg-day)
RfD = reference dose (mg/kg-day)

The intake and the RfD will represent the same exposure period (*i.e.,* chronic, subchronic, or acute).

The HQ for inhalation exposures is calculated using a similar model that incorporates the RfC, rather than the RfD.

The principle concept for a noncancer HI is that a "threshold level" (measured as an HI of less than 1.0) exists below which noncancer health effects are not expected to occur. The HI is calculated by summing the HQs for all chemicals for likely exposure scenarios for a specific population. An HI greater than 1 indicates that the potential exists for non-carcinogenic health effects to occur as a result of site-related exposures, with the potential for health effects increasing as the HI increases. When the HI calculated for all chemicals for a specific population exceeds 1, separate HI values are then calculated for those chemicals which are known to act on the same target organ. These discrete HI values are then compared to the acceptable limit of 1 to evaluate the potential for noncancer health effects on a specific target organ. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media.

At this Subsite, the cancer risks and noncancer hazards were estimated for each of the exposure areas/media and the risk was evaluated for the specific populations identified in each unit under current and reasonably-anticipated future use. A summary of the cancer risks and noncancer hazards above threshold levels for each population in each of the areas of the Subsite, along with the chemicals that contribute the most to the risk or hazard, or COCs, can be found in Tables 11 and 12.

The BHHRA included a recommendation that based on the vapor intrusion screening presented in the BHHRA, a vapor intrusion evaluation should be conducted if buildings that will be occupied are constructed at this 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. Because 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 this 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.

Uncertainty in the Risk Assessment

The process of evaluating human health cancer risks and noncancer health hazards involves multiple steps. Inherent in each step of the process are uncertainties that ultimately affect the final risks and hazards. Important site-specific sources of uncertainty

are identified for each of the steps in the four-step risk process below.

Uncertainties in Hazard Identification

Uncertainty is always involved in the estimation of chemical concentrations. Errors in the analytical data may stem from errors inherent in sampling and/or laboratory procedures. While the datasets for this Subsite are robust, because environmental samples are variable, the potential exists that these datasets might not accurately represent reasonable maximum concentrations. There is a low potential that the risks may be overestimated or underestimated.

Uncertainties in Exposure Assessment

There are two major areas of uncertainty associated with exposure parameter estimation. The first relates to the estimation of exposure point concentrations (EPCs). The second relates to parameter values used to estimate chemical intake (*e.g.,* ingestion rate, exposure frequency). The estimates of the EPCs are influenced on how likely the dataset fully characterizes the contamination at the Subsite. These datasets are robust, so the potential for overestimating or underestimating risk is low. Many of the exposure parameters used in the BHHRA are based on best professional judgement. There is a low potential that the risks may be overestimated or underestimated**.**

Uncertainties in Toxicity Assessment

A potentially large source of uncertainty is inherent in the derivation of the EPA toxicity criteria (*i.e.,* RfDs, RfCs, SFs, IURs). Although these toxicity criteria have been extensively reviewed and peer-reviewed, there is a medium potential that uncertainty factors applied during their derivation may result in overestimation or underestimation of risk. Additionally, there are many contaminants for which no toxicity values are available and therefore they are not quantitatively evaluated in the BHHRA. There is high potential for underestimation because of this lack of toxicity information.

Uncertainties in Risk Characterization

When all of the uncertainties from each of the previous three steps are added, uncertainties are compounded. Because it is unknown whether many of the uncertainties result in an overestimation or underestimation of risk, the overall impact of these uncertainties is unquantifiable. However, some of the uncertainties, such as the lack of toxicity information, will likely result in an overall underestimation of risk.

Ecological Risk Assessment

The BERA for this Subsite 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, methylmercury, zinc, chromium, iron, lead, manganese, selenium, 4,4-dichlorodiphenyldichloroethylene, 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, methylmercury, 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, endrin, 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 as a consequence of the implemented 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 BHHRA indicate that the contaminated soil, indoor air, and groundwater present current and/or potential future unacceptable exposure risk and the BERA indicates that the contaminated soils pose an unacceptable exposure risk. While some of the risks associated with contaminated soil have been mitigated 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 Subsite areas and are not necessarily final actions. Moreover, while some potential ecological and human health risks have been mitigated by the IRMs, conditions that could potentially result in a return to unacceptable risks may occur should O&M related to the IRMs be discontinued.

Basis for Action

The response action selected in this Record of Decision is necessary to protect public health and the environment from actual or threatened releases of hazardous substances.

REMEDIAL ACTION OBJECTIVES

RAOs are based on available information and standards, such as ARARs, to-be-considered (TBC) guidance, and site-specific, risk-based levels established using the risk assessments.[4] The following RAOs have been established for this Subsite:

- Prevent, or reduce to the extent practicable, ingestion of or direct contact with contaminated soil/fill material so as 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, potentially 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, potentially 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 groundwater, surface water, or sediment quality in Onondaga Lake.

NYSDEC's Commercial- and Industrial-Use 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, and the levels are consistent with what EPA has determined are acceptable levels of risk that are protective of human health, ecological exposure, or the groundwater depending upon the existing and anticipated future use of this Subsite. While the land use of this Subsite has historically been industrial, current and anticipated future uses of some areas could include commercial uses (*e.g.,* passive recreational). Groundwater remedial goals outside the WMA are the New York State Ambient Water Quality Standards. Previously implemented IRMs to address surface water and sediment throughout this Subsite have eliminated exposure to these media. Cleanup goals were not specifically developed for them, but maintenance of these IRMs is expected to achieve the RAO.

[4] 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.

SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA Section 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 that 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 Section 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 Section 121(d)(4), 42 U.S.C. § 9621(d)(4).

Based on the anticipated future development of this Subsite, expectations of the reasonably-anticipated future land use, as described above, were considered in the FS to facilitate the development of remedial alternatives. The reasonably-anticipated land use includes commercial use (*e.g.*, 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 previously implemented IRMs relating to this Subsite, which would include monitoring to document that established performance 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.[5] 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 this Subsite) to levels that meet state and federal standards, would be met following construction and implementation of appropriate institutional controls (*e.g.,* estimated one to eight 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:

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

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 be that no additional remedial measures would be taken to address the soil/fill material and shallow and intermediate groundwater contamination at this Subsite.

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

Capital Cost:	$0
Annual O&M Cost:	$0
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 this 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 this Subsite and institutional controls.

A minimum 1-foot thick vegetated soil/granular cover system (or maintained paved surfaces or 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 system would take into consideration development plans that are available for this Subsite at that time. A 1-foot excavation would precede construction of the cover in the CHSA, such that the final cover grade would match the existing grade, with the excavated material being placed on the Willis Plant Area and graded before the placement of the cover at that portion of this Subsite. Some or all of the material present in existing staged soil piles generated from prior IRMs and excavation of Tributary 5A are intended to be beneficially reused at the adjacent Semet Residue Ponds subsite. Any surplus material after that work is performed may be used during grading prior to the placement of a cover at the Willis Plant Area. Any fill material brought to this Subsite would need to meet the requirements for the identified Subsite use as set forth in state regulations (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 this Subsite is generally less than 1 x 10^{-5} cm/sec. The proposed cover materials in combination with the underlying soil/fill material (*e.g.,* Solvay waste) and the 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 this 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. In such a case, 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 indicates 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 rates 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 restrict land use to commercial (including passive recreational)/industrial uses, as appropriate, to prevent the use of groundwater without approved treatment, and to require that any intrusive activities in areas where contamination remains be conducted in accordance with a NYSDEC-approved Site Management Plan (SMP), which would include the following:

- An Institutional and Engineering Control Plan that identifies institutional and engineering controls (*i.e.,* environmental easement and/or restrictive covenants, cover systems) for this 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;
    - maintaining Subsite access controls and NYSDEC notification; and
    - periodic reviews and certification of the institutional and/or engineering controls.

- A 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 previously implemented IRM elements noted above that pertain to the Lakeshore Property, I-690 Storm Drainage System, the East Flume, the Willis Avenue section of the Willis-Semet Berm Improvements, and the Willis Barrier Wall and groundwater collection system. Maintenance and monitoring for these IRMs would include monitoring to document that established performance criteria are met and to identify the need for any corrective action(s), as warranted.

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

The estimated construction time for this alternative is one 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 additional 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 to be 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 Subsite groundwater. Carbon dioxide addition leaves a residual saturation of gas that would continue to treat the groundwater after injections have ceased. 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 zone is illustrated on Figure 7.

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

The estimated construction time of this alternative is one 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 feet 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 this Subsite be reviewed at least once every five years.

The estimated construction time of this alternative is one 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 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 materials present in the floor trenches and the 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 an estimated 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 this Subsite be reviewed at least once every five years.

The estimated construction time of this alternative is one 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 the Former Mercury Cell Building

This alternative is the same as Alternative 2 but with the addition of *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 foot area using an auger for mixing. Debris associated with the floor trenches in the Former Mercury Cell Building would be crushed to allow *in-situ* treatment. Because 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 this Subsite be reviewed at least once every five years.

The estimated construction time of this alternative is one to two 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, this Subsite would be restored to pre-disposal conditions through the full excavation of all soil/fill material exhibiting concentrations above Unrestricted-Use SCOs.[6] 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 site remedies (*e.g.,* Onondaga Lake Bottom Remedy or Semet Subsite Remedy), would not be disturbed and would continue to be operated and maintained.

Mechanical excavation would be conducted to remove all site-wide soil/fill material. Both the PSA and CHSA would be excavated to a depth of approximately 20 feet below the existing grade. Material to be removed would range in thickness from 6 to 45 feet 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 feet of railroad structures to protect their stability. Because of 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 feet 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.” 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.

[6] A partial removal alternative was not evaluated because, 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.

This alternative also would include removal of approximately 165,000 square feet of existing building foundations/slabs, 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-Use 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 this 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 this Subsite's boundary and beyond the POC of the adjacent Semet Residue Ponds subsite. 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 seven to eight 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 required under the NCP consists of an assessment of the individual alternatives against each of the nine evaluation criteria (see below) and a comparative analysis focusing upon the relative performance of each alternative against those criteria.

The first two criteria are known as "threshold criteria" because they are the minimum requirements that an alternative must meet to be eligible for selection as a remedy. The next five criteria, criteria 3 through 7, are known as "primary balancing criteria." These criteria are applied as factors between response measures so that the best option will be chosen given site-specific data and conditions. The final two criteria, criteria 8 and 9, are known as "modifying criteria." Community and support agency acceptance are factors that are assessed by reviewing comments received during the public comment period, including any new information that might be made available after publication of the proposed plan that significantly changes basic features of the remedy with respect to scope, performance, or cost.

The nine evaluation criteria are:

1. Overall protection of human health and the environment in which it is determined whether an alternative eliminates, reduces, or controls threats to public health and the environment through the implementation of remedial measures such as institutional controls, engineering controls, or treatment.
2. Compliance with ARARs in which it is evaluated whether the alternative would meet all of the applicable or relevant and appropriate requirements of federal and state environmental statutes and other requirements that pertain to this Subsite or provide grounds for invoking a waiver.
3. Long-term effectiveness and permanence is considered in the context of the ability of an alternative to maintain protection of human health and the environment over time.
4. Reduction of toxicity, mobility, or volume through treatment is the criterion by which an alternative's anticipated performance related to treatment technologies that an alternative may employ is gauged.
5. Short-term effectiveness is considered in the context of the duration needed to implement an alternative and the risks that the alternative may pose to workers, residents, and the environment during implementation.
6. Implementability is the technical and administrative feasibility of implementing the alternative, including the availability of materials and services.
7. Cost includes estimated capital and annual operation and maintenance 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.

8. State acceptance is whether, based on its review of the RI/FS reports and the Proposed Plan, the State supports, opposes, and/or has identified any reservations with the selected response measure.
9. Community acceptance refers to the public's general response to the alternatives described in the Proposed Plan and the RI/FS reports.

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

Overall Protection of Human Health and the Environment

Alternative 1, the no further action alternative, would not provide protection of human health because of the absence of any 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 this 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 this Subsite. Alternative 1 would not be consistent with current, intended, and reasonably-anticipated future use of this 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, an 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 the continued protectiveness of 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 this 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 13. 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 Subsite 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 previously implemented 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, an 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 floor trenches. This material would be targeted for treatment/removal under Alternative 5 and for *in-situ* treatment to depths of 32 feet bgs under Alternative 6. Alternative 7 would address chemical-specific ARARs through site-wide removal of soil/fill material and elemental mercury.

There were no location- or action-specific ARARs identified for Alternative 1, the no further action alternative, because no action would occur. 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. See Table 13 for more details regarding the ARARs.

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 not be effective in abating 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, an SMP, and its related 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 previously implemented IRM controls are in place, *in-situ* treatment and/or removal of soil/fill materials containing elemental mercury in the vicinity of the Former Mercury Cell Building under Alternatives 5 and 6 may provide some additional long-term effectiveness and permanence relative to Alternative 4.

The continuation of the previously implemented IRMs, as required 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 and/or treatment of DNAPL (potential principal threat waste), as applicable. Under Alternatives 2 through 6, groundwater discharge from this Subsite is currently controlled by the previously implemented IRMs. Alternatives 3, 4, 5 and 6 would provide reduction in toxicity and limit potential mobility by addressing dissolved mercury in groundwater in the vicinity of the Former Mercury Cell Building through treatment and isolation,

respectively. Alternatives 5 and 6 would also provide reduction in toxicity and limit potential mobility by addressing 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 through the excavation, treatment, and off-site disposal of a large volume of that material. Under each alternative except Alternative 1, groundwater and DNAPL collection systems implemented as part of the previously implemented IRMs would provide for reduction of mobility and treatment of COCs in the groundwater.

Under Alternatives 2 through 6, an estimated 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 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 feet 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 are anticipated related to the treatment under Alternatives 3, 5, and 6.

Short-Term Effectiveness

Alternative 1 does not include physical measures 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 one to two construction seasons. Alternative 7 would address RAOs related to soil/fill within seven or eight 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 Alternative 6 has the potential to cause subsurface mobilization of the elemental mercury. However, the implementation of *in-situ* treatment starting around the perimeter of the treatment area in Alternative 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 a result of increased truck traffic and increased noise for the one-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 prior IRMs as required 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 the potential for mercury exposures associated with excavation and off-site management of contaminated soil/fill material in the vicinity of the Former Mercury Cell Building, substantially increased traffic, and increased noise for the seven to eight-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 an estimated three to four 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, but these would be addressed through appropriate engineering controls and protective equipment.

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 existing IRMs as required under Alternatives 2 through 6 would be readily implementable. The 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 cover system inspections and maintenance to verify the continued cover integrity, visual signs of erosion, and overall condition of the 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 because of 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 in the Former Mercury Cell Building Area (as contemplated under 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 they have capacities limited to 1 to 2 roll off containers (approximately 20-30 cubic yards) 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 challenges related to 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 because of the presence of permeable fill and

excavations in close proximity to 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 existing collection systems and barrier walls along the Lakeshore Property. Excavation of DNAPL to 45 feet 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 the soil/fill material would exhibit concentrations of elemental mercury greater than 260 mg/kg, making it a high mercury waste requiring treatment by retort if treatment is conducted inside the United States. As noted above, the two retort facilities that can accept bulk soil with elemental mercury have limited capacities (an estimated 20 to 30 cubic yards per week) and while the Canadian solidification/stabilization facility has greater capacity to accept bulk soil with elemental mercury, materials containing PCBs at or above 2 mg/kg cannot be transported to it 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. Because of worker and community health and safety concerns, it is assumed that treatment would be performed off-site.
- Because of the anticipated volume of excavated material that would require off-site disposal, there are concerns about significantly increased traffic, fuel usage, and adverse effects on both air quality and community safety. Based on the 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 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 the post-construction monitoring and maintenance period. (Although O&M would continue as needed beyond the 30-year period, this 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 Cost	Annual O&M Cost	Total Present Worth Cost
1 – No Further Action	$0	$0	$0
2 – Engineered Cover System	$5.2 Million	$392,685	$10.1 Million
3 – Engineered Cover System with Targeted Shallow/Intermediate Groundwater Treatment at the Former Mercury Cell Building	$7.1 Million	$548,935	$13.9 Million
4 – Engineered Cover System with Targeted Shallow/Intermediate Groundwater Hydraulic Control at the Former Mercury Cell Building	$7.1 Million	$396,405	$12.0 Million
5 – Engineered Cover System with Targeted Shallow/Intermediate Groundwater Hydraulic Control and Mercury Hot Spot Treatment/Removal at the Former Mercury Cell Building	$7.3 Million	$396,405	$12.3 Million
6 – Engineered Cover System with *In-Situ* Treatment at the 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

NYSDEC is the lead agency for this Subsite. EPA has determined that the selected remedy meets the requirements for a remedial action as set forth in CERCLA Section 121, 42 USC § 9621. As such, for the purpose of satisfying this remedy selection criterion of the NCP, NYSDEC, on behalf of New York State, supports the selected remedy.

NYSDOH also supports the selection of this remedy; its letter of concurrence is attached (see Appendix IV).

Community Acceptance

Limited feedback was received from the community during the public comment period. The feedback included a preference for removal of more contaminated material than that which would occur under the preferred alternative and further evaluation of *ex-situ* treatment options for mercury contaminated material. Comments received during the public comment period are summarized and addressed in the Responsiveness Summary, which is attached as Appendix V to this document.

PRINCIPAL THREAT WASTE

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 the migration of contamination to groundwater, surface water, or air, or act as a source for direct exposure. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or will 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 alternatives, using those remedy-selection criteria that are described above. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

As was noted in the “Summary of Subsite Characteristics” section, above, DNAPL and elemental mercury were encountered in soil borings and test pits advanced during the investigations and other response activities performed at this Subsite. Specifically, there is an area of elemental mercury present on the Willis Plant Area and chlorobenzene DNAPL present along the Lakeshore Property, in the northern portion of the Willis Plant Area and potentially at the CHSA. Potential migration of the DNAPL and mercury has, to a large extent, been addressed by prior IRMs. Some of these materials exhibit characteristics of principal threat waste.

Under Alternatives 2 through 6, chlorinated benzene DNAPL would continue to be collected through the Lakeshore Property Chlorinated Benzenes and Recovery IRM and sent to a permitted off-site facility to undergo treatment/disposal. Additional DNAPL, if present in the Willis Plant Area or CHSA, may be recovered and disposed off-site or treated under Alternatives 2 through 6. Elemental mercury-impacted soil/fill material would be isolated from Subsite 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 floor trenches, while *in-situ* treatment under Alternative 6 would solidify/stabilize approximately 3,450 cubic yards of soil/fill material assumed to be impacted with elemental mercury in the vicinity of the Former Mercury Cell Building. Under Alternative 7, excavation of soil/fill material exceeding Unrestricted-Use SCOs would result in the removal of approximately 4,600 cubic yards (to 32 feet bgs) of soil/fill material to address the 3,450 cubic yards of soil/fill assumed to be impacted with elemental mercury.

SELECTED REMEDY

Summary of the Rationale for the Selected Remedy

Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives, and public comments, NYSDEC and EPA have determined that Alternative 5 - Engineered Cover System with Targeted Shallow/Intermediate Groundwater Hydraulic Control and Mercury Hot Spot Treatment/Removal at the Former Mercury Cell Building, best satisfies the requirements of CERCLA Section 121, 42 U.S.C. § 9621, and provides the best balance of tradeoffs among the remedial alternatives with respect to the NCP's nine evaluation criteria, set forth at 40 CFR § 300.430(e)(9).

Alternative 1 would not meet RAOs for this Subsite. While Alternatives 2 through 7 would address the chlorobenzene DNAPL that is present at this Subsite, Alternative 2 would not address elemental mercury, a principal threat waste, that is also present at this Subsite. 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 floor trenches in 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 because of

the highly alkaline nature of Solvay waste material. For this reason, Alternative 6 may not be as effective as Alternative 5 in addressing elemental mercury at this Subsite. 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 selected remedy 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 selected remedy to satisfy the following statutory requirements of CERCLA Section121(b): 1) it will be protective of human health and the environment; 2) it will comply with ARARs; 3) it will be cost-effective; 4) it will utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) it will satisfy the preference for treatment as a principal element (or justify not meeting the preference).

NYSDEC and EPA agree that the selected remedy is protective of human health and the environment; can be readily constructed and operated, presents minimal potential short-term impacts to workers and the community, and is cost-effective. The selected remedy utilizes permanent solutions, alternative treatment technologies, and resource-recovery technologies to the maximum extent practicable.

Description of the Selected Remedy

The selected remedy, Alternative 5, includes the following components:

- Placement of a minimum 1-foot thick vegetated soil/granular cover system (or maintained paved surfaces or buildings) over approximately 20 acres to minimize erosion and mitigate potentially unacceptable exposure of human receptors to constituents exceeding New York State Commercial-Use SCOs in surface soil/fill material. The need for a demarcation layer between the soil cover and the underlying substrate will be evaluated during the design. The design of the cover system will take into consideration development plans that are anticipated or available for this Subsite at that time. A 1-foot excavation will precede construction of the cover in the CHSA, such that the final cover grade will match the existing grades, with the excavated material being deposited at the Willis Plant Area and graded before the placement of the cover at that portion of this Subsite. Some or all of the material present in existing staged soil piles that were generated from prior IRMs and excavation of Tributary 5A are intended to be beneficially reused at the adjacent Semet Residue Ponds subsite. Any surplus material after that work is performed may be used during grading prior to the placement of a cover at the Willis Plant Area. The surface area in the vicinity of the Former Mercury Cell Building will be covered with a low permeability cover (*i.e.,* high density

polyethylene geomembrane). Structures, such as buildings, pavement, or sidewalks, as part of future development, could also serve as acceptable substitutes or replacements for the vegetated cover either upon the implementation of the remedy or at a future time. The extent, thickness, and permeability of covers will be revisited during the design phase and/or during site management, if Subsite uses change, as necessary.

- Targeted treatment and/or removal and disposal of mercury hot spots associated with the floor trenches in the Former Mercury Cell Building. As the presence of free elemental mercury and low-level PCBs may limit disposal options, pre-design investigations will be conducted to characterize this material to assess whether *in-situ* treatment, off-site management, or a combination of the two will be the most practicable approach to address materials in the floor trenches and associated elemental mercury.
- Installation of a vertical barrier hydraulic containment system, to isolate contaminated shallow and intermediate groundwater in the vicinity of the Former Mercury Cell Building, and an extraction well system within the vertical barrier to address potential infiltration. Excavation of debris associated with the installation of the vertical barrier is assumed to be limited to building foundations that may be necessary to remove to install the barrier, as the installation of the vertical barrier is intended to surround the Former Mercury Cell Building. Collected groundwater will be treated at the Willis Avenue GWTP, which was constructed under an IRM.
- Performance of a field study 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, it will 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 will be evaluated to determine if mass reduction of contamination could be achieved. A treatability study would be performed to determine the effectiveness and implementability of *in-situ* treatment, and to facilitate the remedial design.
- Continued O&M associated with the IRMs that have been implemented at this Subsite. The IRMs include the Lakeshore Property Chlorinated Benzenes Recovery IRM, the I-690 Storm Drainage System IRM, the East Flume IRM, the Willis Avenue section of the Willis-Semet Berm Improvements IRM, and the Willis Barrier Wall Hydraulic Containment System IRM. O&M of the IRMs will include monitoring to document that established criteria are met 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 reapplication of vegetation in areas of non-survival, as necessary.
- MNA of the shallow/intermediate groundwater at this Subsite POC (outboard of the Willis Barrier Wall). Further evaluation of MNA rates will 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 at the POC of both subsites will be addressed via MNA.

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

    - Institutional and Engineering Control Plan that identifies institutional and engineering controls (*i.e.,* environmental easements and/or restrictive covenants, cover systems) for this Subsite and details the following steps and media-specific requirements necessary to ensure that they remain in place and 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-Subsite building construction should include either vapor intrusion sampling and/or installation of mitigation measures, if necessary;
        - maintaining Subsite access controls 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 will be established during design.

    - An O&M Plan that identifies the O&M requirements of the engineering controls. O&M will include monitoring to determine if established performance criteria are met and to identify the need for corrective action(s), as warranted. Corrective actions for the cover system may consist of cover repair in areas of disturbance or reapplication of vegetation in areas of non-survival.[7]

This Subsite is part of a WMA because the waste is a solid waste containing contaminants of concern and the area will meet the requirements for containment under RCRA Subtitle D. The vertical hydraulic conductivity of the Solvay waste unit present at this Subsite is generally less than 1×10^{-5} cm/sec (and the geometric mean of the vertical

7 The annual O&M cost estimates associated with the cover and for maintenance of the cover is included in the cost estimates.

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

The remedy includes the restoration of shallow/intermediate groundwater at the WMA's POC via MNA. Based on multiple lines of evidence, degradation of organic constituents is occurring in the shallow and intermediate groundwater via natural attenuation and degradation (*e.g.,* biodegradation). Some uncertainties exist with respect to the estimated timeframes developed to achieve groundwater criteria. Further evaluation of natural attenuation rates will be conducted as part of the preliminary remedial design and/or O&M. The evaluation may include collection of additional shallow and intermediate groundwater samples inboard and outboard of the hydraulic control system to confirm that natural attenuation is taking place and to refine estimated timeframes for contaminants in groundwater to achieve criteria.

Sampling will be performed, as necessary, to determine the appropriate cover thickness in various areas of this Subsite.

The cover system will require routine maintenance and inspections to maintain its integrity.

Fill material brought to this Subsite will need to meet the requirements for the identified Subsite use as set forth in New York State regulations (6 NYCRR Part 375-6.7(d)). Native species will be used for the vegetative component of covers. To develop cost estimates, the seed application is anticipated to consist of a grassland seed mix native to New York State and selected for its ability to attain relatively high growth rates and ecological function. Refinements to the seed mix will be developed as part of remedial design.[8]

Green remediation techniques, as detailed in NYSDEC's Green Remediation Program Policy-DER-31,[9] and EPA Region 2's Clean and Green Policy[10] will be considered for the selected 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

[8] Where applicable, seed mixes that produce flowering plants will be used to provide habitat for pollinators.
[9] See http://www.dec.ny.gov/docs/remediation_hudson_pdf/der31.pdf.
[10] See http://epa.gov/region2/superfund/green_remediation

- 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 fuel.

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

Summary of the Estimated Remedy Costs

The estimated capital cost of the selected remedy is $7.3 million; the annual O&M is $396,405; and the total present-worth cost (using a 7% discount rate) is $12.3 million. Table 14 provides the basis for the cost estimates for Alternative 5.

It should be noted that these cost estimates are expected to be within +50 to -30 percent of the actual project cost. These cost estimates are based on the best available information regarding the anticipated scope of the selected remedy. Changes to the cost estimate can occur as a result of new information and data collected during the design of the remedy.

Expected Outcomes of the Selected Remedy

The results of the HHRA 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 previously 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 Subsite areas and are not necessarily final actions. The selected remedy will mitigate these remaining risks. In addition, it is anticipated that the remedy will result in the restoration of shallow/intermediate groundwater at the POC of this Subsite and the adjacent Semet Residue Ponds Subsite via MNA.

The State of New York, Onondaga County, and the City of Syracuse have jointly sponsored the preparation of a land-use master plan to guide future development of the Onondaga Lake area (Syracuse-Onondaga County Planning Agency, 1998). The primary objective of these land-use planning efforts is to enhance the quality of the Onondaga Lake area for recreational and commercial uses. Implementation of the remedy will aid this long-term planning effort by addressing concerns related to human exposure to contaminated sediments, soils, and surface water.

Under the selected remedy, potential risks to human health and the environment will be reduced to acceptable levels. Remediation goals for the COCs are presented in Tables 1 through 9 in Appendix II. Remediation goals for surface soil will be met following construction and implementation of appropriate institutional controls (*e.g.,* approximately one year following the start of construction). The estimated time to attain remediation goals for groundwater outside the WMA ranges from 100 to 700 years. These estimates are based on available data for groundwater and porewater collected from beneath the lake, and they were based on conservative assumptions. Additional data (*e.g.,* groundwater) will be collected to refine the estimated timeframe for restoration and long-term monitoring will be performed.

STATUTORY DETERMINATIONS

Under CERCLA Section 121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions that employ treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, or contaminants at a site.

For the reasons discussed below, NYSDEC and EPA have determined that the selected remedy meets these statutory requirements.

Protection of Human Health and the Environment

The results of the risk assessment indicate that, if no action is taken, this Subsite poses an unacceptable ecological and human health risk.

The selected remedy will reduce exposure levels to protective levels or to within EPA's generally acceptable risk range of 10^{-4} to 10^{-6} for carcinogenic risk and below the HI of 1 for noncarcinogens. The implementation of the selected remedy will not pose unacceptable short-term risks or cross-media impacts that cannot be mitigated. The selected remedy will be protective of human health and the environment in that the construction of cover systems over contaminated soil will preclude potential human and ecological exposure to contamination in soil. Combined with institutional controls, the selected remedy will provide protectiveness of human health and the environment over both the short- and long-term.

Compliance with ARARs and Other Environmental Criteria

The selected remedy will comply with the location-, chemical- and action-specific ARARs identified. The ARARs, TBCs, and other guidelines for the selected remedy are provided

in Table 13.

Cost-Effectiveness

A cost-effective remedy is one whose costs are proportional to its overall effectiveness (NCP Section 300.430(f)(1)(ii)(D)). Overall effectiveness is based on the evaluations of the following: long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness. Based on the comparison of overall effectiveness (discussed above) to cost, the selected remedy meets the statutory requirement that Superfund remedies be cost-effective and will achieve the cleanup levels in the same amount of time in comparison to the costlier alternatives.

Each of the alternatives underwent a detailed cost analysis. In that analysis, capital and annual O&M costs were estimated and used to develop present-worth costs. In the present-worth cost analysis, annual O&M costs were calculated for the estimated life of the alternatives and related monitoring using a seven percent discount rate and a 30-year interval. The estimated capital, annual O&M, and total present-worth costs for the selected remedy are $7.3 million, $396,405; and $12.3 million, respectively. While the estimated costs for the selected remedy are similar to those for Alternatives 2, 3, 4, and 6, the selected remedy will be more effective than those alternatives in addressing elemental mercury in soil/fill material in the vicinity of the Former Mercury Cell Building. While Alternative 7 would also address elemental mercury in soil/fill material at the Subsite as well other contaminated media, it would be the least cost-effective means of achieving remedial action objectives identified for this Subsite.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy provides the best balance of tradeoffs among the alternatives with respect to the balancing criteria set forth in NCP Section 300.430(f)(1)(i)(B), such that it represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at this Subsite.

The selected remedy will permanently address mercury contaminated soil in the vicinity of the Former Mercury Cell Building Area as it includes *in-situ* treatment and/or removal of soil/fill materials containing 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 will be identified through a treatability study that will be conducted during the design phase.

The continued O&M of the prior IRMs as required under the selected remedy will provide

long-term effectiveness and permanence while addressing DNAPL and groundwater impacts. Implementation of an engineered cover system and institutional controls under the selected remedy will provide adequate and reliable means of controlling erosion of, exposure to, and direct contact with contaminated soil/fill material.

Preference for Treatment as a Principal Element

CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous substances as a principal element (or justify not satisfying the preference). The selected remedy includes targeted treatment and/or removal and disposal of mercury hot spots associated with the floor trenches in the Former Mercury Cell Building. Treatment or removal of the elemental mercury-impacted soil/fill material will address approximately 450 cubic yards of contaminated material associated with the floor trenches. As the presence of free elemental mercury and low-level PCBs may limit disposal options, pre-design investigations will be conducted to characterize this material to assess whether *in-situ* treatment and/or off-site management of these materials will be most practicable to address the floor trenches and associated elemental mercury.

Under the selected remedy, contaminated chlorobenzene DNAPL in the Lakeshore Property will continue to be collected through O&M of the Lakeshore Property Chlorinated Benzenes Recovery IRM and be sent to a permitted off-site facility for treatment/disposal. The selected remedy includes a field study 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 will be removed (*e.g.,* using recovery wells) and sent off-site for treatment/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 will be evaluated to determine if mass reduction of contamination could be achieved. A treatability study will be performed to verify the effectiveness and implementability of *in-situ* treatment of residual DNAPL, and to facilitate the remedial design.

Five-Year Review Requirements

The selected remedy, once fully implemented, will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that would otherwise allow for unlimited use and unrestricted exposure. Consequently, a statutory review will be conducted within five years after initiation of the remedial action and at five-year intervals thereafter, to ensure that the remedy is, or will be, protective of human health and the environment.

DOCUMENTATION OF SIGNIFICANT CHANGES

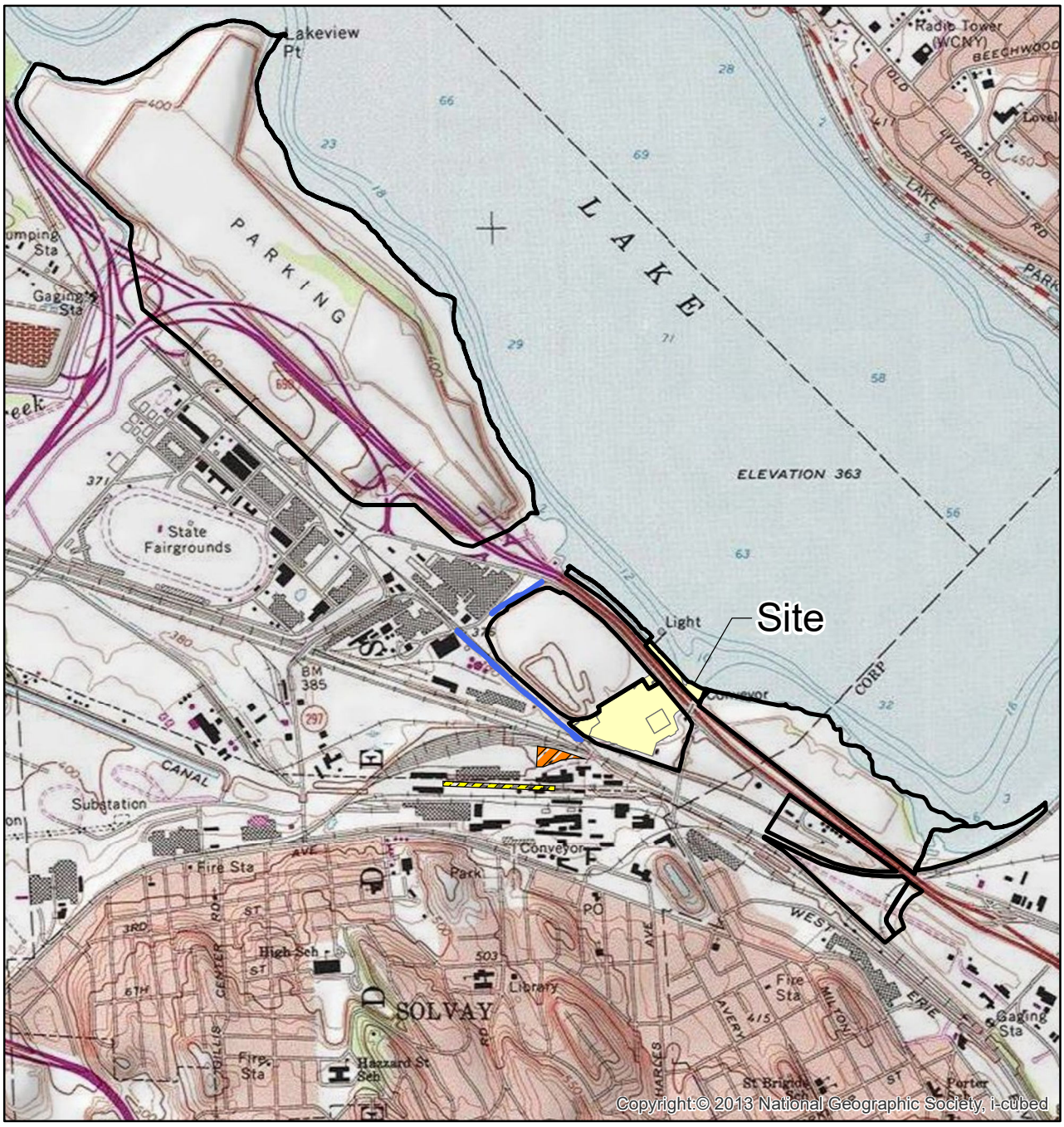
The Proposed Plan, released for public comment on July 21, 2019, identified Alternative 5, Engineered Cover System with Targeted Shallow/Intermediate Groundwater Hydraulic Control and Mercury Hot Spot Treatment/Removal at the Former Mercury Cell Building, as the preferred alternative for this Subsite. Based upon its review of the written and verbal comments submitted during the public comment period, NYSDEC and EPA determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

ALLIED CHEMICAL – WILLIS AVENUE SUBSITE
OF THE ONONDAGA LAKE SUPERFUND SITE
RECORD OF DECISION

APPENDIX I

FIGURES

FIGURE 1



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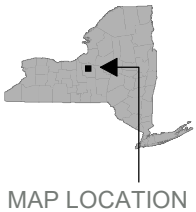

MAP LOCATION

WILLIS AVENUE SITE
RECORD OF DECISION
GEDDES, NEW YORK

N

LEGEND

STUDY AREA

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

SITE LOCATION

0 1,000 2,000 4,000

Feet

1:24,000

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O'BRIEN & GERE ENGINEERS, INC.

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FIGURE 2

ONONDAGA LAKE
ENGINEERED FLOODPLAIN
WESTERN STORM DRAIN SYSTEM
WILLIS BARRIER WALL
2009 RESTORATION AREA
WEST WALL
2010 RESTORATION AREA
SEMET BARRIER WALL
DNAPL COLLECTION SYSTEM STORAGE TANK
LIGHT WEIGHT FILL
EAST FLUME (REMOVED)
WILLIS LAKESHORE PROPERTY
48" INTAKE
72" INTAKE
GATE
I-690 WESTBOUND
I-690 EASTBOUND
STATE FAIR BLVD
OUTFALL 004
60" MAIN SEWER
TRIBUTARY 5A
NORTHWEST DITCH
DRAINAGE DITCH
SOIL PILE 1
WILLIS PLANT AREA
WILLIS AVENUE
10" CHLORINE WASTE WATER
SOIL PILE 2
WILLIS-SEMET GROUNDWATER TREATMENT PLANT
BALLFIELD SITE
SEMET RESIDUE PONDS SITE
POND 2
POND 1
POND 5
POND 3
POND 4
CRUCIBLE SPECIALTY METALS
6" SARAN PIPE
FORMER MERCURY CELL BUILDING
CSX RAILROAD
MOUNDED AREA
DRAINAGE DITCH
OUTFALL 006
42" P.A. SEWER
INDUSTRIAL DRIVE
FORMER CHURCH & DWIGHT FASILITY
CSX RAILROAD
TRIBUTARY 5A
CRUCIBLE SPECIALTY METALS
CRUCIBLE SPECIALTY METALS
SOUR
GENERAL CHEMICAL
SOFT COAL STORAGE AREA
INDUSTRIAL DRIVE
FORMER SUEZ
ROCK TENN

THE BENZENE PIPELINE & CHLOROBENZENE RESIDUAL WASTE PIPELINE DEPICTED ARE APPROXIMATE LOCATIONS. THE LOCATIONS FOR THE PIPELINES ON THE WILLIS PLANT AREA ARE UNKNOWN. THESE PIPELINES WERE REMOVED DURING THE DEMOLITION OF THE PLANT AREAS. WHILE IN-PLACE, THE BENZENE PIPELINE WAS ON ELEVATED PIPE BRIDGES, AND THE CHLOROBENZENE PIPELINE WAS BOTH ON THE ELEVATED PIPE BRIDGE AND BURIED ALONG ITS PATH.

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

N

0 200 400 800
Feet

WILLIS AVENUE SITE
RECORD OF DECISION
GEDDES, NEW YORK

SITE PLAN

SEPTEMBER 2019
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O'BRIEN & GERE ENGINEERS, INC.

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

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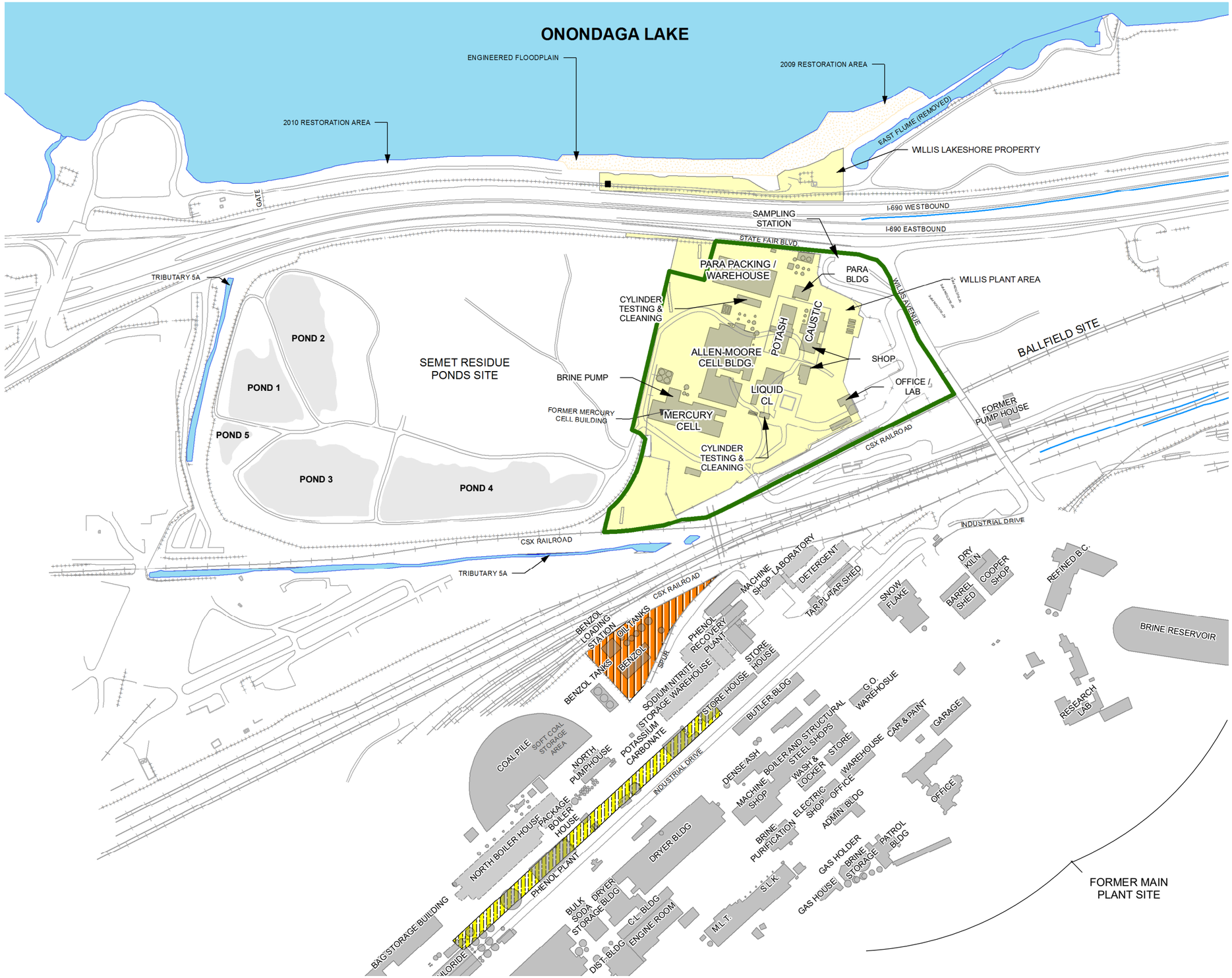
FIGURE 3



LEGEND

- HISTORICAL BUILDING
- WILLIS AVENUE PLANT BOUNDARY

STUDY AREA

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

WILLIS AVENUE SITE
RECORD OF DECISION
GEDDES, NEW YORK

FORMER SITE BUILDINGS

0 200 400 800
Feet

SEPTEMBER 2019
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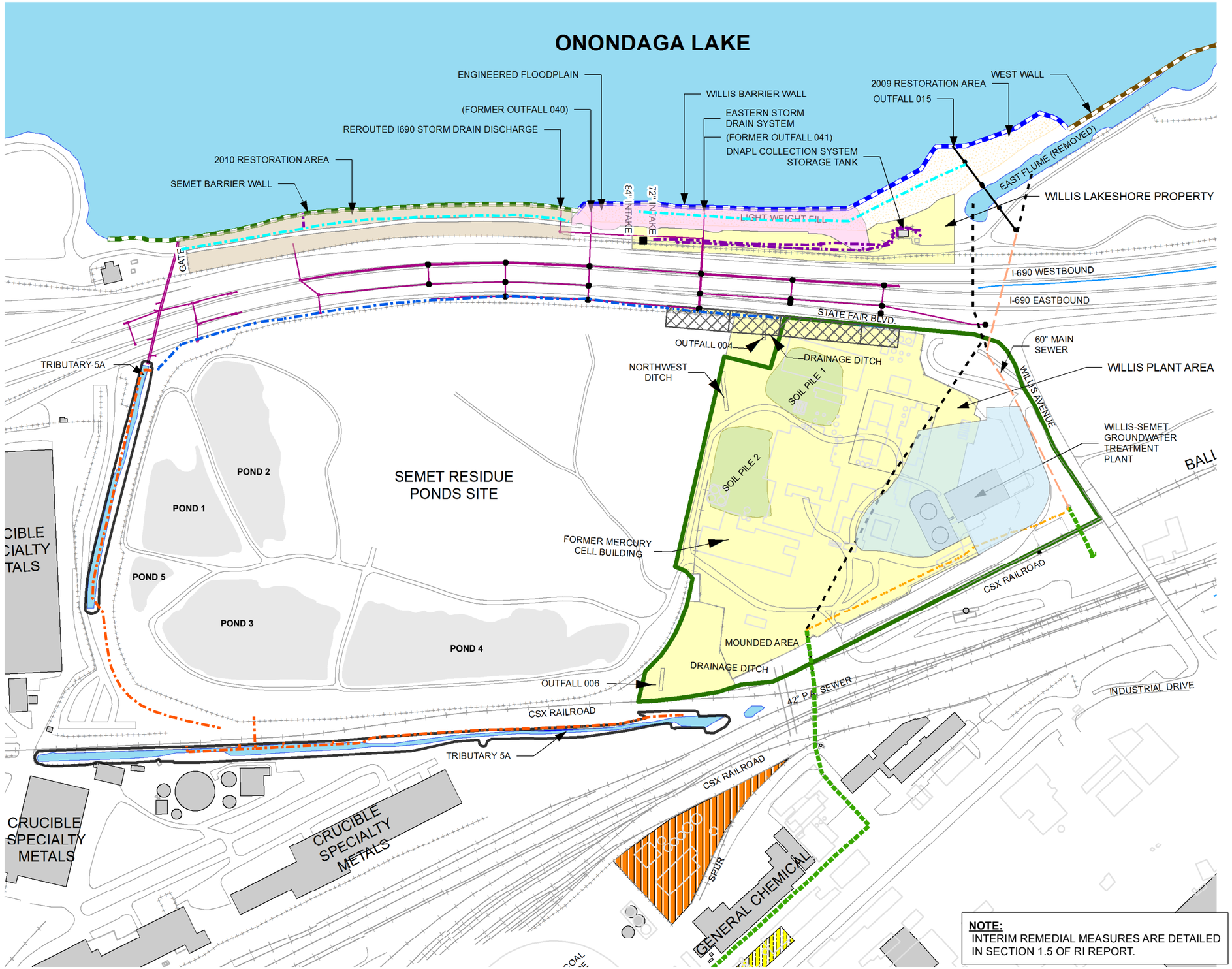
O'BRIEN & GERE ENGINEERS, INC.

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



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

N

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 RECORD OF DECISION GEDDES, NEW YORK

INTERIM REMEDIAL MEASURES AND REMEDIAL ACTIONS

0 150 300 600
Feet

SEPTEMBER 2019
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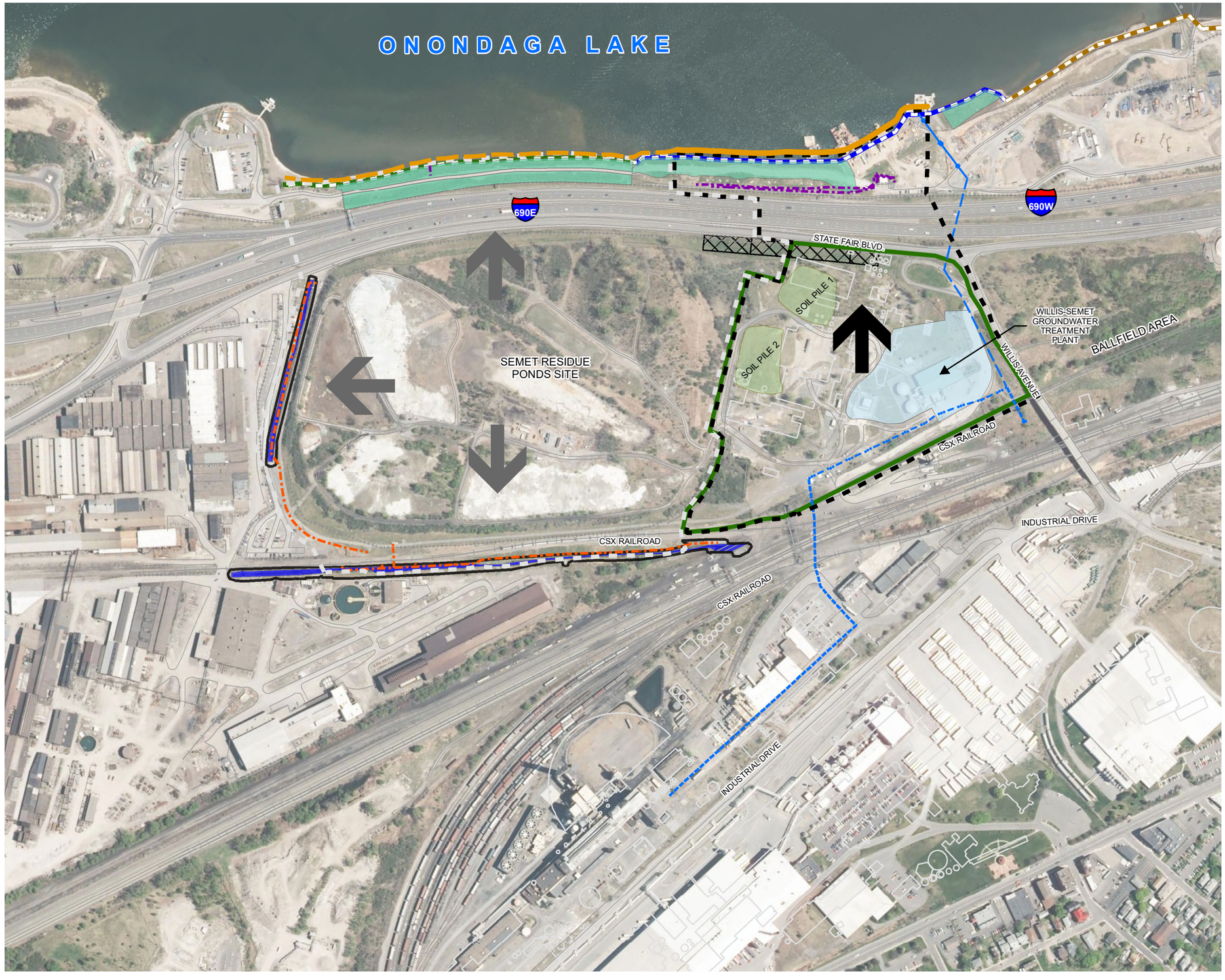

N

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
RECORD OF DECISION
GEDDES, NEW YORK

WASTE MANAGEMENT AREA AND GROUNDWATER POINT OF COMPLIANCE

0 200 400 800
Feet

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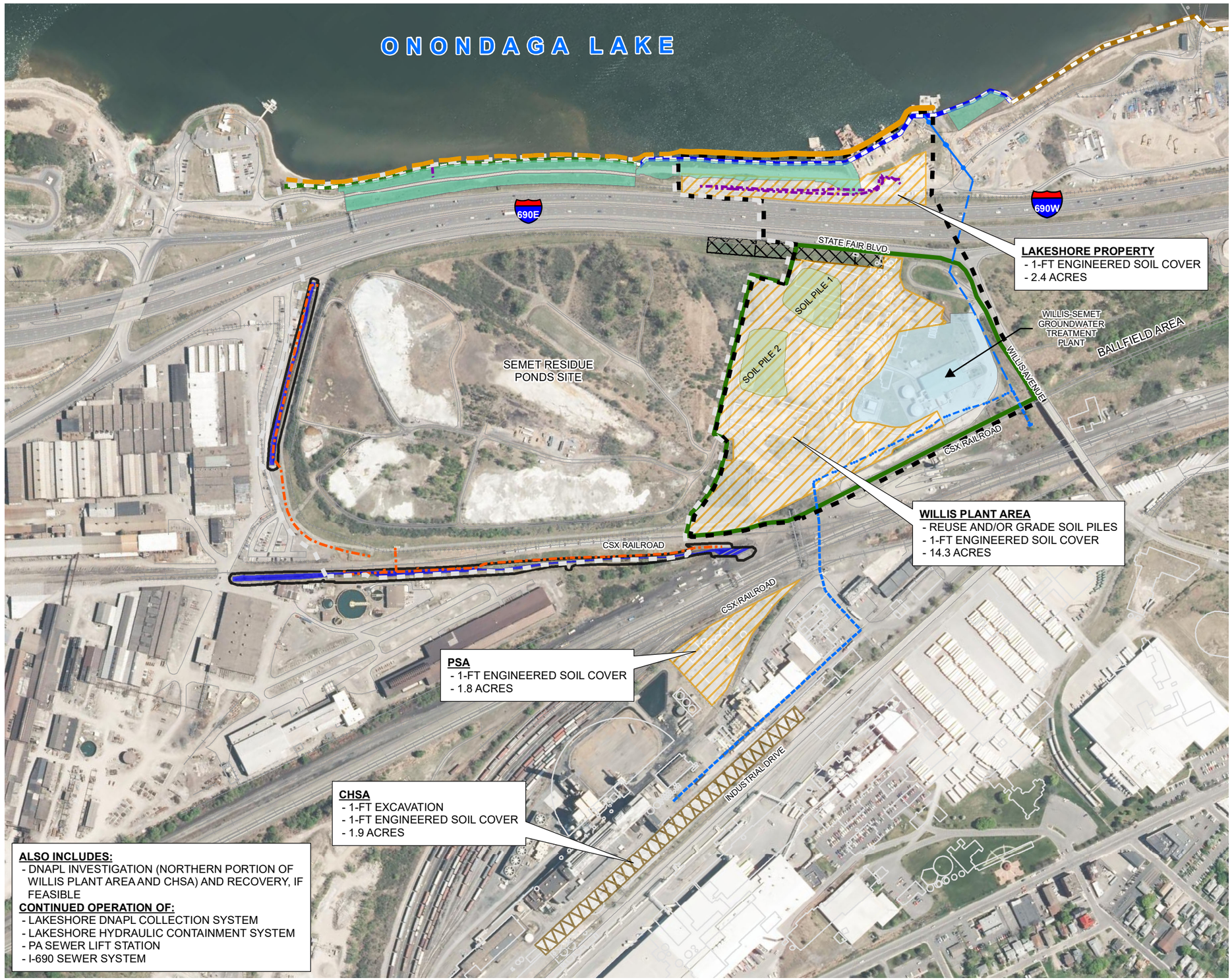

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LEGEND

- 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 RECORD OF DECISION GEDDES, NEW YORK

ALTERNATIVE 2

0 200 400 800
Feet

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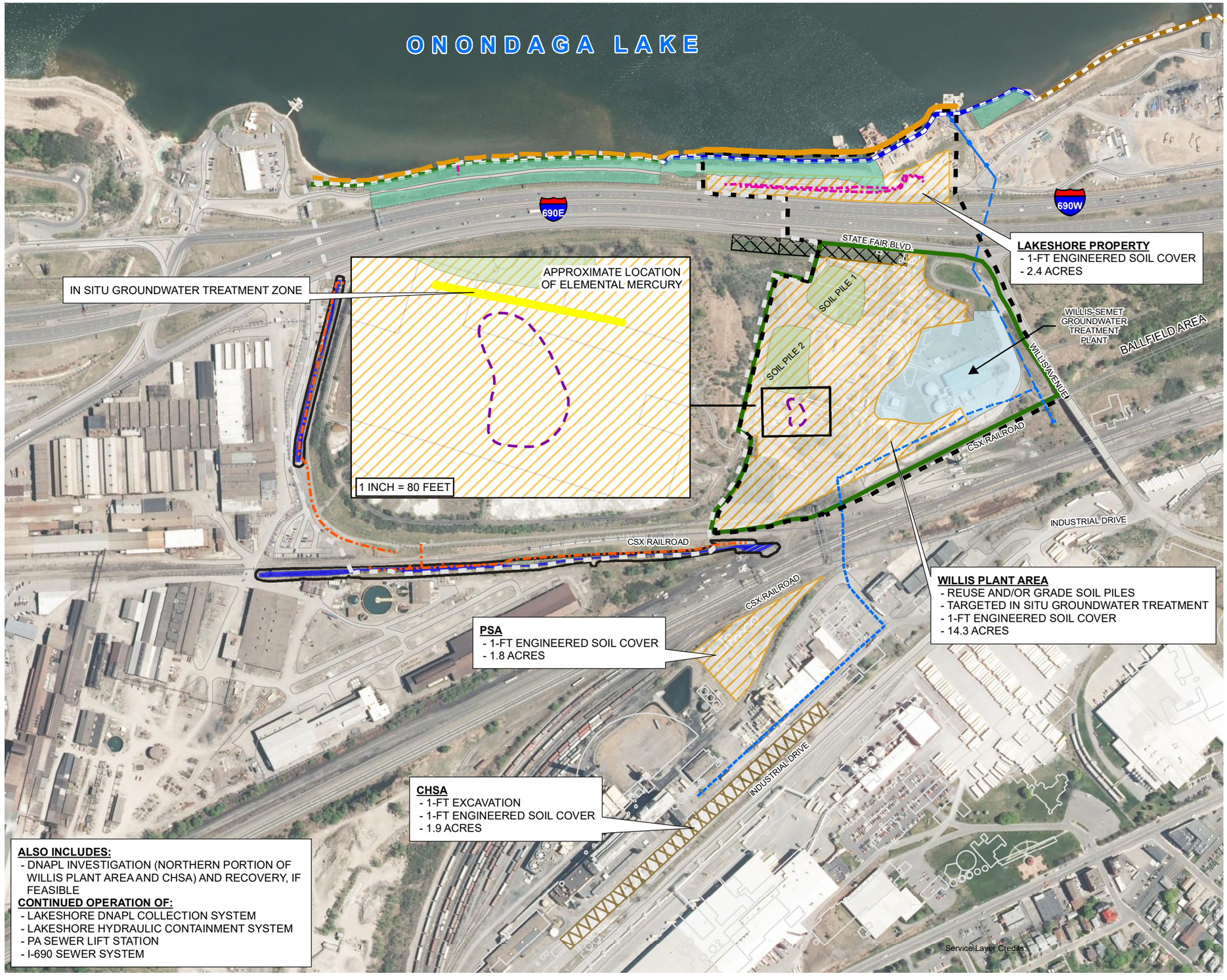

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LEGEND

- 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
- 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 RECORD OF DECISION GEDDES, NEW YORK

ALTERNATIVE 3

0 200 400 800
Feet

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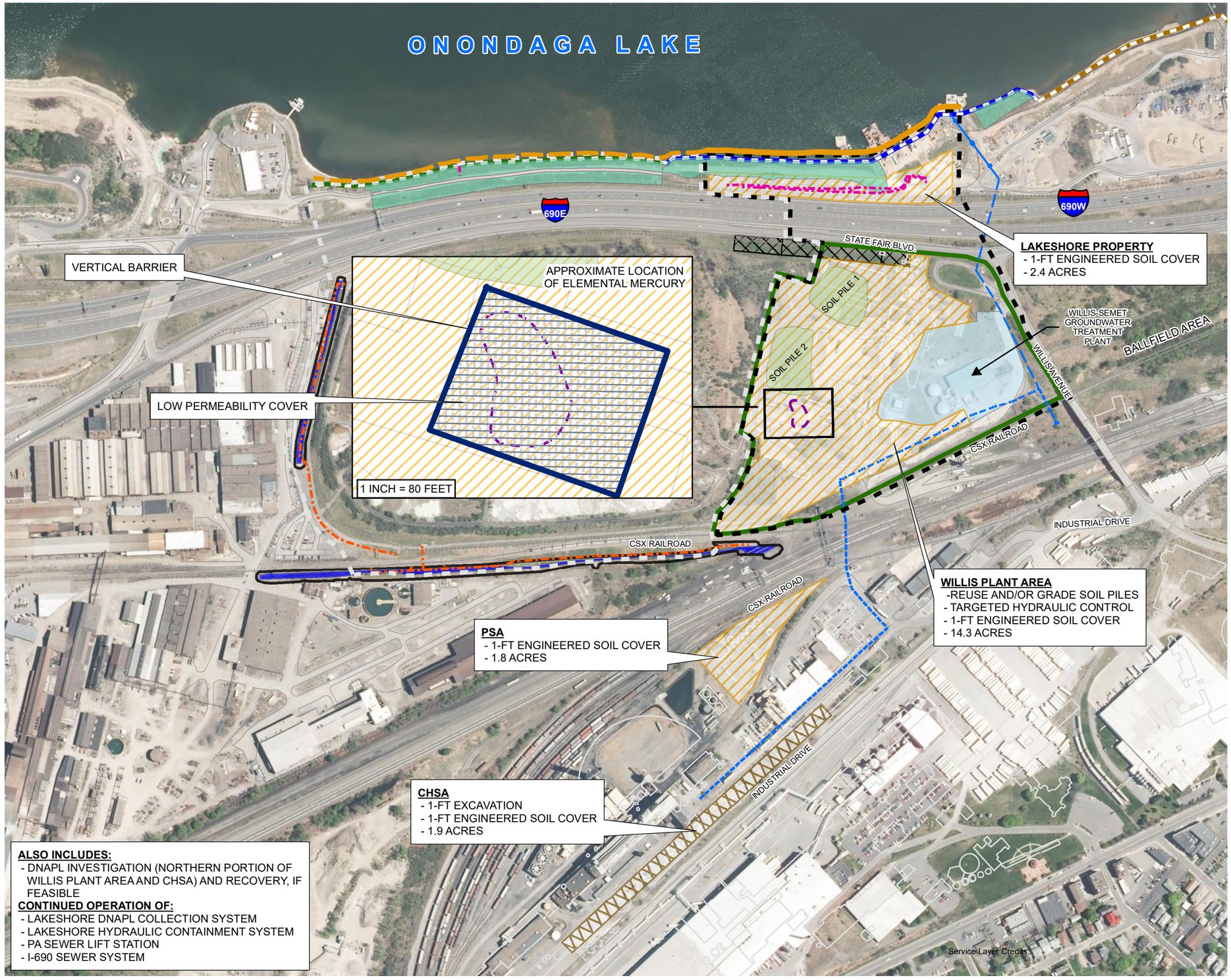

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LEGEND

- 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 RECORD OF DECISION GEDDES, NEW YORK

ALTERNATIVE 4

0 200 400 800
Feet

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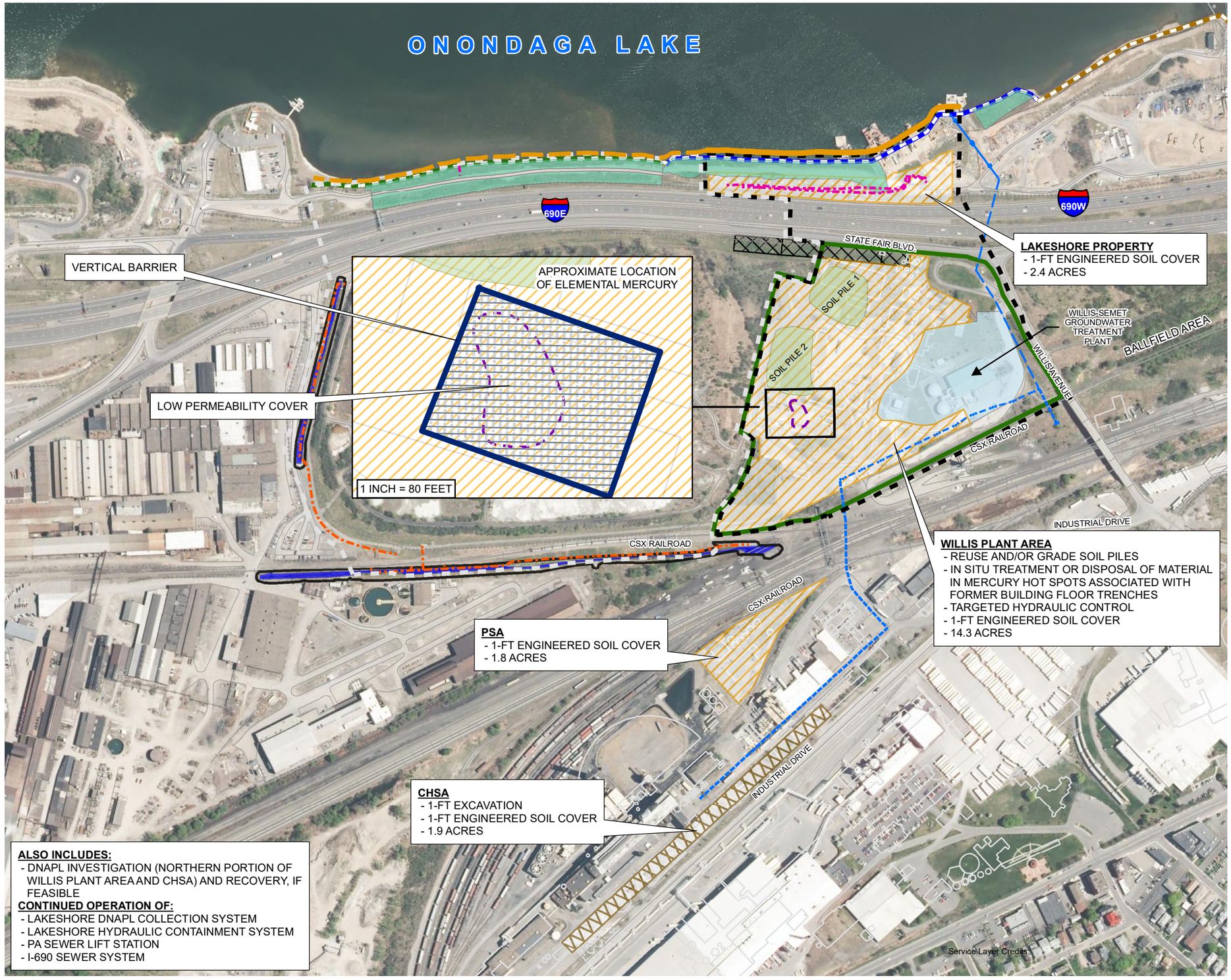

N

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
- 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 RECORD OF DECISION GEDDES, NEW YORK

ALTERNATIVE 5

0 200 400 800
Feet

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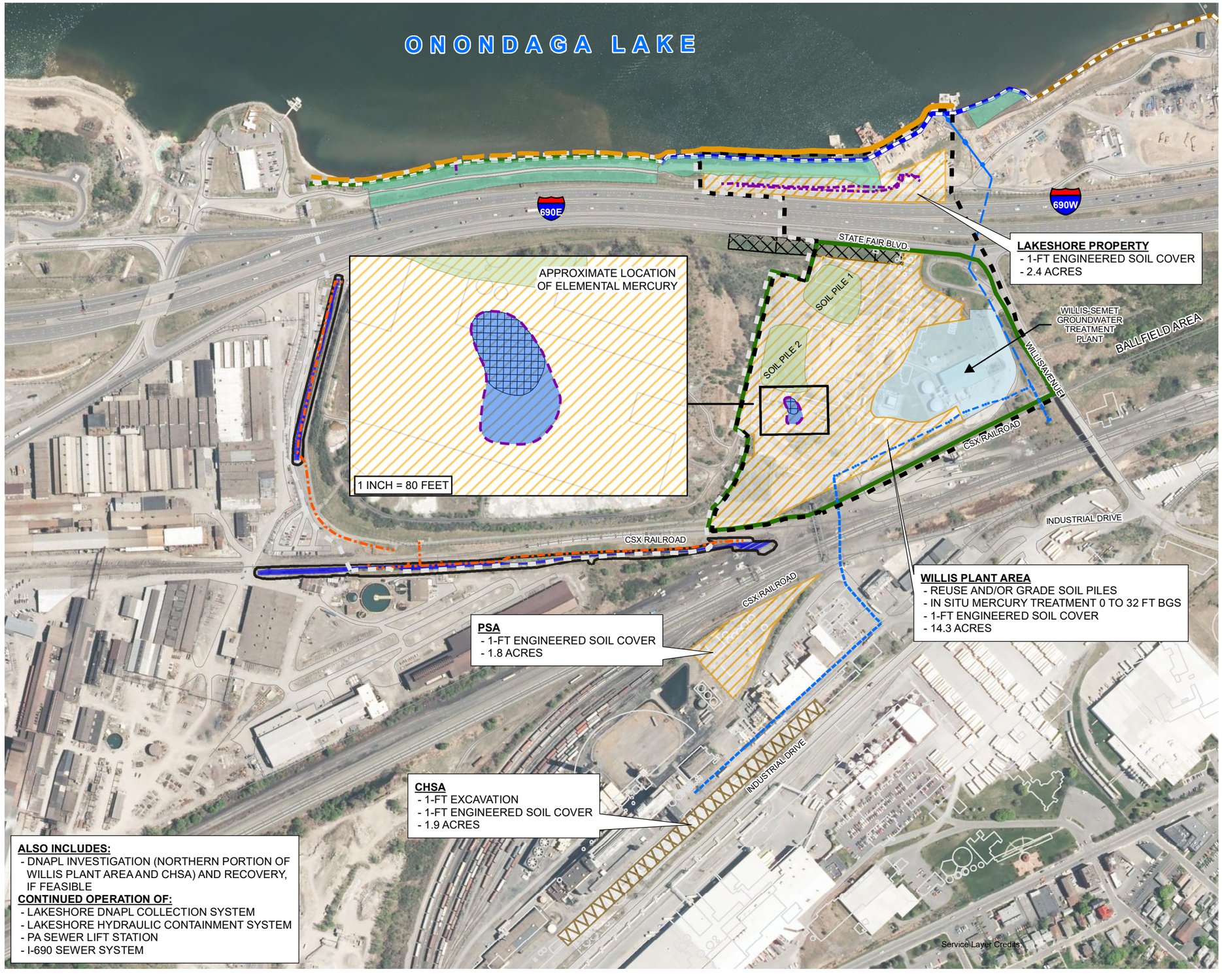


N

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

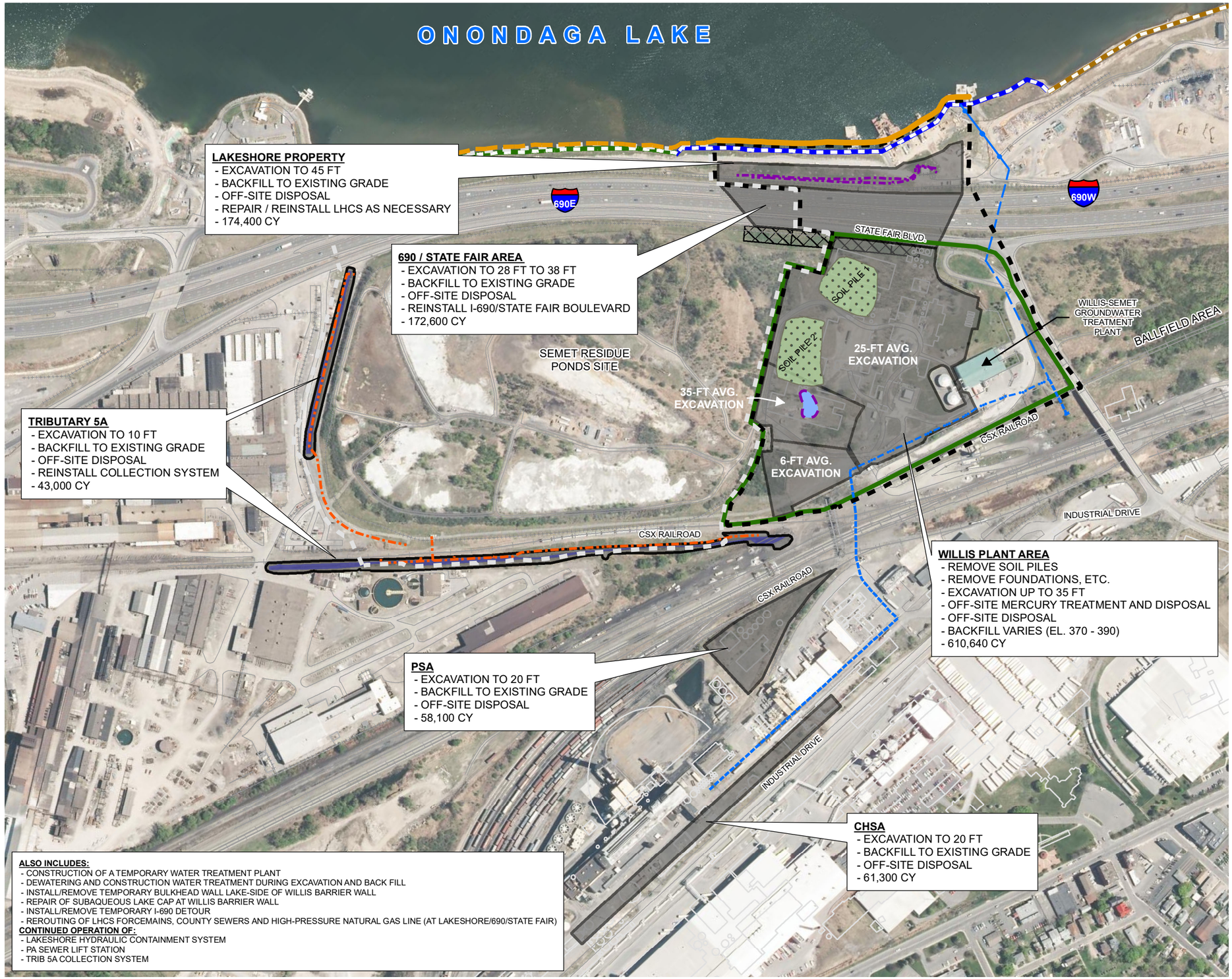
WILLIS AVENUE SITE RECORD OF DECISION GEDDES, NEW YORK

ALTERNATIVE 6

0 200 400 800
Feet

SEPTEMBER 2019
1163.72600

O'BRIEN & GERE ENGINEERS, INC.



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 RECORD OF DECISION GEDDES, NEW YORK

ALTERNATIVE 7

0 200 400 800
Feet

SEPTEMBER 2019
1163.72600

O'BRIEN & GERE ENGINEERS, INC.

ALLIED CHEMICAL – WILLIS AVENUE SUBSITE
OF THE ONONDAGA LAKE SUPERFUND SITE
RECORD OF DECISION

APPENDIX II

TABLES

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: 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 of the Mean Concentration	
Benzene	200-400 Years
Toluene	40-50 Years
Chlorobenzene	400-700 Years

Table 11: 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 Area	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 1 E-04 cancer risk or a non-cancer hazard index of 1 are typically those that will require remedial action at a site and are referred to as COCs.
8. Commercial/industrial SCOs are available for all COCs identified here except for dioxins and vanadium. The EPA risk-based commercial/industrial Regional Screening Levels (RSLs) for dioxins and vanadium in soil of 7.2 E-04 mg/kg and 5,800 mg/kg, respectively, may be considered for these COCs given the absence of SCOs.

Table 12: 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
	Construction Worker	Upper Soil	Manganese, Mercury, Nickel	NA	30
	Utility Worker	Intermediate Soil, Intermediate Groundwater	Mercury	NA	5
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
	Industrial Worker	Surface Soil	Dioxins, Mercury	2E-04	9
	Construction Worker	Upper Soil	Dioxins, Chromium, Manganese, Mercury, Nickel	NA	50
	Utility Worker	Intermediate Soil	Dioxins, Mercury, PCBs	NA	30
Former Chlorination Building	Adolescent Trespasser	Surface Soil	Dioxins	4E-04	20
	Adult Trespasser	Surface Soil	Dioxins	7E-04	10
	Surveillance Worker	Surface Soil	Dioxins	5E-04	10
	Industrial Worker	Surface Soil	Dioxins	2E-03	30
	Construction Worker	Upper Soil	Dioxins, Manganese	8E-04	400
	Utility Worker	Intermediate Soil	Dioxins	7E-04	300
Southwest Off-Site/Outfall 006 Exposure Area	Adolescent Trespasser	Surface Soil	PCBs	NA	3
	Industrial Worker	Surface Soil	Mercury, PCBs	NA	4
	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 12: 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, Benzene, 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. Chemicals that exceed a 1 E-04 cancer risk or a hazard index of 1 are typically those that will require remedial action at a site and are referred to as COCs.
8. Commercial/industrial SCOs are available for all COCs identified here except for dioxins and vanadium. The EPA risk-based commercial/industrial Regional Screening Levels (RSLs) for dioxins and vanadium in soil of 7.2 E-04 mg/kg and 5,800 mg/kg, respectively, may be considered for these COCs given the absence of SCOs.
9. "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.
10. NYSDEC Class GA groundwater SGVs are available for all groundwater COCs identified here except for vanadium. The EPA risk-based resident tap water RSL of 86 µg/L for vanadium may be considered given the absence of a Class GA groundwater SGV or federal drinking water standard for vanadium.

TABLE 13 POTENTIALLY APPLICABLE OR RELEVANT AND APPROPRITE REQUIREMENTS (ARARS) AND TO BE CONSIDERED (TBC) MATERIALS

Medium Location/Action	Citation	Requirements	Comments	Potential ARAR	Potential TBC
Potential Chemical-Specific ARARs and TBCs					
Soil/fill Material	6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives (SCOs)	Promulgated state regulation that provides guidance for SCOs for various restricted property uses (industrial, commercial, restricted residential, and residential), for the protection of groundwater and ecological resources, and for unrestricted property use. Commercial use includes passive recreational use that refers to recreational uses with limited potential for soil contact, such as: (1) artificial surface fields; (2) outdoor tennis or basketball courts; (3) other paved recreational facilities used for roller hockey, roller skating, shuffle board, etc.; (4) outdoor pools; (5) indoor sports or recreational facilities; (6) golf courses; and (7) paved (raised) bike or walking paths [DER-10 (NYSDEC 2010)]. Industrial use includes land use for the primary purpose of manufacturing, production, fabrication or assembly processes and ancillary services. The industrial use category allows the use of the site only for industrial purposes with access to the site limited to workers and occasional visitors [DER-10 (NYSDEC 2010)].	SCOs for restricted use (industrial, commercial) are potentially relevant and appropriate to site soil/fill material given the current and reasonably anticipated future land use as a commercial or industrial property. SCOs for the protection of groundwater may not be applicable, relevant or appropriate because migration of Site groundwater is currently being controlled.	Yes	No[1]
	USEPA Regional Screening Levels	Guidance that provides human health risk-based screening values for soil at industrial sites. Screening levels are calculated based on human health exposure assumptions and toxicity data.	Industrial soil screening levels are potentially applicable for the screening of soil/fill material.	No	Yes
Shallow/Intermediate Groundwater	6 NYCRR Part 703 – Class GA Groundwater Quality Standards	Promulgated water quality standards for fresh groundwater, including narrative and constituent-specific standards.	Not applicable to shallow or intermediate groundwater within the limits of the Site where Solvay waste and other fill materials are present. Potentially applicable for shallow and intermediate groundwater beyond the limits of the waste management area (*i.e.,* Site boundary).	Yes	No
	NYS TOGS 1.1.1 – Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations	Guidance that summarizes groundwater standards and guidance values. Guidance values are provided where standards are not available.	Not applicable to shallow or intermediate groundwater within the limits of the Site where Solvay waste and other fill materials are present. Potentially applicable for shallow and intermediate groundwater beyond the limits of the waste management area (*i.e.,* Site boundary).	Yes	No
	40 CFR Part 141 – Drinking Water Standards	Promulgated federal regulation that establishes primary drinking water regulations applicable to public water systems.	Not applicable to shallow or intermediate groundwater within the limits of the Site where Solvay waste and other fill materials are present. Potentially applicable for shallow and intermediate groundwater beyond the limits of the waste management area (*i.e.,* Site boundary). Shallow and intermediate groundwater is not used as a drinking water source as municipal water is available, nor is it suitable for a drinking water source (due to salinity).	Yes	No
Potential Location-Specific ARARs and TBCs					

[1] USEPA Region 2 considers 6 NYCRR Part 375-6 Remedial Program SCOs to be a TBC, not an ARAR.

TABLE 13. POTENTIALLY APPLICABLE OR RELEVANT AND APPROPRITE REQUIREMENTS (ARARS) AND TO BE CONSIDERED (TBC) MATERIALS

Medium Location/Action	Citation	Requirements	Comments	Potential ARAR	Potential TBC
Construction of Buildings	NYSDOH's October 2006 Guidance for Evaluating Soil Vapor Intrusion in the State of New York	Guidance document that provides thresholds for indoor air and subslab soil vapor above which vapor mitigation is required.	Not currently applicable, because no buildings are present on the Site. Potentially applicable if future buildings are constructed at the Site.	No	Yes
	OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air, OSWER Publication 9200.2-154, June 2015	Technical guidance that provides recommendations on assessment of vapor intrusion pathways that pose an unacceptable risk to human health.	Not currently applicable, because no buildings are present on the Site. Potentially applicable if future buildings are constructed at the Site.	No	Yes
Water Bodies	33 CFR 320 - 330 - Navigation and Navigable Waters	Regulatory policies and permit requirements for work affecting waters of the United States and navigable waterways.	Substantive, non-administrative requirements potentially applicable to work affecting Onondaga Lake.	Yes	No
	16 USC 661 - Fish and Wildlife Coordination Act	Requires protection of fish and wildlife in a stream or other water body when performing activities that modify a stream or river.		Yes	No
Wetlands	6 NYCRR 663 - Freshwater wetland permit requirements	Actions occurring in a designated freshwater wetland (within 100 feet) must be approved by NYSDEC or its designee. Activities occurring adjacent to freshwater wetlands must: be compatible with preservation, protection, and conservation of wetlands and benefits; result in no more than insubstantial degradation to or loss of any part of the wetland; and be compatible with public health and welfare.	Not applicable or relevant and appropriate since the Site is not within 100 feet of a designated freshwater wetland regulated by NYSDEC.	No	No
	Clean Water Act Section 404 33 CFR Parts 320 - 330	Regulatory policies and permit requirements for work affecting waters of the United States, including wetlands.	Not applicable or relevant. There are no delineated wetlands on Site.	No	No
	Clean Water Act Section 404 40 CFR Parts 230-231	Provides for restoration and maintenance of integrity of waters of the United States, including wetlands, through the control of dredged or fill material discharge.		No	No
	Executive Order 11990 - Protection of Wetlands	Executive order requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction or loss of wetlands if a practical alternative exists.		No	No
Wetlands & Floodplains	Policy on Floodplains and Wetland Assessments for CERCLA Actions (OSWER Directive 9280.0-2; 1985)	Policy and guidance requiring Superfund actions to meet substantive requirements of Executive Orders 11988 and 11990. Describes requirements for floodplain assessment during remedial action planning.	Not applicable for wetlands as there are no delineated wetlands on Site. To be considered during the remedial design as portions of the Site are within the 100-year floodplain. Not relevant as work on remedial actions is already subjected to mandates for environmental assessment contained in Section 104 of CERCLA.	No	Yes
	Statement of Procedures on Floodplains Management and Wetlands Protection (January 5, 1979)	Policy and guidance for implementing Executive Orders 11988 and 11990. Requires federal agencies to evaluate the potential effects of action proposed in wetlands and floodplains to avoid, to the extent possible, adverse effects. Federal agencies are required to evaluate alternatives to actions in wetlands or floodplains and to avoid or minimize adverse impacts if not practical alternatives exist.		No	Yes

TABLE 13. POTENTIALLY APPLICABLE OR RELEVANT AND APPROPRITE REQUIREMENTS (ARARS) AND TO BE CONSIDERED (TBC) MATERIALS

Medium Location/Action	Citation	Requirements	Comments	Potential ARAR	Potential TBC
Floodplains	6 NYCRR 373-2.2 - Location standards for hazardous waste treatment, storage, and disposal facilities -100-yr floodplain	Hazardous waste treatment, storage, or disposal facilities located in a 100-yr floodplain must be designed, constructed, operated and maintained to prevent washout of hazardous waste during a 100-year flood.	Not applicable or relevant and appropriate. A portion of the Site is within the 100-year floodplain.; however, no hazardous waste treatment, storage, or disposal facilities are planned to be located on Site.	No	No
	40 CFR Part 264.18(b) - Location Standards - Floodplains	Hazardous waste treatment, storage, or disposal facilities located in a 100-yr floodplain must be designed, constructed, operated and maintained to prevent washout of hazardous waste during a 100-year flood.	Not applicable or relevant and appropriate. A portion of the Site is within the 100-year floodplain; however, no hazardous waste treatment, storage, or disposal facilities are planned to be located on Site.	No	No
	Executive Order 11988 - Floodplain Management	USEPA is required to conduct activities to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupation or modification of floodplains. The procedures also require USEPA to avoid direct or indirect support of floodplain development wherever there are practicable alternatives and minimize potential harm to floodplains when there are no practicable alternatives.	Potentially applicable or relevant. Portions of the Site are located within the 100-year floodplain.	Yes	No
Floodplains (Cont.)	Executive Order 13690 - Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input	Executive order establishes a Federal Flood Risk Management Standard (FFRMS), a Process for Further Soliciting and Considering Stakeholder Input, and amends Executive Order 11988. The FFRMS establishes a construction standard and framework for Federally funded projects constructed in, and affecting, floodplains, to reduce the risks and cost of floods. Under the FFRMS, federal agency management is expanded from the current base flood level to a higher vertical elevation and corresponding horizontal floodplain to address current and future flood risk to increase resiliency of projects funded with federal funds. The Executive Order also sets forth a process for solicitation and consideration of public input, prior to implementation of the FFRMS.	Potentially applicable or relevant. A portion of the Site is within the 100-year floodplain.	Yes	No
	6 NYCRR 500 - Floodplain Management Regulations Development Permits	Promulgated state regulations providing permit requirements for development in areas of special flood hazard (floodplain within a community subject to a one percent or greater chance of flooding in any given year).	Potentially applicable or relevant and appropriate since a portion of the Site is within the 100-year floodplain.	No	No
	Town of Geddes Flood Protection Ordinance	Permit requirements for work in areas of special flood hazard.	Potentially applicable or relevant and appropriate since a portion of the Site is within the 100-year floodplain.	No	No
Within 61 Meters (200 feet) of a Fault Displaced in Holocene Time	40 CFR Part 264.18(a) - Location Standards - Seismic considerations	New treatment, storage, or disposal of hazardous waste is not allowed.	Not applicable or relevant and appropriate. Site is not located within 200 feet of a fault displaced in Holocene time, as listed in 40 CFR 264 Appendix VI. None listed in New York State.	No	No
Within Salt Dome or Bed Formation, Underground Mine, or Cave	40 CFR Part 264.18 (c) - Location standards; salt dome formations, salt bed formations, underground mines and caves.	Placement of non-containerized or bulk liquid hazardous waste is not allowed.	Not applicable or relevant and appropriate. No salt dome formations, salt bed formations, underground mines or caves present at Site.	No	No
Habitat of an Endangered or Threatened Species	6 NYCRR 182	Promulgated state regulation that provides requirements to minimize damage to habitat of an endangered species.	Not applicable or relevant and appropriate. No endangered or threatened wildlife species, rare plants or significant habitats were identified at the site. One threatened plant within 2 miles of Site on north shore of Onondaga Lake not anticipated to be impacted by Site activities.	No	No
	Endangered Species Act	Provides a means for conserving various species of fish, wildlife, and plants that are threatened with extinction.		No	No
	50 CFR Part 17 - Endangered and Threatened Wildlife and Plants and 50 CFR Part 402 - Interagency Cooperation	Promulgated federal regulation that requires that federal agencies ensure authorized, funded, or executed actions will not destroy or have adverse modification of critical habitat.		No	No

TABLE 13. POTENTIALLY APPLICABLE OR RELEVANT AND APPROPRITE REQUIREMENTS (ARARS) AND TO BE CONSIDERED (TBC) MATERIALS

Medium Location/Action	Citation	Requirements	Comments	Potential ARAR	Potential TBC
Historical Property or District	National Historic Preservation Act 36 CFR 800- Preservation of Historic Properties Owned by a Federal Agency	Remedial actions are required to account for the effects of remedial activities on any historic properties included on or eligible for inclusion on the National Register of Historic Places.	Potentially applicable. A draft Phase 1 assessment identified the potential for prehistoric and historic resources in and in the vicinity of the Site.	Yes	No
	National Historic Preservation Act 36 CFR Part 65 - National Historic Landmarks Program	Promulgated federal regulation requiring that actions must be taken to preserve and recover historical/archeological artifacts found.		Yes	No
	New York State Historic Preservation Act of 1980 9 NYCRR Parts 426 - 428	State law and regulations requiring the protection of historic, architectural, archeological and cultural property.		Yes	No
Wilderness Area	Wilderness Act 50 CFR Part 35 - Wilderness Preservation and Management	Provides for protection of federally-owned designated wilderness areas.	Not applicable or relevant and appropriate. Site not located in wilderness area.	No	No
Wild, Scenic, or Recreational River	Wild and Scenic Rivers Act	Provides for protection of areas specified as wild, scenic, or recreational.	Not applicable or relevant and appropriate. Site not located near wild, scenic or recreational river.	No	No
Coastal Zone	Coastal Zone Management Act	Requires activities be conducted consistent with approved State management programs.	Not applicable or relevant and appropriate. Site not located in coastal zone.	No	No
Coastal Barrier	Coastal Barrier Resources Act	Prohibits any new Federal expenditure within the Coastal Barrier Resource System.	Not applicable or relevant and appropriate. Site not located in coastal barrier.	No	No
Protection of Waters	33 U.S.C. 1341 - Clean Water Act Section 401, State Water Quality Certification Program	States have the authority to veto or place conditions on federally permitted activities that may result in water pollution.	Potentially applicable to Site.	Yes	Yes
Potential Action-Specific ARARs and TBCs					
Institutional Controls	NYSDEC DER-33 Institutional Controls: A Guide to Drafting and Recording Institutional Controls, December 2010	Technical guidance document that provides guidelines for proper development and recording of institutional controls as part of a site remedial program.	Potentially applicable TBC when institutional controls are implemented as a component of the selected remedy.	No	Yes
Cover Systems	NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, May 2010	Technical guidance document that provides guidelines for cover thicknesses as they relate to property use in areas where exposed surface soil exceeds NYCRR Part 375 SCOs. Specifically, where the exposed surface soil at the site exceeds the applicable soil cleanup objective for protection of human health and/or ecological resources, the soil cover for restricted residential use, is to be two feet; for commercial or industrial use, is to be one foot; or when an ecological resource has been identified is to be a minimum of two feet; and when such a concern is identified by NYSDEC, consideration should be given to supplementing the demarcation layer to serve as an impediment to burrowing.	Potentially applicable TBC for cover alternatives.	No	Yes
	RCRA Subtitle D, 40 CFR Part 358.60 – Closure Criteria	Regulations established under Subtitle D set federal closure requirements including installation of a final cover system that is designed to minimize infiltration and erosion, for owners and operators of municipal solid waste landfill units.	Potentially relevant and appropriate. Due to the presence of soil/fill Material deposited at portions of the Site, it is being considered a Waste Management Area for which closure criteria for final cover systems may be relevant.	Yes	No
Landfill	40 CFR Part 257 - Criteria for Classification of Solid Waste Disposal Facilities and Practices	Promulgated federal regulation that provides criteria for solid waste disposal facilities to protect health and the environment.	Landfilling of wastes may be applicable for the Site. Potentially applicable for treatment residuals or soil/fill material consolidated on-Site in a containment unit.	Yes	No

TABLE 13. POTENTIALLY APPLICABLE OR RELEVANT AND APPROPRITE REQUIREMENTS (ARARS) AND TO BE CONSIDERED (TBC) MATERIALS

Medium Location/Action	Citation	Requirements	Comments	Potential ARAR	Potential TBC
	40 CFR Parts 264 and 265, Subpart N – Landfills	Promulgated federal regulation that provides requirements for hazardous waste landfill units.		Yes	No
Principal Threat and Low Level Threat Waste	A Guide to Principal Threat and Low Level Threat Wastes – Quick Reference Fact Sheet (OSWER Superfund Publication 9380.3-06FS, November 1991)	Guidance that outlines federal expectations, definitions, and documentation requirements related to waste considered principal or low level threat waste.	Potentially applicable TBC.	No	Yes
Generation and Management of Solid Waste	6 NYCRR 360 - Solid Waste Management Facilities	Promulgated state regulation that provides requirements for management of solid wastes, including disposal and closure of disposal facilities.	Potentially applicable to alternatives including disposal of residuals generated by treatment processes.	Yes	No
Land Disposal	6 NYCRR 376 - Land Disposal Restrictions	Promulgated federal and state regulations that provide treatment standards to be met prior to land disposal of hazardous wastes.	Potentially applicable to residuals generated by treatment processes if found to be hazardous wastes and disposed at a landfill. Applicable for off-site treatment and disposal of soil/fill material.	Yes	No
	40 CFR Part 268 - Land Disposal Restrictions				
	62 CFR 25997 - Phase IV Supplemental Proposal on Land Disposal of Mineral Processing Wastes				
Green Remediation	NYSDEC DER-31 Green Remediation Program Policy, January 2011	State and federal technical guidance documents that provide guidelines for the development of site remediation strategies in a manner that minimizes environmental impacts and applies green remediation concepts (e.*g.*, reduction in greenhouse gas emissions, energy consumption and resource use, promotion of recycling of materials and conservations of water, land and habitat).	Potentially applicable TBC.	No	Yes
	Superfund Green Remediation Strategy, September 2010				
General Excavation	6 NYCRR 200-203, 211-212 - Prevention and Control of Air Contamination and Air Pollution	Provides requirements for air emission sources.	Portions potentially applicable to volatile emissions during excavation	Yes	No
	6 NYCRR 257 - Air Quality Standards	Promulgated state regulation that provides specific limits on generation of SO_2, particulates, CO_2, photochemical oxidants, hydrocarbons (non-methane), NO_2, fluorides, beryllium and H2S from point sources.	Not applicable or relevant and appropriate. Dust emissions would not be generated from a point source. Potential TBC during dust generating activities such as earth moving, grading and excavation.	No	Yes
	40 CFR Part 50.1 - 50.12 - National Ambient Air Quality Standards	Promulgated federal regulation that provides air quality standards for pollutants considered harmful to public health and the environment. The six principle pollutants are carbon monoxide, lead, nitrogen dioxide, particulates, ozone, and sulfur oxides.	Potentially applicable to alternatives during which dust generation may result, such as during earth moving, grading, and excavation.	Yes	No
	NYS TAGM 4031 - Dust Suppressing and Particle Monitoring at Inactive Hazardous Waste Disposal Sites	State guidance document that provides limitations on dust emissions.	To be considered material where more stringent than air-related ARARs.	No	Yes
Potential Action-Specific ARARs and TBCs (Cont'd)					
Transportation	6 NYCRR 364 - Waste Transporter Permits	Promulgated state regulation requiring that hazardous waste transport must be conducted by a hauler permitted under 6 NYCRR 364.	Potentially applicable for off-site transport of hazardous waste.	Yes	No

TABLE 13. POTENTIALLY APPLICABLE OR RELEVANT AND APPROPRITE REQUIREMENTS (ARARS) AND TO BE CONSIDERED (TBC) MATERIALS

Medium Location/Action	Citation	Requirements	Comments	Potential ARAR	Potential TBC
	49 CFR 107, 171-174 and 177-179 - Department of Transportation Regulations	Promulgated federal regulation requiring that hazardous waste transport to off-site disposal facilities must be conducted in accordance with applicable Department of Transportation requirements	Potentially applicable for off-site transport of hazardous waste to off-site treatment/disposal facilities.	Yes	No

Notes:

ARARs - Applicable or Relevant and Appropriate Requirements

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act

CFR - Code of Federal Regulations

DER - Division of Environmental Remediation

FS - Feasibility Study

NYCRR - New York Code of Rules and Regulations

NYS - New York State

NYSDEC - New York State Department of Environmental Conservation

NYSDOH - New York State Department of Health

OSWER - Office of Solid Waste and Emergency Response

RCRA – Resource Conservation and Recovery Act

SCOs - Soil Cleanup Objectives

TAGM - Technical and Administrative Guidance Memorandum (NYSDEC)

TBC - To be Considered

TOGS – Technical and Operational Guidance Series

USC - United States Code

USEPA or EPA - United States Environmental Protection Agency

Shaded cells - not identified as Potential ARARs or TBCs

COST ESTIMATE SUMMARY

TABLE 14. ALTERNATIVE 5 COST ESTIMATE

Site: Honeywell Willis Avenue
Location: Geddes, NY
Phase: Feasibility Phase (+50% / -25%)
Base Year: 2017

Conceptual Basis: 1-ft vegetated cover over Main Plant, Lakeshore Property, PSA and CHSA
Vertical Barrier Cell with Low perm Layers added to Veg Cover
Targeted ISS of shallow mercury impacted fill
Continuation of DNAPL and GW collection systems

ITEM	UNIT	ESTIMATED QUANTITY	ESTIMATED UNIT COST	ESTIMATED COST	NOTES
Direct Capital Costs					
General Conditions	WK	32	$18,000	$574,616	Trailer, fuel, small tools, consumables and safety
Mercury Related Health and Safety	WK	2	$5,000	$10,000	
Air Monitoring	WK	32	$4,250	$135,673	
Surveys	WK	32	$3,000	$95,769	During capping
Irrigation	WK	6	$5,000	$30,000	Following seeding
Environmental Easement	LS	1	$30,000	$30,000	
Site Management Plan	LS	1	$50,000	$50,000	
Pre-Design Investigation					
DNAPL delineation - North Plant	LS	1	$100,000	$100,000	3 observation wells and 10 probes
DNAPL delineation - CHSA	LS	1	$60,000	$60,000	2 observation wells and 5 probes
Site Preparation					
Clearing and Grubbing	AC	20.4	$3,000	$61,170	
Rough Grading	AC	20.4	$1,100	$22,429	Site grading and prep exclusive of soil piles
QA/QC					
Materials QA/QC Testing - Topsoil	EA	34	$500	$17,013	1/500 cy of imported materials
Materials QA/QC Testing - Fill and Stone	EA	34	$400	$13,610	1/500 cy of imported materials
Performance QA/QC - Compaction	WK	32	$1,700	$54,269	
Vertical Barrier Cell at MCB					
Remove Remaining Slab/Foundation	CY	267	$15	$4,000	20-ft width along sheeting alignment
T&D by Truck - C&D	TON	770	$55	$42,350	Fill at 1.5 ton/cy, concrete at 2.0 ton/cy
Install sheetpiling	SF	22,400	$40	$896,000	550 LF steel sheetpiling with grout; assume 40-ft total vertical length.
Install Monitoring Well	EA	10	$5,000	$50,000	5 Shallow and 5 Intermediate downgradient to vertical barrier
Targeted Elemental Mercury *In situ* Treatment					
Soil Mixing mobilization	LS	1	$100,000	$100,000	
Excavate to expose trenches	CY	225	$15	$3,375	stage and backfill with trench spoils following ISS
Reagent Addition and Mixing	CY	225	$125	$28,125	Soil mixing within trenches via excavator assumes sulfur reagent and portland addition
Verification Testing	EA	1	$700	$788	One per 200 cy; permeability, TCLP and total mercury
Vegetative Soil Cover, 1-ft - Willis Plant Area (including Lakeshore Property)					
Erosion and Sediment Control	LF	13,924	$4.00	$55,696	Reinforced silt fence; one replacement
Temporary cover crop for erosion control	AC	14	$3,600	$50,400	Willis Plant site only
Place Topsoil to 6-inch depth	CY	14,036	$58	$814,088	Placement by conventional equipment in 6-inch lifts
Place Imported Fill to 6-inch depth	CY	14,036	$43	$603,548	Placement by conventional equipment in 6-inch lifts
Low-Perm Layers over MCB area	SF	25,200	$2	$56,700	install LLDPE, geotextile and geocushion to 10-ft beyond limits of vertical barrier cell
Demarcation layer	AC	16.7	$8,300	$138,610	single layer non-woven geotextile below cap
Final seeding	AC	16.7	$18,000	$300,600	Modified old field successional with fertilizer and hydromulch

COST ESTIMATE SUMMARY

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Vertical Barrier Cell with Low perm Layers added to Veg Cover
Targeted ISS of shallow mercury impacted fill
Continuation of DNAPL and GW collection systems

ITEM	UNIT	ESTIMATED QUANTITY	ESTIMATED UNIT COST	ESTIMATED COST		NOTES
Vegetative Soil Cover, 1-ft - PSA						
Erosion and Sediment Control	LF	2,992	$4.00	$11,968		Reinforced silt fence; one replacement
Place Topsoil to 6-inch depth	CY	1,428	$58	$82,812		Placement by conventional equipment in 6-inch lifts
Place Imported Fill to 6-inch depth	CY	1,428	$43	$61,395		Placement by conventional equipment in 6-inch lifts
Demarcation layer	AC	1.8	$8,300	$14,691		single layer geotextile below cap
Final seeding	AC	1.8	$18,000	$31,860		Modified old field successional with fertilizer and hydromulch
Vegetative Soil Cover, 1-ft - CHSA						
Erosion and Sediment Control	LF	5,870	$4.00	$23,480		Reinforced silt fence; one replacement
Excavation of Soil/Fill Material	CY	3,098	$9.75	$30,202		Removal by conventional excavation to 1-ft bgs to maintain adjacent site grade
Transportation to Main Plant Site	CY	3,098	$16	$49,562		
Grading	CY	3,098	$3.85	$11,926		Grading at Willis Plant prior to cap placement
Place Topsoil to 6-inch depth	CY	1,549	$58	$89,830		Placement by conventional equipment in 6-inch lifts
Place Imported Fill to 6-inch depth	CY	1,549	$43	$66,598		Placement by conventional equipment in 6-inch lifts
Demarcation layer	AC	1.9	$8,300	$15,936		single layer geotextile below cap
Final seeding	AC	1.9	$18,000	$34,560		Modified old field successional with fertilizer and hydromulch
				SUBTOTAL (rounded):	**$4,920,000**	
				TOTAL ESTIMATED DIRECT CAPITAL COST (rounded):	**$4,920,000**	
				ENGINEERING/MANAGMENT, CONSTRUCTION OVERSIGHT, OBG OH&P	**$934,800**	6%, 8%, and 5% respectively
				CONTINGENCY (30%)	**$1,476,000**	Scope Contingency
				TOTAL ESTIMATED CAPITAL COST (rounded):	**$7,300,000**	
Operation and Maintenance Costs						
Annual						
Reporting and Recordkeeping	EA	1	$20,000	$20,000		
Cover inspection	LS	1	$12,480	$12,480		Assumes 2 scientists/engineers, 4 days, 8 hours/day, semi-annual inspections
Cap Maintenance						
Vegetation Maintenance	AC	2	$3,000	$6,000		Spot seeding; 10% of all areas annually
Soil Cover maintenance and incidental repairs	AC	2	$225	$450		Topsoil repair, 5 cy per acre annually
Groundwater Monitoring - Mercury Cell Area						
Monitoring Event	LS	1	$3,720	$3,720		Each of 6 wells, once annually for mercury in groundwater
DNAPL Recovery System						
Routine maintenance - Labor	LS	1	$17,250	$17,250		Building and grounds maintenance, minor repairs, inspections
Maintenance - parts	LS	1	$10,500	$10,500		Pump, compressor and major system repairs
Electrical Power	LS	1	$1,200	$1,200		Panel and air compressor
T&D for DNAPL	EA	8	$5,000	$40,000		1,000 gallons each event inc. fuel and fees
DNAPL Delineation Wells - Collection and Disposal						
DNAPL Recovery from wells	LS	1	$40,000	$40,000		Assumes 2 scientists/engineers, 4 hours each weekly
T&D for DNAPL	EA	4	$2,500	$10,000		10 gallons per week; disposed quarterly inc. fuel and fees

COST ESTIMATE SUMMARY

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Site: Honeywell Willis Avenue
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ITEM	UNIT	ESTIMATED QUANTITY	ESTIMATED UNIT COST	ESTIMATED COST	NOTES
Lakeshore Collection System - Willis Wall					
Routine maintenance - Labor	LS	1	$17,250	$17,250	Grounds maintenance, acid addition, value cleaning, well lancing
Maintenance - parts	LS	1	$8,000	$8,000	Pump, compressor and major system repairs
Electrical Power	LS	1	$2,600	$2,600	
Willis-Semet WWTP operation (incremental)	gal	16,819,200	0.0064	$106,955	Based on 32 gpm for Willis Wall portion of Willis/Semet Hydraulic Containment System
PA Sewer Operation and Maintenance					
Routine maintenance - Labor	LS	1	$15,800	$15,800	Building and generator maintenance, inspection
Maintenance - parts	LS	1	$5,600	$5,600	Pump and generator system repairs
Electrical Power	LS	1	$15,600	$15,600	
Backup generator fuel	LS	1	$3,000	$3,000	
I-690 Sewer					
Inspect and Repair	LS	1	$60,000	$60,000	CCTV inspection and repair of two locations by CIPP
Years 5, 10, 15, 20, 25, 30					
Five Year Review	EA	1	$15,000	$15,000	

Present Worth Analysis Years (1-30)		Discount Factor	**Present Worth ($)**	
Cost Type	Cost	Df=7	**(rounded)**	
Capital Cost - Year 0	$7,300,000	1.00	**$7,300,000**	
Annual O&M - Years 1-30	$396,405	0.41	**$4,919,000**	Average discount factor for years 1-30
Periodic O&M - Years 5, 10, 15, 20, 25, 30	$15,000	0.36	**$32,000**	Average discount factor for years 5, 10, 15, 20, 25 and 30

TOTAL PRESENT WORTH ESTIMATED ALTERNATIVE COST (rounded): VE COST (rounded): $12,251,000

ALLIED CHEMICAL – WILLIS AVENUE SUBSITE
OF THE ONONDAGA LAKE SUPERFUND SITE
RECORD OF DECISION

APPENDIX III

ADMINISTRATIVE RECORD INDEX

Administrative Record Index
Allied Chemical – Willis Avenue Site

(New York State Inactive Hazardous Waste Disposal Site #7-34-026)

RI/FS Activities	Documents
Pre-Remedial Investigation Information	History of the Willis Avenue Plant, Petroleum Storage Facility and Associated "Hot-Spots" (November 1989) Citizen Participation Plan for the Onondaga Lake National Priority List Site (January 1996)
Remedial Investigation/Feasibility Study Work Plans	Work Plan, Remedial Investigation/Feasibility Study: Willis Avenue Plant, Petroleum Storage Facility and Associated "Hot-Spots, Geddes, New York (1990) Willis Avenue Chlorobenzene Site Supplemental Remedial Investigation/Feasibility Study, Geddes, New York (August 1997)
Remedial Investigation Reports	Willis Avenue Chlorobenzene Site Human Health Risk Assessment (July 2010) Willis Avenue Chlorobenzene Site Revised Baseline Ecological Risk Assessment Geddes, New York (April 2013) Remedial Investigation for the Willis Avenue Chlorobenzene Site, Geddes, New York (March 2014, revised September 2014)
Feasibility Study Report	Willis Avenue Site Feasibility Study Report (July 2019)
Documents Related to IRM Activities	DNAPL Recovery System Modifications Work Plan (May 2002) Interim Remedial Measure Construction Completion Report. Willis Avenue Portion Willis Avenue Semet Tar Beds Site IRM (February 2012) Phase 1 DNAPL Recovery System Modifications Construction Completion Report (December 2012)

	Ballfield/Willis/Semet Berm and I-690 Underdrain Construction Completion Report (April 2014) East Flume Interim Remedial Measure Construction Completion Report (August 2014) DNAPL Recovery System Phase 2 Modifications (August 2018)
Management of Staged Soil Piles	May 7, 2019 Letter from Stephen Miller to Tracy Smith; RE: Semet Residue Ponds Site Materials Use Request, Site #734008 May 28, 2019 Letter from Tracy Smith to Stephen Miller, RE: Semet Residue Ponds Site Materials Use Request, Site #734008
Proposed Plan Released Start of Public Comment Period	Notice of Public Meeting and Opportunity to Comment (July 21, 2019) Proposed Plan and Listserv Notice (July 22, 2019)
Public Meetings Held	Documentation and Transcript of August 6, 2019 Public Meeting (Attached to the Record of Decision as Appendix V-d) Written Comments on Proposed Plan (Attached to the Record of Decision as Appendix V-e)
Records of Decision Issued	Semet Residue Ponds Operable Unit 1 Record of Decision and Responses to Comments (Responsiveness Summary) (March 2002) Semet Residue Ponds Operable Unit 2 Record of Decision and Responses to Comments (Responsiveness Summary) (March 2019) Willis Avenue Record of Decision and Responses to Comments (Responsiveness Summary) (September 2019)
Enforcement Documents	RI/FS Consent Order for the Allied Chemical Willis Avenue Site (August 1990) IRM Consent Order - DNAPL Recovery Wells (1992) IRM Consent Order - I-690 Stormwater Drainage (November 1996)

	IRM Consent Order – Willis/Semet IRM, East Flume IRM (April 2002)

ALLIED CHEMICAL – WILLIS AVENUE SUBSITE
OF THE ONONDAGA LAKE SUPERFUND SITE
RECORD OF DECISION

APPENDIX IV

NEW YORK STATE DEPARTMENT OF HEALTH LETTER OF CONCURRENCE

NEW YORK STATE OF OPPORTUNITY. Department of Health

ANDREW M. CUOMO
Governor

HOWARD A. ZUCKER, M.D., J.D.
Commissioner

SALLY DRESLIN, M.S., R.N.
Executive Deputy Commissioner

July 19, 2019

Michael Ryan, Director
Division of Environmental Remediation
NYS Dept. of Environmental Conservation
625 Broadway
Albany, NY 12233

Re:
Proposed Plan
Allied Chemical - Willis Avenue
Site #734026
Geddes, Onondaga County

Dear Mr. Ryan,

At your Department's request, we have reviewed the US EPA's July 2019 *Proposed Plan* for the referenced site to determine whether the remedy is protective of public health. The Allied Chemical - Willis Avenue site is a subsite of the Onondaga Lake Superfund Site. I understand that human exposures to contamination associated with this site will be addressed by the remedy as follows:

- Soil: The remedy would include 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. A site cover system would be required to allow for commercial use of the site in accordance with 6 NYCRR Part 375. Recoverable DNAPL that is identified would be removed for off-site disposal. If no recoverable DNAPL is encountered, *in-situ* treatment 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. Future excavations at the site would be conducted in accordance with an approved excavation plan to properly manage human exposures to remaining contaminated soil.

- Groundwater: Use of groundwater at the site, without approved water quality treatment, will be restricted by an environmental easement placed on the site. A vertical barrier hydraulic containment system would be installed to isolate contaminated shallow and intermediate groundwater in the vicinity of the Former Mercury Cell Building. The shallow and intermediate groundwater outside of the lakeshore barrier walls would be restored through natural attenuation.

- Soil Vapor: A soil vapor intrusion evaluation will be completed, and appropriate actions implemented, for any buildings developed on the site.

Periodic reviews will be completed to certify that these elements of the remedy are in place and remain effective. Based on this information, and with the understanding that protections will be in place during the remediation to prevent the community from being exposed to site-related contaminants and particulates, I believe the proposal is protective of public health and concur with the remedial plan. If you have any questions, please contact Ms. Maureen Schuck at (518) 402-7860.

Sincerely,

FOR

Christine N. Vooris, P.E., Director
Bureau of Environmental Exposure Investigation

ec: E. Lewis-Michl / K. Malone / M. Schuck / M. Sergott / e-File
J. Strepelis - NYSDOH CRO
L. Letteney - OCHD
S. Edwards / D. Hesler / T. Smith - NYSDEC Central Office
H. Warner - NYSDEC Region 7

ALLIED CHEMICAL – WILLIS AVENUE SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE RECORD OF DECISION

APPENDIX V

RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY
FOR THE
RECORD OF DECISION
ALLIED CHEMICAL – WILLIS AVENUE
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
TOWN OF GEDDES, ONONDAGA COUNTY, NEW YORK

INTRODUCTION

This Responsiveness Summary provides a summary of the public's comments and concerns received during the public comment period related to the Allied Chemical – Willis Avenue Subsite (Subsite) of the Onondaga Lake Superfund site Proposed Plan and provides the New York State Department of Environmental Conservation (NYSDEC) and U.S. Environmental Protection Agency's (EPA's) responses to those comments and concerns. All comments summarized in this document have been considered in NYSDEC and EPA's final decision in the selection of a remedy to address the contamination at the Subsite.

SUMMARY OF COMMUNITY RELATIONS ACTIVITIES

Honeywell International, Inc., (Honeywell), under NYSDEC's oversight, conducted field investigations at the Subsite from 1990 through 2014, which culminated in the completion of a remedial investigation (RI)[1] report in September 2014 and a feasibility study (FS)[2] report in July 2019. NYSDEC and EPA's preferred remedy for the Subsite and the basis for that preference were identified in a Proposed Plan.[3] The RI/FS reports and Proposed Plan were released to the public for comment on July 21, 2019. These documents were made available to the public on NYSDEC's website, http://www.dec.ny.gov/chemical/37558.html, or at information repositories maintained at the Solvay Library, 615 Woods Road, Solvay, New York; Onondaga County Public Library, 447 South Salina Street, Syracuse, New York; Atlantic States Legal Foundation, 658 West Onondaga Street, Syracuse, New York; NYSDEC, Division of Environmental Remediation, 625 Broadway, Albany, New York and NYSDEC Region 7, 615 Erie Boulevard West, Syracuse, New York. A NYSDEC listserv bulletin notifying the public of the availability for the above-referenced documents, the comment period commencement and completion dates, and the date of the planned public meeting was issued on July 22, 2019. A notice providing the same information was published in *The Syracuse Post-Standard* on July 21, 2019. The public comment period ended on August 21, 2019.

[1] The RI determines the nature and extent of the contamination at a site and evaluates the associated human health and ecological risks.
[2] An FS identifies and evaluates remedial alternatives to address the contamination.
[3] A Proposed Plan describes the remedial alternatives considered for a site and identifies the preferred remedy with the rationale for this preference.

On August 6, 2019, NYSDEC conducted a public meeting at the Geddes Town Hall Court Room to inform local officials and interested citizens about the Superfund process, present the Proposed Plan for the Subsite, including the preferred remedy, and respond to questions and comments from the public. Two people, including residents and local government officials, attended the public meeting.

SUMMARY OF COMMENTS AND RESPONSES

Comments were received at the public meeting and in writing. Written comments were received from:

- Aaron McKeon, via a July 23, 2019 email
- Alma Lowry, Of Counsel, Law Office of Joseph J. Heath (submitted on behalf of the Onondaga Nation), via an August 21, 2019 letter

The transcript from the public meeting can be found in Appendix V-d.

The written comments submitted during the public comment period can be found in Appendix V-e.

A summary of the comments provided at the public meeting and comments that were received from the public and the Onondaga Nation during the public comment period, as well as NYSDEC and EPA's responses to them, are provided below.

Schedule

Comment #1: A commenter asked about the schedule to begin the construction of the remedy.

Response #1: Following the issuance of the Record of Decision (ROD), negotiation of an Order on Consent between NYSDEC and Honeywell to perform the design and construction of the remedy will commence. It is anticipated that the design will take less than one year and construction will take one year.

Anticipated Future Use

Comment #2: A commenter asked about the anticipated future use of the Subsite after the construction of the remedy is complete.

Response #2: The current and reasonably anticipated future land uses for the Subsite are industrial and commercial (including passive recreation).[4] The anticipated future use

[4] Based on 6NYCRR Part 375 and NYSDEC's *Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation* (DER-10) passive recreation includes

of the Lakeshore Property (north of I-690) includes the 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 anticipated that the portions of the property south of I-690 will continue to be used for either industrial or commercial purposes.

Comment #3: A commenter asked if the remedy would affect the construction of the Onondaga County West Shore Trail Extension.

Response #3: It is not anticipated that the remedy will interfere with the trail construction. The trail construction in the Lakeshore Area (extending from the Semet Residue Ponds Subsite to Harbor Brook) is part of Honeywell's Natural Resource Damages settlement and it is anticipated that the construction will be coordinated with the trail construction.

Removal of Waste

Comment #4: A commenter opined that complete removal of contaminated materials at the Subsite should be performed rather than covering the wastes and leaving them in place.

Response #4: Alternative 7, which includes removal and off-site disposal of contaminated materials, would be much more difficult to implement, present significant short-term impacts to the community, and would be considerably more costly than constructing a soil cover. Placing a soil cover over contaminated materials is an appropriate method of preventing human and ecological exposure to contaminated materials.

Comment #5: A commenter indicated that the preferred remedy will relegate the site and its natural resources to a permanent contaminated state and that natural resources on and around the site will be prevented from returning to their rightful roles as part of a functioning, healthy, sustainable ecosystem and that for these reasons and to ensure long-term environmental and public health protection, all or most of the contaminated materials should be removed.

Response #5: The Subsite will be remediated in a manner that is protective of human health and the environment for the Subsite's intended use. The studies that were conducted and evaluations and decisions that were made relative to selecting the remedy were in accordance with state and federal laws, policies, and guidance. Also, see Response #4.

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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).

Comment #6: A commenter opined that the Proposed Plan evaluates a range of options to cover or immobilize wastes and leave them in place, but evaluates only one token removal option. In this case, Alternative 7 includes full removal of essentially all the contaminated soil on site, which requires removal and replacement of major roadways, sewer lines, and other infrastructure. None of the reviewed alternatives consider easily identifiable accommodations or exceptions to complete removal that would preserve these roads, sewers, or other infrastructure. As a result, waste removal is characterized as impossibly disruptive and expensive. A more nuanced alternative, which leaves soils that are underneath existing roadways or necessary to support major infrastructure on or around the site, should also be considered.

Response #6: As stated in the Proposed Plan, a partial removal alternative was not evaluated because groundwater collection and treatment and other remedial activities (*e.g.,* dense nonaqueous phase liquid (DNAPL) removal, potential cover systems) would still be necessary, negating any additional benefit from partial removal of the wastes. Also, see Response #4.

Comment #7: A commenter stated that given the timeframe until groundwater would meet the remedial action objectives and the elemental mercury and chlorobenzene DNAPL remaining on-site, the cumulative environmental and potentially economic benefits of a truly clean site to balance the up-front costs of removal, should be considered.

Response #7: Costs provided in the FS report and Proposed Plan include estimated capital, annual operation and maintenance (O&M), and total present-worth costs. The anticipated long-term O&M costs for the soil cover placement alternatives includes expenditures for cap maintenance, continued O&M of the groundwater collection and treatment systems, and inspections. The total present-worth cost of the selected remedy, which includes both upfront capital costs and O&M over a 30-year period, is approximately 1.7% that of the capital cost for the full removal under Alternative 7.

Groundwater

Comment #8: A commenter opined that the time periods of at least 43 years and, at most, 700 years, to reach acceptable contaminant levels for human or ecological exposure at the Point of Compliance (POC) are not reasonable and that remediation alternatives that ensure groundwater recovery within a much shorter time frame of at most 10 to 15 years should be considered.

Response #8: It was determined that the time periods are reasonable and protective of human health and the environment because groundwater is not being used by the public and a public water source is available. In addition, the Onondaga Lake Bottom cap (including the chemical isolation layer and amendment additions) was designed to be

effective for at least 1,000 years, which is greater than the time needed to achieve the groundwater standards for benzene, toluene, and chlorobenzene at the POC.

Honeywell's Capacity to Maintain Remedy

Comment #9: A commenter opined that the long-term success of the remedy depends on oversight for hundreds of years and that Honeywell and NYSDEC would need to remain active and engaged with the site for many times longer than either entity has been in existence.

Response #9: After a remedy is selected in a ROD, NYSDEC intends to negotiate an Order on Consent with Honeywell that would require the development of the design, implementation of the remedy, and long-term O&M and Site Management. Under NYSDEC's regulatory authority and an order, NYSDEC, as part of its continued oversight, may require, as warranted, that a remedial party post financial assurance. Additionally, Honeywell's successors and assigns will be bound by the terms of such an order.

***In-Situ* Treatment**

Comment #10: A commenter opined that the specific *in-situ* treatment that will be used for DNAPL or elemental mercury are not identified and that NYSDEC should not select a remedy until specific *in-situ* alternatives are identified and can be evaluated.

Response #10: Predesign investigations and/or treatability studies will be performed to determine the most appropriate means of addressing DNAPL and the elemental mercury associated with the floor trenches in the Former Mercury Cell Building.

***Ex Situ* Treatment of Elemental Mercury**

Comment #11: A commenter stated that *ex-situ* treatment options that would remove mercury from the soil rather than simply attempting to immobilize the mercury should be evaluated.

Response #11: The screening and evaluation of remedial technologies and the rationale for why technologies, which included *ex-situ* treatment, were removed or retained are discussed in the FS report. Relative to the *in-situ* treatment alternatives, the *ex-situ* alternatives are significantly costlier and would also increase potential impacts to workers and the community (*e.g.,* increased truck traffic/noise).

Soil washing of mercury-contaminated media had previously been a viable technology and was conducted at the nearby LCP Bridge Street Subsite in 2004 and 2005 as part of the remedy for that subsite. However, due to increased concerns about potential environmental impacts associated with the use of mercury in manufacturing, which has undermined the commercial market for mercury, and the enactment of the Mercury Export

Ban Act of 2008, there is currently a lack of viable remediation companies that have the expertise and experience needed to safely and effectively address mercury-contaminated media by soil washing. For this reason, an alternative which includes soil washing would be difficult to implement and, relative to other remedial options, may pose higher potential risks to workers conducting the cleanup. In addition to alternatives that include soil washing, alternatives that include thermal treatment were evaluated in the FS report.

Modifications to Cover as a Result of Change in Use

Comment #12: A commenter opined that the Proposed Plan does not give full consideration to the recreational uses on the Lakeshore Property that might be expected and provides no evidence that members of the public will not leave the trail to walk along the shoreline; picnic; birdwatch; fish; observe or collect rocks, leaves or flowers; search for bugs, frogs, snakes, or other wildlife; or simply view the lake from a closer vantage point.

Response #12: The reasonably-anticipated use of the Willis Lakeshore Property includes access roads and trails for passive recreational use as part of the Onondaga County West Shore Trail Extension and public access/use (*e.g.,* fishing) along the shoreline in this area. Except for picnicking, the examples provided regarding soil contact would be appropriate under a passive recreational use and a one-foot cover would be protective and prevent exposure to underlying contaminated soils. Much of the area along the lakeshore, particularly in the area where the Willis Avenue barrier wall was constructed along the shore of Onondaga Lake, already have multiple feet of clean cover material present. In addition, any changes at the Subsite would need to be compatible with the Site Management Plan, which will identify the use restrictions and engineering controls for the Subsite and document the steps and media-specific requirements necessary to ensure that the institutional and engineering controls remain in place and effective. As stated in the ROD, the extent, thickness, and permeability of the covers would be revisited during the design phase and/or during site management, if site uses change, as necessary. The environmental easement to be granted for the property will restrict the Subsite use to commercial/passive recreational, with a requirement that additional remediation must be performed prior to the implementation of a higher use (*e.g.,* active recreational).

Context for the Public

Comment #13: A commenter opined that the Proposed Plan does not provide the necessary context for the public to understand and evaluate the safety of the proposed remedy. For example, the environmental and public health significance of elemental mercury or chlorobenzene DNAPL was not discussed. DEC provides a list of contaminants that are present in different areas of the Subsite at levels above industrial or commercial use standards, but provides no information about how widespread those

contaminants are or how many samples exceeded applicable standards for each contaminant or by how much. The Proposed Plan includes human health risk assessments for “Current Conditions” and “Future Scenarios” but provides no information on the future conditions that were the basis for the “Future Scenarios” evaluation. The commenter opined that this information is necessary for the public to evaluate the seriousness of the threat posed by this Subsite and the adequacy of the proposed and preferred remedies. The commenter opined that NYSDEC should modify the remedy to address these omissions and reissue the Proposed Plan to ensure that the public has the proper context to evaluate and respond to the proposal.

Response #13: The purpose of the Proposed Plan is to describe the remedial alternatives considered for soil/fill material and shallow and intermediate groundwater at the Subsite and to identify the preferred remedial alternative with the rationale for this preference. A brief background of the Subsite and contaminants present are included and, as discussed in the Proposed Plan, much greater detail and additional information is available in the RI report and human health risk assessment. In addition, the Proposed Plan discusses how DNAPL and elemental mercury are a principal threat waste, which are materials considered to be highly toxic or highly mobile that would present a significant risk to human health or the environment should exposure occur. Also, tables included in the Proposed Plan indicate how many exceedances of the relevant soil cleanup objectives occurred in the various areas of the Subsite.

Monitored Natural Attenuation

Comment #14: A commenter asked if monitoring of natural attenuation in the groundwater is being performed.

Response #14: Monitoring of natural attenuation in the groundwater is not currently being performed. However, 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 the shallow and intermediate groundwater. Further evaluation of monitored natural attenuation will be conducted as part of the preliminary remedial design and/or as part of O&M.

Comment #15: A commenter asked what contaminants are naturally attenuating in groundwater within the Subsite boundaries.

Response #15: Within the Subsite boundaries, there is evidence of attenuation of organic constituents within shallow and intermediate groundwater. However, due to the presence of historical fill materials (*e.g.,* Solvay waste) deposited at the Subsite, it is not anticipated that groundwater standards, specifically related to Solvay waste (*e.g.,* chlorides) would be achievable. Also see Response #14.

Comment #16: A commenter asked what would happen if progress with natural attenuation was not observed during the monitoring.

Response #16: Natural attenuation will be evaluated as part of site management and the five-year review process performed by EPA. As noted in the ROD, active measures to address contaminated groundwater were considered during the FS screening evaluation. As a result of low permeability conditions, the potential for injection well fouling, and the variability of geochemical conditions, the ability to implement active measures would be limited within Onondaga Lake. As an example, groundwater upwelling velocity was a key variable in the design of the Lake Bottom cap. Implementing active measures, such as in-situ treatment or extracting contaminated groundwater using vertical or horizontal extraction wells installed under the Lake may mobilize groundwater and produce conditions different than those used for the Lake Bottom cap modeling and design. Given this, it is not anticipated that a contingency remedy could or should be implemented even if monitored natural attenuation was determined not to be progressing as anticipated because doing so could potentially compromise the effectiveness of the Lake Bottom cap. Nevertheless, if it is determined during the design or O&M period that natural attenuation is not occurring or not occurring within a reasonable timeframe, then active measures to address the shallow and intermediate groundwater outside the POC could be reconsidered. In the event that implementing active measures would still not be feasible without potentially adversely affecting the Lake Bottom remedy, then a technical impracticability waiver relating to the attainment of groundwater standards would need to be documented.

Differences Between Alternatives

Comment #17: A commenter asked what the main differences were between Alternative 4, engineered cover system with targeted shallow/intermediate groundwater hydraulic control at the former mercury cell building, and Alternative 5, engineered cover system with targeted shallow/intermediate groundwater hydraulic control and mercury hot spot treatment/removal at the former mercury cell building, are.

Response #17: Both alternatives include engineered cover systems and a vertical barrier hydraulic containment system in the vicinity of the former mercury cell building, but Alternative 5 also includes targeted treatment (*e.g., in-situ* solidification/stabilization) and/or removal/off-site disposal of soil/fill material associated with the floor trenches exhibiting free elemental mercury.

ALLIED CHEMICAL – WILLIS AVENUE SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE RECORD OF DECISION

APPENDIX V-a

JULY 2019 PROPOSED PLAN

Allied Chemical - Willis Avenue Site

Subsite of the Onondaga Lake Superfund Site

Geddes, Onondaga County, New York

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

July 2019

EPA 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

[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.

Willis Plant Area

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.

Chlorobenzene Hot-Spot Area

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.

Petroleum Storage Area

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.

Willis Plant Area and Lakeshore Property

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.

Chlorinated Hot-Spots Area

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.

Petroleum Storage Area

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

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.

"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.

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.

[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

[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?”.

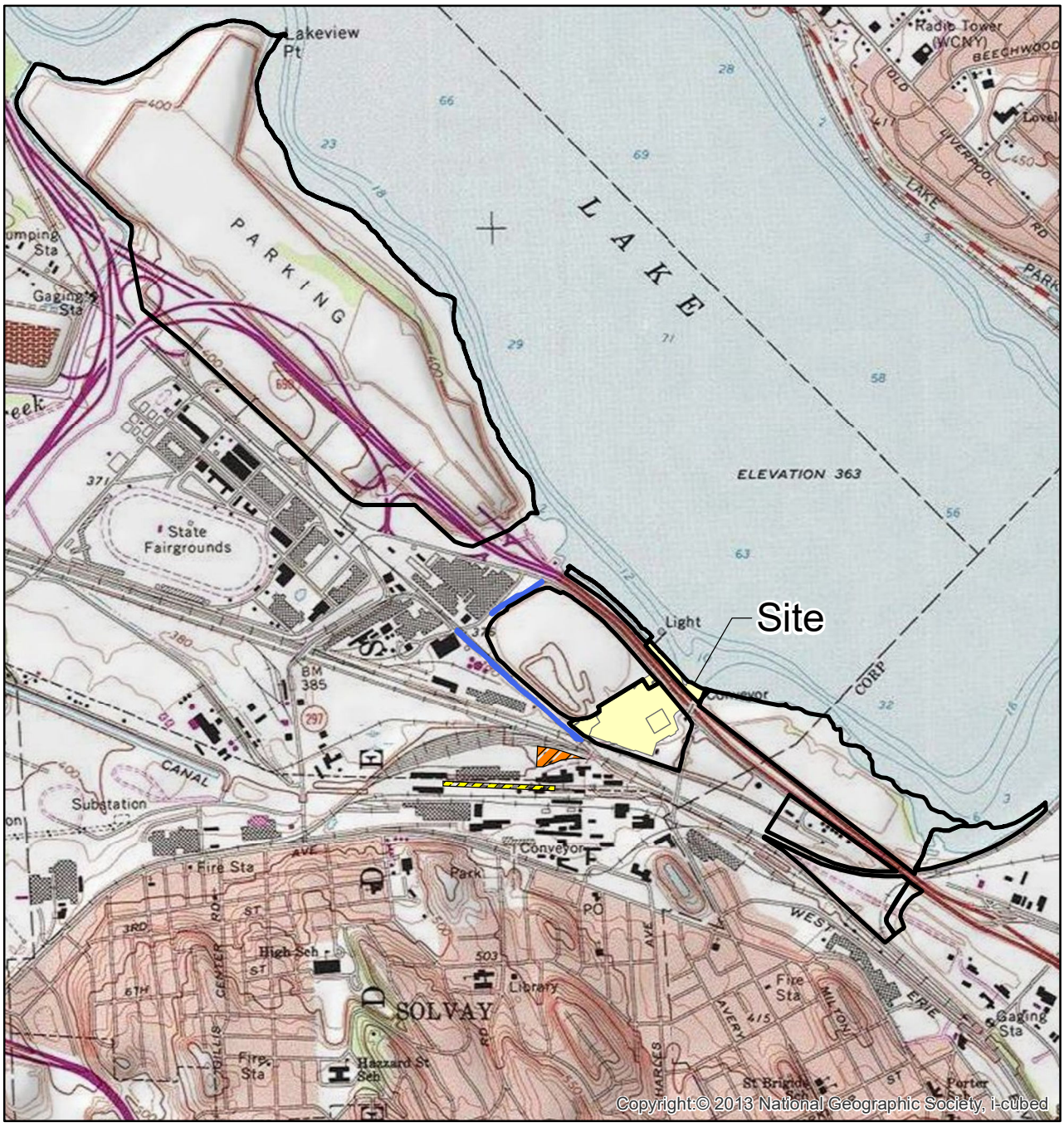
Table 11: Risks/Hazards Exceeding Threshold Levels Under Future Scenarios					
Exposure Area	**Population**	**Exposure Media**	**COCs**	**Cancer Risk**	**Noncancer Hazard**
Plant Area	Industrial Worker	Surface Soil	Mercury	NA	2
	Construction Worker	Upper Soil	Manganese, Mercury, Nickel	NA	30
	Utility Worker	Intermediate Soil, Intermediate Groundwater	Mercury	NA	5
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
	Industrial Worker	Surface Soil	Dioxins, Mercury	2E-04	9
	Construction Worker	Upper Soil	Dioxins, Chromium, Manganese, Mercury, Nickel	NA	50
	Utility Worker	Intermediate Soil	Dioxins, Mercury, PCBs	NA	30
Former Chlorination Building	Adolescent Trespasser	Surface Soil	Dioxins	4E-04	20
	Adult Trespasser	Surface Soil	Dioxins	7E-04	10
	Surveillance Worker	Surface Soil	Dioxins	5E-04	10
	Industrial Worker	Surface Soil	Dioxins	2E-03	30
	Construction Worker	Upper Soil	Dioxins, Manganese	8E-04	400
	Utility Worker	Intermediate Soil	Dioxins	7E-04	300
Southwest Off-Site/Outfall 006 Exposure Area	Adolescent Trespasser	Surface Soil	PCBs	NA	3
	Industrial Worker	Surface Soil	Mercury, PCBs	NA	4
	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

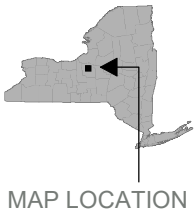
Notes

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?".

FIGURE 1



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

JULY 2019
1163.72600

O'BRIEN & GERE ENGINEERS, INC.

7/12/2019 10:04:13 AM

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PLOTDATE: 06/14/18 9:13:24 AM ROZWODBJ

FIGURE 2

ONONDAGA LAKE
ENGINEERED FLOODPLAIN
WESTERN STORM DRAIN SYSTEM
WILLIS BARRIER WALL
2009 RESTORATION AREA
WEST WALL
2010 RESTORATION AREA
SEMET BARRIER WALL
DNAPL COLLECTION SYSTEM STORAGE TANK
LIGHT WEIGHT FILL
EAST FLUME (REMOVED)
FORMER WEST FLUME
WILLIS LAKESHORE PROPERTY
84" INTAKE
72" INTAKE
GATE
I-690 WESTBOUND
I-690 EASTBOUND
STATE FAIR BLVD
OUTFALL 004
60" MAIN SEWER
TRIBUTARY 5A
DRAINAGE DITCH
NORTHWEST DITCH
SOIL PILE 1
WILLIS PLANT AREA
WILLIS AVENUE
10" CHLORINE WASTE WATER
SOIL PILE 2
WILLIS-SEMET GROUNDWATER TREATMENT PLANT
BALLFIELD SITE
SEMET RESIDUE PONDS SITE
POND 2
POND 1
POND 5
6" SARAN PIPE
FORMER MERCURY CELL BUILDING
CRUCIBLE SPECIALTY METALS
CSX RAILROAD
MOUNDED AREA
DRAINAGE DITCH
POND 3
POND 4
OUTFALL 006
42" RA SEWER
INDUSTRIAL DRIVE
FORMER CHURCH & DWIGHT FACILITY
TRIBUTARY 5A
CRUCIBLE SPECIALTY METALS
CRUCIBLE SPECIALTY METALS
CSX RAILROAD
36" DIA
GENERAL CHEMICAL
SOFT COAL STORAGE AREA
INDUSTRIAL DRIVE
FORMER SUEZ
ROCK TENN

THE BENZENE PIPELINE & CHLOROBENZENE RESIDUAL WASTE PIPELINE DEPICTED ARE APPROXIMATE LOCATIONS. THE LOCATIONS FOR THE PIPELINES ON THE WILLIS PLANT AREA ARE UNKNOWN. THESE PIPELINES WERE REMOVED DURING THE DEMOLITION OF THE PLANT AREAS. WHILE IN-PLACE, THE BENZENE PIPELINE WAS ON ELEVATED PIPE BRIDGES, AND THE CHLOROBENZENE PIPELINE WAS BOTH ON THE ELEVATED PIPE BRIDGE AND BURIED ALONG ITS PATH.

N

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

JULY 2019
1163.72600

O'BRIEN & GERE ENGINEERS, INC.

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

PLOTDATE: 06/14/18 9:18:02 AM ROZWODBJ

FIGURE 3

ONONDAGA LAKE
ENGINEERED FLOODPLAIN
2009 RESTORATION AREA
2010 RESTORATION AREA
EAST FLUME (REMOVED)
WILLIS LAKESHORE PROPERTY
GATE
SAMPLING STATION
I-690 WESTBOUND
I-690 EASTBOUND
STATE FAIR BLVD.
TRIBUTARY 5A
PARA PACKING / WAREHOUSE
PARA BLDG
WILLIS PLANT AREA
WILLIS AVENUE
CYLINDER TESTING & CLEANING
POTASH
CAUSTIC
ALLEN-MOORE CELL BLDG.
SHOP
BALLFIELD SITE
POND 2
POND 1
POND 5
POND 3
POND 4
SEMET RESIDUE PONDS SITE
BRINE PUMP
LIQUID CL
OFFICE / LAB
FORMER MERCURY CELL BUILDING
MERCURY CELL
FORMER PUMP HOUSE
CSX RAILROAD
CYLINDER TESTING & CLEANING
INDUSTRIAL DRIVE
CSX RAILROAD
TRIBUTARY 5A
MACHINE SHOP
LABORATORY
DETERGENT
TAR & TAR SHED
SNOW FLAKE
DRY KILN
BARREL SHED
COOPER SHOP
REFINED B.C.
BRINE RESERVOIR
BENZOL LOADING STATION
OIL TANKS
BENZOL
SPUR
PHENOL RECOVERY PLANT
STORE HOUSE
BENZOL TANKS
SODIUM NITRITE STORAGE WAREHOUSE
STORE HOUSE
POTASSIUM CARBONATE
BUTLER BLDG.
G.O. WAREHOUSE
RESEARCH LAB
COAL PILE
SOFT COAL STORAGE AREA
NORTH PUMPHOUSE
DENSE ASH
BOILER AND STRUCTURAL STEEL SHOPS
WASH & LOCKER
STORE
WAREHOUSE
CAR & PAINT
GARAGE
OFFICE
NORTH BOILER HOUSE
PACKAGE BOILER HOUSE
PHENOL PLANT
INDUSTRIAL DRIVE
MACHINE SHOP
ELECTRIC SHOP
OFFICE
ADMIN. BLDG
BRINE PURIFICATION
DRYER BLDG
BULK SODA STORAGE BLDG
DRYER
C.L. BLDG
ENGINE ROOM
DIST. BLDG
M.I.T.
S.I.K.
GAS HOLDER
BRINE STORAGE
PATROL BLDG
GAS HOUSE
BAG STORAGE BUILDING
FORMER MAIN PLANT SITE

N

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

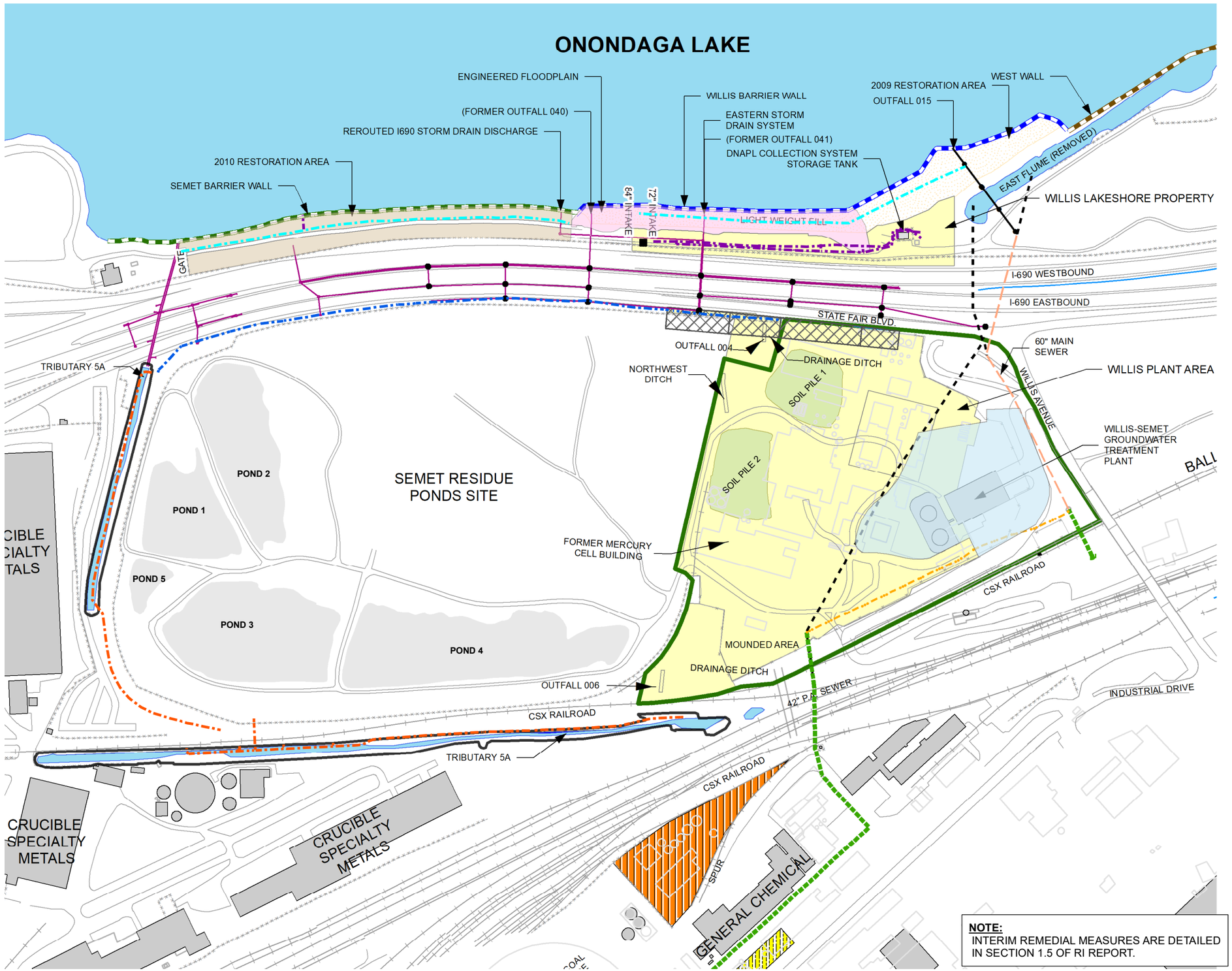
JULY 2019
1163.72600

O'BRIEN & GERE ENGINEERS, INC.

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

PLOTDATE: 06/14/18 12:00:38 PM ROZWODBJ

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

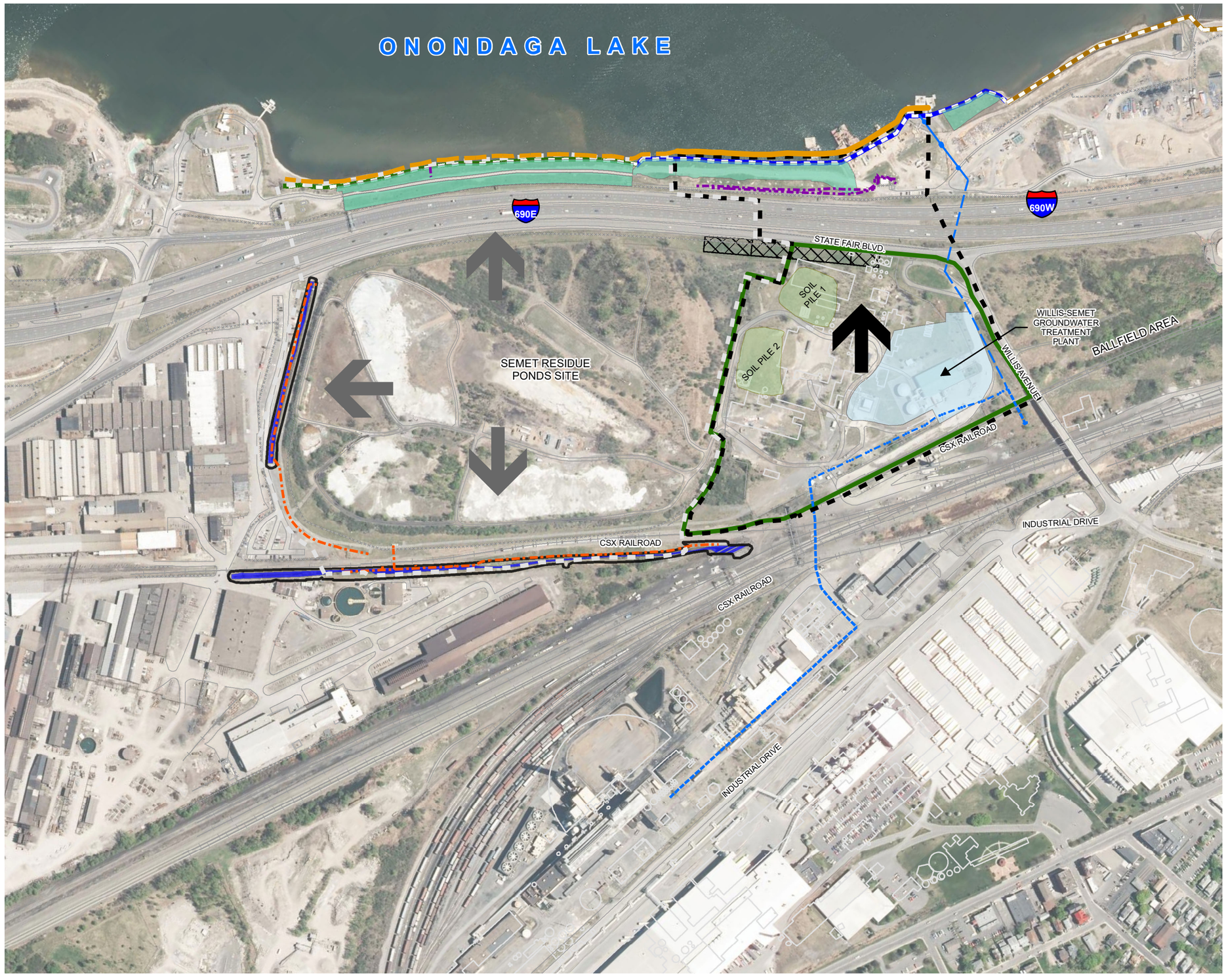
INTERIM REMEDIAL MEASURES AND REMEDIAL ACTIONS

0 150 300 600
Feet

JULY 2019
1163.72600

O'BRIEN & GERE ENGINEERS, INC.

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



N

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

JULY 2019
1163.72600

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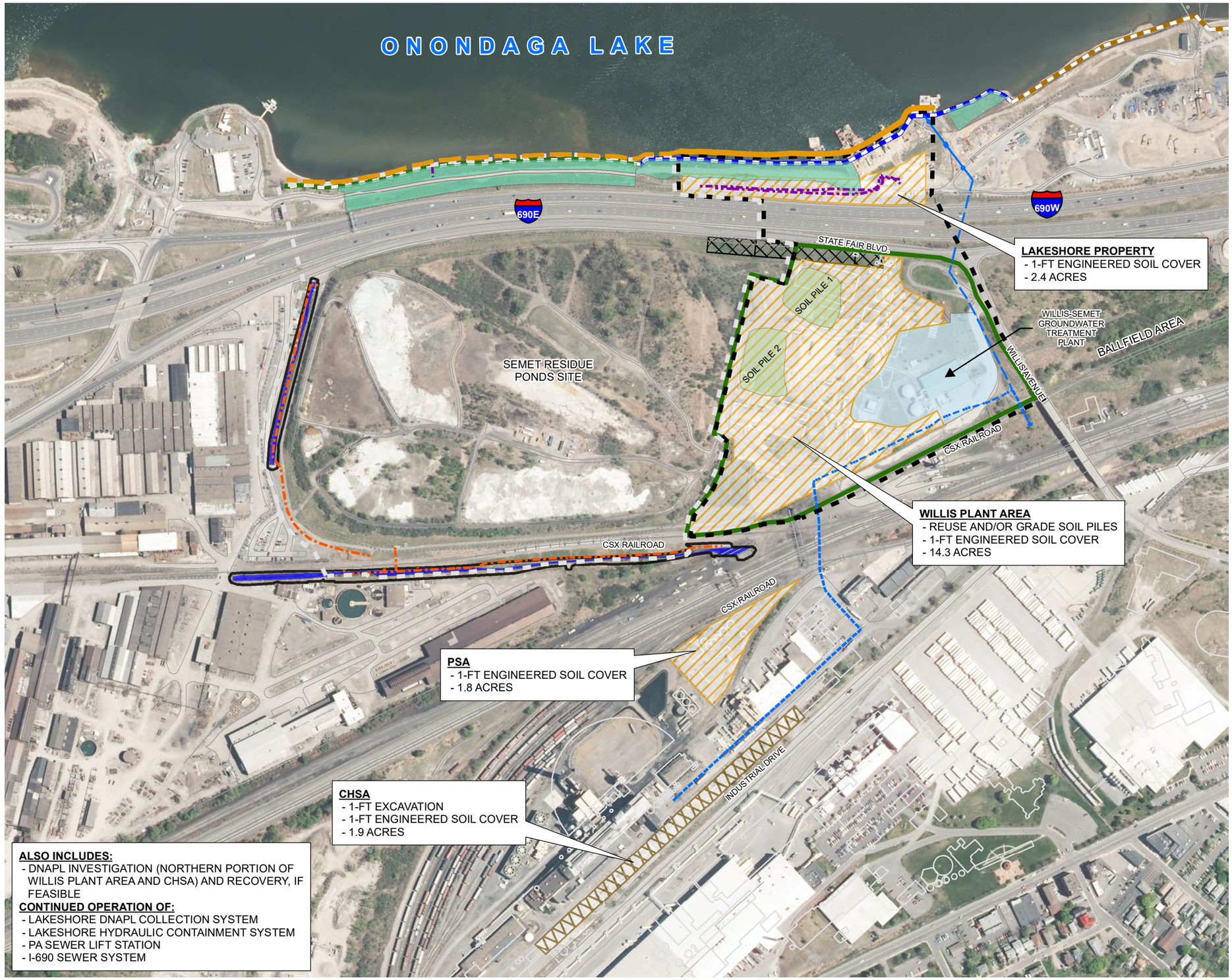
I:\Honeywell.1163\70277.Semet-2018-Ou-2\Docs\DWG\MXD\PRAP\FIGURE 5.mxd



N

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

JULY 2019
1163.72600

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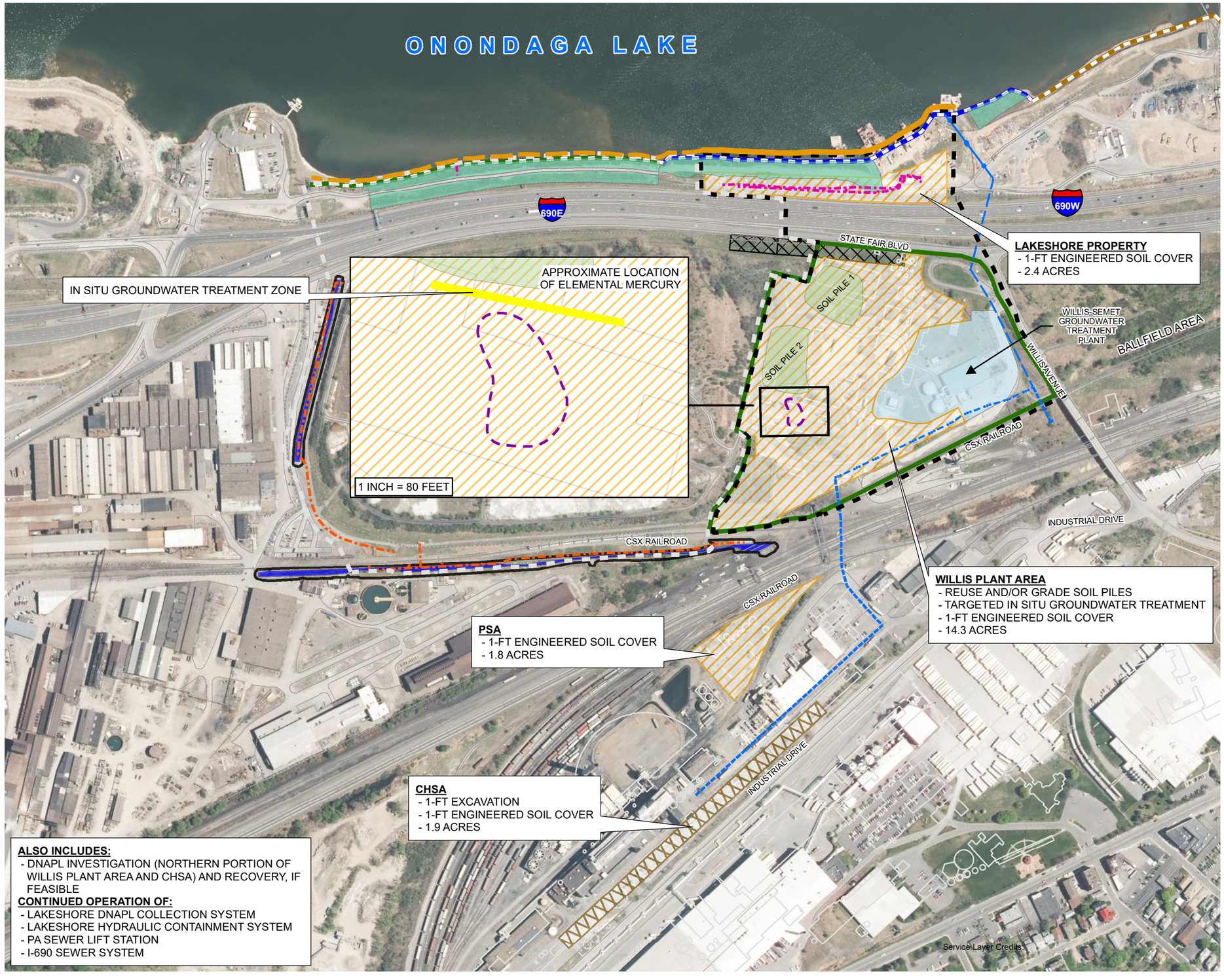


N

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
- 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

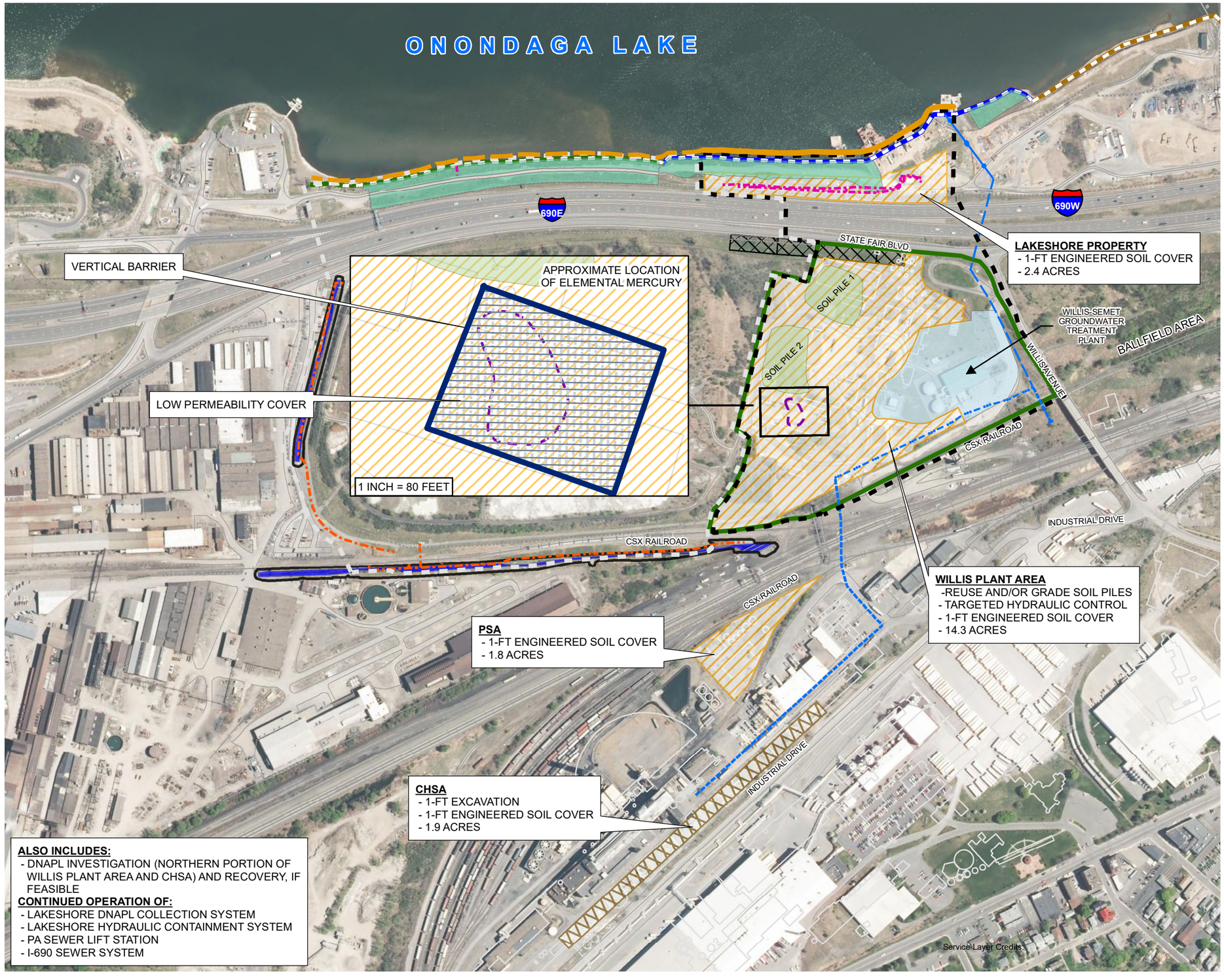
WILLIS AVENUE SITE FEASIBILITY STUDY GEDDES, NEW YORK

ALTERNATIVE 3

0 200 400 800
Feet

JULY 2019
1163.72600

O'BRIEN & GERE ENGINEERS, INC.



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
- 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

JULY 2019
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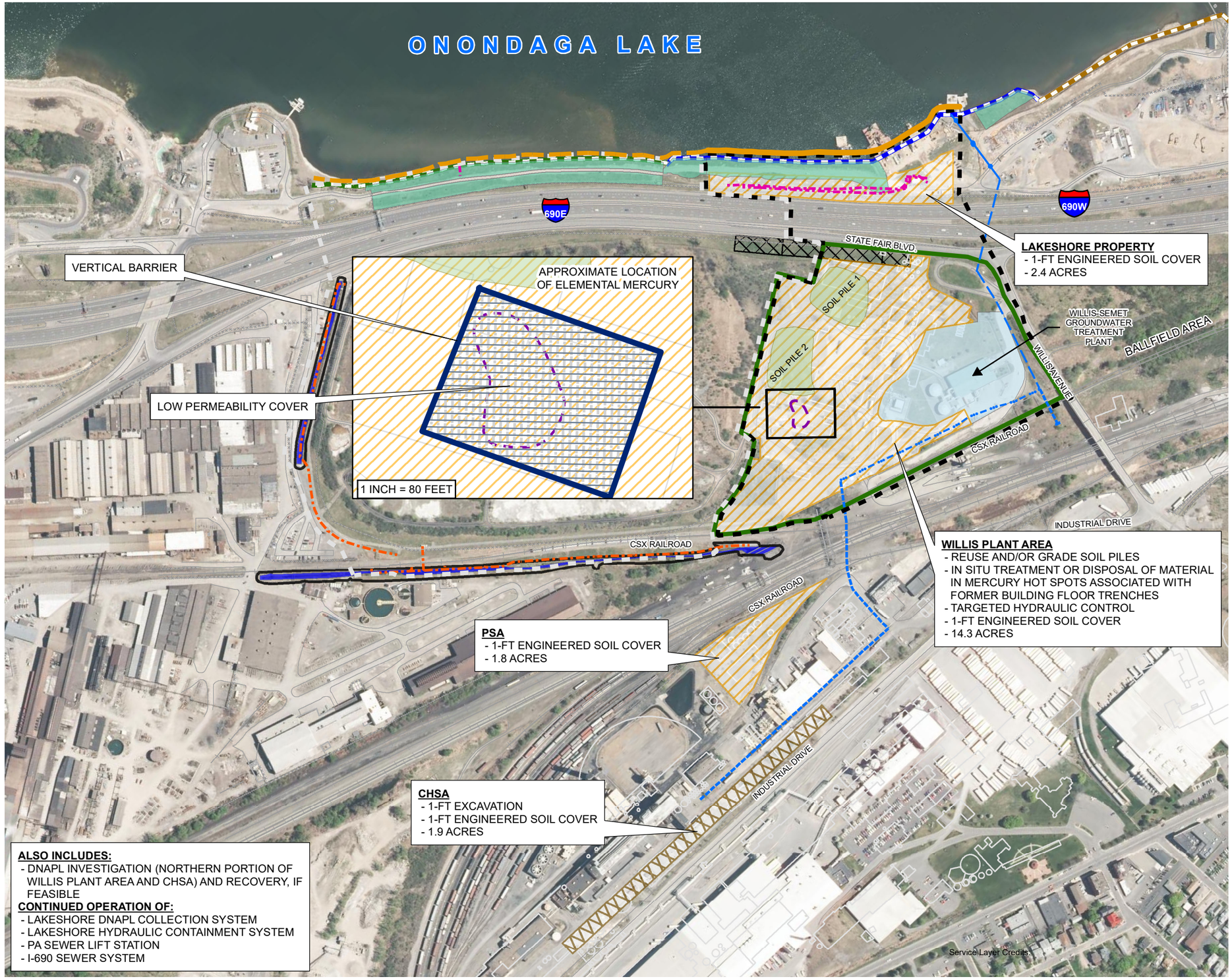
O'BRIEN & GERE ENGINEERS, INC.



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
- 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

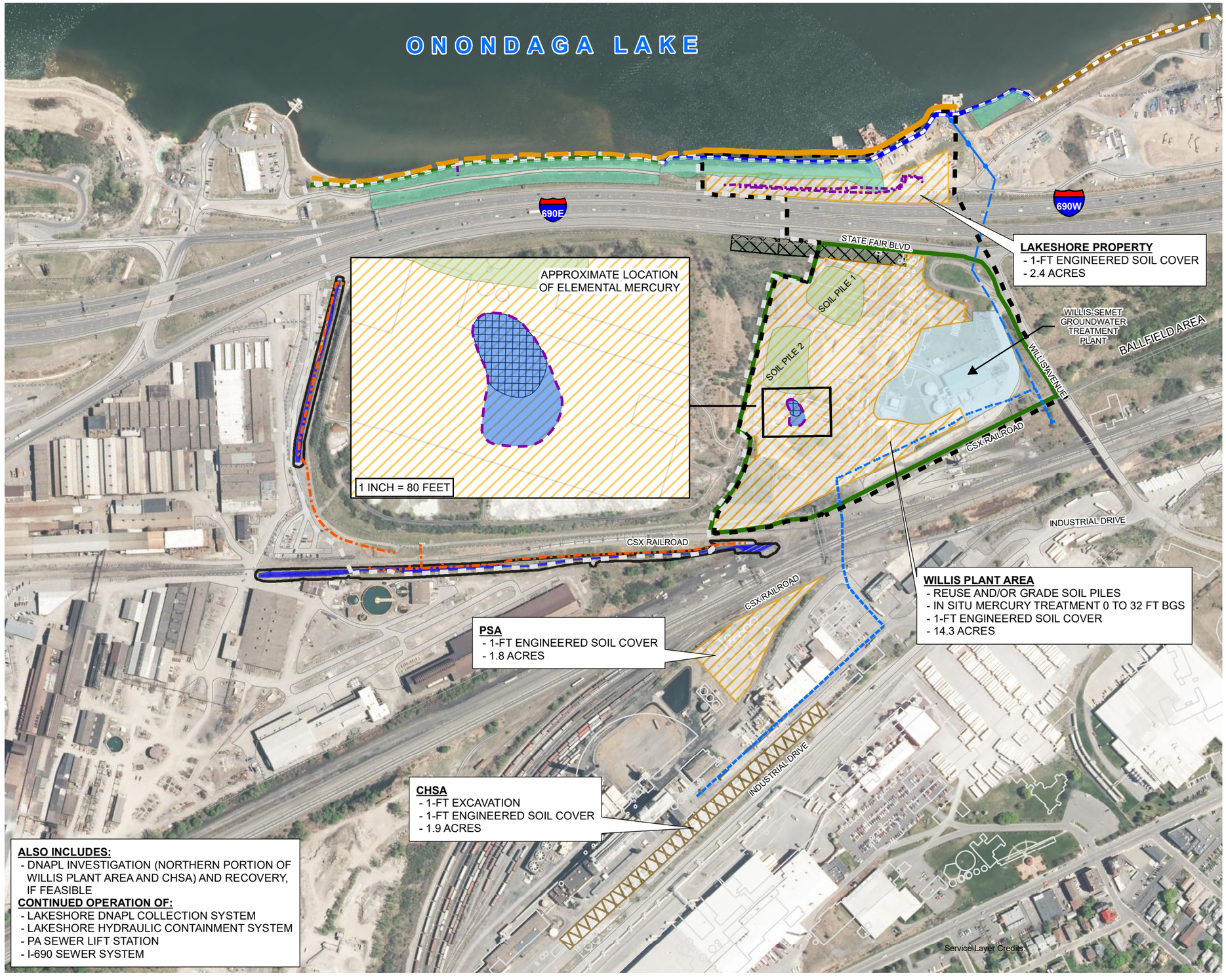
WILLIS AVENUE SITE FEASIBILITY STUDY GEDDES, NEW YORK

ALTERNATIVE 5

0 200 400 800
Feet

JULY 2019
1163.72600

O'BRIEN & GERE ENGINEERS, INC.



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

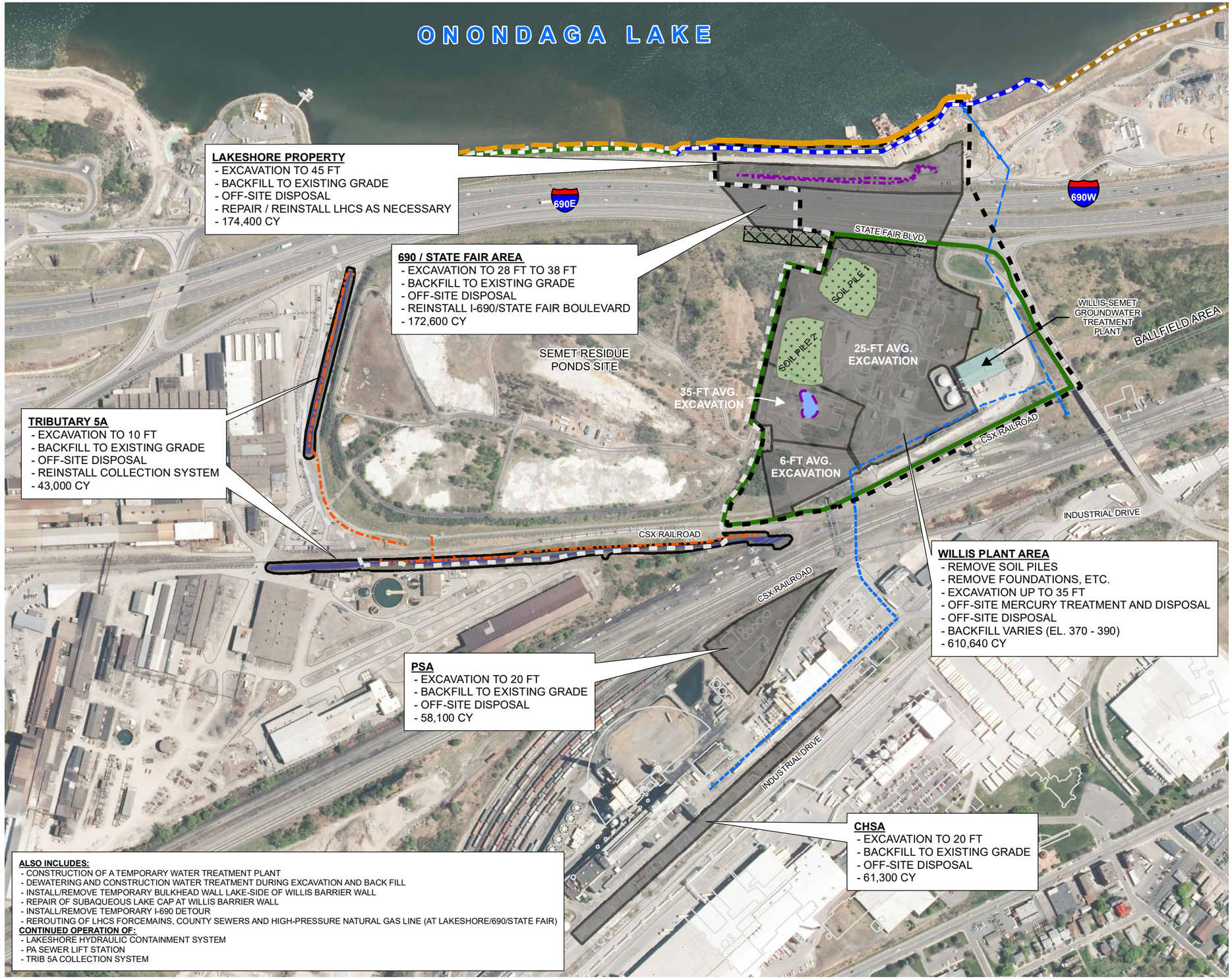
WILLIS AVENUE SITE PROPOSED REMEDIAL ACTION PLAN GEDDES, NEW YORK

ALTERNATIVE 6

0 200 400 800
Feet

JULY 2019
1163.72600

O'BRIEN & GERE ENGINEERS, INC.



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

JULY 2019
1163.72600

O'BRIEN & GERE ENGINEERS, INC.

ALLIED CHEMICAL – WILLIS AVENUE SUBSITE
OF THE ONONDAGA LAKE SUPERFUND SITE
RECORD OF DECISION

APPENDIX V-b

PUBLIC NOTICE PUBLISHED IN THE
SYRACUSE POST STANDARD
ON JULY 21, 2019

Ad Number:0009254331

Date	Position	Description	P.O. Number	Ad Size
07/21/2019	Other Legals NY	THE NEW YORK STATE DEPARTMENT OF		1 x 183.00 CL

THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION INVITES PUBLIC COMMENT ON THE PROPOSED PLAN FOR THE ALLIED CHEMICAL - WILLIS AVENUE SITE. The New York State Department of Environmental Conservation (NYSDEC) and the U.S. Environmental Protection Agency (EPA) will hold an open house from 5:00 – 6:00 PM and a public meeting at 6:00 PM on August 6, 2019 at the Geddes Town Hall Courtroom, 1000 Woods Road, Solvay, NY to discuss the Proposed Plan for the Allied Chemical – Willis Avenue Subsite (Subsite) of the Onondaga Lake Superfund Site. The Proposed Plan provides a summary of the findings of the Remedial Investigation and Feasibility Study (RI/FS) conducted to determine the nature and extent of the contamination at the Subsite, whether this contamination poses a threat to public health and the environment and identify and evaluate remedial alternatives. The Proposed Plan also identifies the preferred remedy and the basis for this preference. NYSDEC and EPA are issuing the Proposed Plan to encourage and receive input and comments from the public. The primary objectives of the proposed action are to minimize the migration of contaminants and any current or potential future human health and environmental impacts. The main features of the preferred remedy include the installation of a one-foot thick soil cover; treatment and/or excavation of mercury hot spots; targeted shallow /intermediate groundwater hydraulic control; evaluation and recovery/treatment of separate phase liquids (if present); monitored natural attenuation of groundwater at shallow/intermediate depths; continuation of the operation and maintenance related to Interim Remedial Measures that have been implemented at the Subsite; institutional controls; development of a Site Management Plan; periodic reviews; and long-term maintenance. The deep groundwater will be evaluated and addressed as part of a regional unit in a future study. The preferred alternative described in the Proposed Plan is NYSDEC and EPA's 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 selected remedy will be made after NYSDEC and EPA have taken into consideration all public comments. NYSDEC is soliciting public comment on the alternatives considered in the detailed analysis of the FS because NYSDEC and EPA may select a remedy other than the preferred remedy. The Proposed Plan and RI/FS reports are available on NYSDEC's website at www.dec.ny.gov/chemical/37558.html and at the following locations: Onondaga County Public Library 447 South Salina Street Syracuse, New York 13202 315 435 1800; Solvay Public Library 615 Woods Road Solvay, NY 13209 Phone: (315) 468-2441; Atlantic States Legal Foundation 658 West Onondaga Street Syracuse, New York 13204 315 475 1170; NYSDEC 615 Erie Boulevard, West Syracuse, New York 13204 2400 315 426 7400 Please call for an appointment; NYSDEC, DER 625 Broadway, 12th Floor Albany, New York 12233 7013 518 402 9676 Please call for an appointment. Written comments associated with the remedy for the Subsite, received during the public comment period which ends on August 20, 2019, as well as oral comments received at the public meeting, will be documented and addressed in the Responsiveness Summary section of the Record of Decision, the document which formalizes the selection of the remedy. All written comments should be addressed to: Mr. Tracy A. Smith, Project Manager NYS Department of Environmental Conservation 625 Broadway, 12th Floor Albany, NY 12233 7013 tracy.smith@dec.ny.gov (Indicate "Willis Avenue Proposed Plan Comments" in the subject line of the e-mail)

ALLIED CHEMICAL – WILLIS AVENUE SUBSITE
OF THE ONONDAGA LAKE SUPERFUND SITE
RECORD OF DECISION

APPENDIX V-c

PUBLIC MEETING SIGN-IN SHEET

NEW YORK
STATE OF
OPPORTUNITY

Department of
Environmental
Conservation

Public Meeting

Topic Willis Ave. Public Meeting
Date 8/6/19

Name	Affiliation, if any
21. Richelle Brown	Onondaga Nation employee
22. Travis Glazier	Onondaga County
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ALLIED CHEMICAL – WILLIS AVENUE SUBSITE
OF THE ONONDAGA LAKE SUPERFUND SITE
RECORD OF DECISION

APPENDIX V-d

AUGUST 6, 2019 PUBLIC MEETING TRANSCRIPT

STATE OF NEW YORK

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

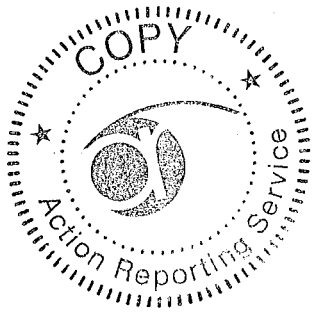
In the Matter of the

WILLIS AVENUE SITE PROPOSED PLAN

PUBLIC HEARING in the above matter, conducted at the Geddes Town Hall Courtroom, 1000 Woods Road, Solvay, New York before JOHN F. DRURY, CSR, Notary Public in and for the State of New York, on August 6, 2019, 6:00 p.m.

A p p e a r a n c e s:

TRACY ALAN SMITH	Presenter Project Manager NYSDEC
DON HESLER	NYSDEC
BOB NUNES	EPA
STEPHANIE WEBB	NYSDEC



INDEX TO SPEAKERS

Smith Presentation

PRESENTER SMITH: Most everybody know who I am, I'm Tracy Smith, I'm project manager for the Department of Environmental Conservation for the Willis Avenue site, which we're here to talk about today.

So today I'll be talking about site background, some locations, disposal history, contaminants, interim remedial measures that were performed, the alternative we evaluated, and the next steps, and the preferred alternative. This is a small group and most everybody here knows a lot of the project. Feel free to ask some questions if something comes up. It's kind of an informal meeting I think tonight is fine.

So the Willis Avenue site, subsite is the Onondaga Lake NPL site located north and south of I-690, southwest of Onondaga Lake, it covers approximately 26 acres. The site includes the lakeshore area, right there, that's about two and-a-half acre strip of land

between I-690 and Onondaga Lake. The Willis plant area, which is approximately 20 acres in size. The petroleum storage area and the chlorobenzene hot spot area. Those are approximately two acres each in size.

In addition we have deep groundwater at this and nearby subsite. The nearby subsite like Waste Beds 1 through 8, Semet and Waste Bed B. That deep water is going to be addressed separately as part of a regional unit. What we're going to be talking about today is an alternative to address the soil, contamination and shallow and intermediate groundwater.

So the Willis Avenue site is located adjacent to the Semet residue pond site, which is another subsite to Onondaga Lake of course. A similar remedy selection process was performed at the Semet site earlier this year. Construction is currently ongoing there.

Some site background. The Willis

Avenue plant area, there was a facility that operated from 1918 to 1977. Produced chlorinated benzene products and benzene, toluene, they also produced caustic pot ash, caustic soda, chlorine gas by the electrolysis of brine solution.

The lakeshore property that historically contained a causeway that was used as a docking facility for barges transporting materials and products during the plant operations. It was also recently used for the staging capping material during the Onondaga Lake remediation.

From 1915 to 1970 there was a facility on the petroleum storage area that produced benzene, toluene, xylene and naphthalene. That area was also used for the storage of Number 2 fuel oil in storage tanks by Honeywell. Those oil storage tanks were removed during the closure of the Allied main plant back in 1986.

Smith Presentation

The chlorobenzene hot spot areas is a former pipeline that traversed the area, and that conveyed chlorobenzene waste from the Willis plant to the former Allied main plant. Chlorobenzene and benzenes there are attributed to leakage from that pipeline.

Several investigations have been performed at the site. Main one being the remedial investigation. The data available for the site is summarized in the Remedial Investigation Report. And alternatives to addressing the contamination were evaluated in the Feasibility Study. Both those documents are available in the document depositories.

Site contaminants include benzene, toluene, the methylbenzene, chlorinated benzene, PCB, and mercury. Elemental mercury is present in the area of the former Mercury Cell building. Steps of 32 feet and DNAPL, which is a separate stage of liquid like an oil present in

the groundwater, and that's present in several areas of the site.

Risk assessments were also performed. Those include the human health risk assessment, or HHRA, and an ecological risk assessment. And those are based on no remedial activity being performed.

HHRA indicated that there could be unacceptable risk to the trespassers and future workers, if there were no remedial work performed at the site.

Here's some pictures of contamination present at the site. In the top left here you can see that's a soil core from the Willis plant area. You can see the amber fluid there, which is some of the DNAPL present. In the bottom left photo you can see, kind of difficult to see there, but mercury in this soil core in the Solvay waste. Solvay waste, which is ubiquitous throughout the area. That is that whitish ionic waste present in many areas around Onondaga Lake, of course.

Smith Presentation

The mercury is present in elemental forms throughout the Solvay waste down to approximately 32 feet.

The photo on the right here is a former floor trench, and that was associated with operations at the former Mercury Cell building area that's located on the Willis plant area. Those trenches are approximately present between approximately three to six feet below the surface, and there is elemental mercury present within them. It's difficult to see on the picture of course, but there is elemental mercury that's seen during the investigations that were performed there.

During facility operations there were four trenches that were located parallel to each other that conveyed used mercury to a fifth trench, which then conveyed the mercury to a pump located in a former pump room on the site. So while the rest of the building was removed, these floor trenches remain

on the site.

So IRMs or interremedial measures were performed on the site. These are performed to address the fine problems at a site before a final remedy is selected. So several IRMs which are listed here, I will discuss in more detail, were performed. Those were performed to prevent exposure or shut off the central sources of contamination to Onondaga Lake.

Chlorinated benzenes DNAPL collection system that included recovery wells to collect DNAPL was installed in 1995 at the lakeshore property. The system was upgraded in 2002 and then upgraded again in 2012, and additional upgrades are being performed and will be completed soon. These pictures show the recovery well installation and some of the recent upgrades.

The DNAPL collected in this system, stored or will be stored at the Willis Avenue plant area, and then disposed of

off-site at a permitted facility. To date the system has collected approximately 75,000 gallons of DNAPL, and will be back in operation soon.

To prevent migration of contaminated shallow and intermediate groundwater to Onondaga Lake, approximately a 1,300 foot barrier wall was installed with a groundwater collection system behind it. That was installed along Onondaga Lake shoreline in 2008 and 2009. A portion of this wall was installed into Onondaga Lake, due to the contamination present and the subsurface stability concerns.

This system is part of a larger hydraulic lakeshore control system that runs along the southwestern shoreline of the lake. The Willis groundwater treatment plant was installed in 2006 and it was upgraded three times since then. That treats groundwater collected from this IRM and the other Honeywell subsites along the lake.

Groundwater infiltrates into a storm

drain, it was infiltrating into a storm drainage system associated with I-690 and State Fair Boulevard north of the Willis plant area. So that was mitigated by the I-690 storm drainage system IRM. Work included separating the groundwater and the stormwater, clean and inspecting pipes, sealing catch basins and manholes and lining the pipes to prevent groundwater infiltration.

The east flume IRM redirected via a new 48 inch outfall pipe, storm water and non-contact cooling water from the former main plant area, formerly discharged to the east flume, directly to Onondaga Lake. The east flume was a surface water feature that was a former cooling pond. And that was backfilled under the IRM associated with the adjacent Waste Bed B/Harbor Brook site.

Also there is a former storm sewer that traversed the Willis plant area approximately up in here. And that was closed and rerouted into this 48 inch

outfall.

The last IRM discussed is the berm improvement IRM. In 2012 due to elevated levels of mercury present in the surface soils, berm material from select areas along State Fair Boulevard was excavated and then clean fill and topsoil was placed. The total between 12 and 24 inches of clean fill and topsoil was placed, followed by planting of trees and grasses and shrubs.

Moving on, these are the remedial action objectives for the site. The objectives for the remediation were established for the site as listed here. These are a summary of these objectives I'm not going to read through them all.

The main purpose is to prevent unacceptable human exposure and ecological impact, and to prevent migration of contaminants in Onondaga Lake.

At a minimum the remedy needs to eliminate or mitigate all stress to

public health and the environment. So these are the alternatives.

This is a list of the alternatives that were considered based on the re-election objectives and a review of the applicable technologies to address contamination of the site. More detail is provided in the proposed plan and the feasibility study.

Alternative 1 is the No Action alternative. We're required to evaluate this alternative for all the remedies as a baseline or basis for comparison to the other potential alternatives. Basically it's an alternative just to leave the site in its present form. It doesn't provide any additional protection for health or the environment.

Alternative 2 is a cover alternative. That includes placing a minimum of one foot of clean soil cover to prevent human exposure to contaminants. That's based on

commercial use. And incorporated into hot spot area, one foot of material to be excavated before placement. So the existing surface elevation would not change. This excavated material would then be placed in the Willis plant area and covered and consolidated there.

In areas of the Willis plant area and the core hot spot area where there is DNAPL present, an investigation will be performed to determine if that DNAPL, how much DNAPL is present there and if it can be collected. If not, other in place methods to address any residual DNAPL would be evaluated.

The alternative also include continued operation and maintenance and monitoring associated with the IRMs as discussed previously, and other long term monitoring, institution of controls, site management.

Alternatives 3 through 6 includes the same cover DNAPL and other remedial components of Alternative 2. And

include different methods to address the elemental mercury present at the site. I'll discuss these in further detail shortly.

Alternative 7 is the full removal alternative. That includes full removal of all contaminated materials, including removing and replacing the infrastructure of the site, such as the highways, I-690 and utilities nearby.

So as I stated, Alternatives 3 through 6 includes the same components as in the soil cover addressed in DNAPL in Alternative 2. But these alternatives address the different methods to address the elemental mercury present in the mercury cell area, as you can see here.

So you can see this figure, the elemental mercury footprint was at the former Mercury Cell building fairly small, approximately 5,500 square feet or roughly an area 55 feet by a hundred feet if you think of it that way.

Smith Presentation

Alternative 3 would address the elemental mercury in this area through a combination of physical or chemical processes. Treatability studies need to be performed, but to estimate cost for the alternative treatment was assumed to be by injection of carbon dioxide. Carbon dioxide would lower groundwater pH. That would promote precipitation of mercury in the site groundwater and then periodic rejection of the carbon dioxide or whatever material would be used would be necessary, that being operation maintenance performed over time with this alternative.

Alternative 4 includes a vertical hydraulic containment system to isolate the contaminated shell and intermediate groundwater in the vicinity of the former Mercury Cell building. It's assumed that sheet piles would be driven to a depth of approximately 35 feet into the low permeability and clay unit, with excavation of any remaining building

foundations that may be needed to install the sheet piles. The surface of this area would then be covered with a low permeability cover, and then an extraction well system would be installed, vertical barrier and collected groundwater treatment at the Willis Avenue ground water treatment plant.

Alternative 5 is essentially the same as Alternative 4 but also includes targeted treatment and for removal of mercury hot spots associated with the former floor trenches that I showed and discussed earlier.

Addressing the hot spots would include either in situ treatment, such as solidification or stabilization of the shallow material there or excavation and off-site removal of the trenches and associated elemental mercury contaminated material.

Alternative 6 is in situ treatment alternative to address the elemental

mercury in the soil fill material. Specifically the soil fill material that contains elemental mercury, to approximately 32 feet deep would be treated by mixing solidification or stabilizing agents in the ground.

In situ stabilization, solidification or ISS would likely be performed using an auger for mixing with the ISS. Debris associated with the former floor trenches or any building slabs with the Mercury Cell building would be crushed to allow the ISS to be performed.

Due to the site conditions, the site solidification and stabilization material would be collected for a treatability study, and would be specified in the design. Site conditions include Solvay waste and other stuff at depth that need be considered.

Also due to the presence of the historic fill materials on the site,

such as the Solvay waste, it's not anticipated the groundwater standards would be achieved within the site boundaries within a reasonable time frame at the Willis plant area and lakeshore area.

So under Alternatives 2 through 6, the site would be treated as part of a waste managed area with groundwater outside of the Willis and Semet barrier walls, and the lakeshore being restored, the natural attenuation. The groundwater within the site boundary, including the Willis plant area and lakeshore area would not be restored just due to the Solvay waste and high chlorides and other materials present.

Evaluation of the groundwater conditions at the site indicate the natural attenuation occurring. Degradation of groundwater constituents occurring in the shallow area of the groundwater.

Of these alternatives further

evaluations would also be needed during design and operation maintenance and monitoring to ensure this is continued, attenuated actually.

So we evaluated all the remedial alternatives using these criteria. All the remedial alternatives over the No Action alternative undergoing the detail evaluations meet the first two criteria which are protection of human health and environment and compliance with federal and state requirements -- regulations actually.

Other criteria include long term effectiveness, short term effectiveness, how easy or difficult a remedy is to implement and how the remedy is accepted by the community. Also including cost and state acceptance also.

So under Alternative 7, the Removal Alternative, there is several implementability issues. The alternative assumes removal of depths ranging from 10 to 45 feet, at approximately 1.1

million cubic yards of material transported off site for disposal. Then you would need to bring backfill material back onto the site to bring the site back up to grade for proper restoration.

So that would result in approximately 160 truckloads of material a day over 10 months a year for about seven or eight years; figure that way. In addition to the increased truck traffic there is worker and public safety issues, stability issues, issues associated with management of such large volume of material, construction water and the ability to find a place to dispose of that amounts of material.

We also didn't evaluate a partial removal alternative, because there is not really an appreciable benefit by removing just some material. The material still needs covering and long term monitoring.

In regard to cost. Alternative 1 is

zero dollars. Alternative 2 through 6 costs that range from approximately 10 to 14 million. Alternative 7 has the highest cost of course, about approximately $720 million. These costs include long term operation of maintenance of the alternatives. It doesn't include the cost of the work that's already been performed under the IRMs.

Alternatives 2 through 5 take one year to implement. Alternative 6 will take one to two years. And Alternative 7 would take seven to eight years.

So the preferred alternative, the EPA and state would select is Alternative 5. And that includes, as I mentioned before, placement of 1 foot of clean cover material, treatment and/or excavation of the mercury hot spots associated with the former trenches. Targeted shell, intermediate groundwater, hydraulic control in the mercury hot spot area. Recovery and treatment of

DNAPL. Shallow and intermediate groundwater outside the barrier wall is going to be treated for unnatural evaluation. There's also institutional controls and site management.

The institutional controls would further reduce potential for exposure to the site, such as restricting the site to future use. The site management plan would include maintenance and monitoring of the covers and address any future changes for the use of the site.

So this figure shows the major components of the preferred remedy that I just discussed. Shows the areas where the cover would be placed. The former Mercury Cell building here on the site, where treatment and the removal and the location of the groundwater hydraulic control barrier.

Note that as part of the barrier wall and the other IRM work on the lakeshore, the clean cover materials have been placed up here on the

lakeshore area. A minimum one foot of material in most places, thicker than 2 feet of clean material already exist in this area. Just noting this because the Onondaga County Trail is going to be constructed in that area. And cover material essentially already meets the requirements of the preferred remedy. So additional remedial work should not be necessary there.

Alternative 5 is being proposed as a preferred remedy because it protects public health and the environment. It provides the best balance of the alternatives based on the evaluation criteria and it achieves remediation goals for the site.

Alternative 1 doesn't meet the threshold criteria, protection of public health and the compliance with the regulations.

Alternatives 2 through 5, they're generally similar under short term effectiveness. And Alternatives 2

through 6 are pretty similar under cost criteria. Alternatives 5 and 6 meet the reduction in toxicity and mobility of volume under treatment and long term effectiveness, and the permanent criteria to a greater extent than Alternatives 2, 3 and 4. 5 and 6 include treatment and all of the elements of mercury.

Under Alternative 6 in situ treatment may be difficult to implement in the depths of the subsurface below the floor trenches due to the highly alkaline nature of Solvay waste. Therefore Alternative 6 may not be as implementible as Alternative 5. Alternative 6 also requires an additional construction season.

And then as discussed previously, Alternative 7 would be extremely difficult, it's not a significant short term impact, it takes significantly longer to implement compared to the other alternatives, and the least cost

effective alternative.

So the next steps. The public comment period is going to be closed on August 21st. We're going to accept comments up to that date. You can mail or e-mail, send the comments to me. And any questions asked tonight will also be incorporated into the Responsive Summary that's going to be included in the Record Of Decision that reflects the remedy.

Following the comment period here and the Record Of Decision as I just mentioned, select the final remedy for the site. That's when that will be issued. The Record Of Decision includes the responses to the questions and comments received.

Following the Record Of Decision the remedial design will proceed, with construction anticipated shortly thereafter. As I mentioned, the time to construct the alternative is estimated to be one year. Design and construction

and maintenance of the remedy is anticipated to be performed by Honeywell with DEC oversight. That's all I have. Here's my contact information. Feel free to ask any questions if you have any. Anyone?

QUESTIONS BY RACHILLE BROWN:

Q. Is the monitoring of the attenuation happening already?

A. Natural attenuation would be ongoing of course, monitor natural attenuation would be performed after the remedy is selected. And basically performing groundwater monitoring, making sure that natural attenuation continues and is ongoing. That would be a long term thing where monitoring would have to continue for a long period of time essentially.

Q. What is naturally attenuating at this point inside of the site?

A. There's been evidence of some natural attenuation inside the site, shallow or intermediate groundwater. But because of all the other materials inside the solid waste materials, the solid waste material, groundwater objectives

would never be met because of those. So behind the barrier walls on the Willis plant area and the lakeshore area we wouldn't anticipate however meeting those criteria, meaning the groundwater standards. But outside of the barrier wall when you go outside into Onondaga Lake, it is assumed that those could be met eventually.

Q. And if you weren't seeing progress on it would there be another --

A. Yeah, that's part of the five year review process, same as they've been doing here. So yes, that would be probably evaluated every five years under that process. We'd see what information is available and ensure that progress is being made. And if it isn't then yeah, we would have to probably look at that and see if we have to do some active measures or what's going on really.

Q. The main difference between 4 and 5 are the treatment of the hot spot, right?

A. Yes, that's really the only difference, addressing those former trench areas. We still have the same hydraulic containment around them. It's addressing possible mercury source and the

shallow surface soils that are there.

Q. And that's the excavation question?

A. Yes, excavation, removal or an in situ treatment, such as the stabilization, solidification, to bind up those materials, so any mercury isn't migrating deeper into the subsurface, which would be contained anyway, but it would be good to address something there, so some of the shallow surface materials are addressed.

PRESENTER SMITH: Any other questions from anybody else? We'll be around if you want to, feel free to ask any questions informally, I'm here. So appreciate it, and thanks for coming tonight.

[Conclusion of public hearing].

* * * *

REPORTER'S CERTIFICATE

I, JOHN DRURY, CSR, and Notary Public, certify:

That the foregoing proceedings were taken before me at the time and place therein set forth, at which time the witness was put under oath by me;

That the testimony of the witness and all objections made at the time of the examination were recorded stenographically by me and were thereafter transcribed;

That the foregoing is a true and correct transcript of my shorthand notes so taken;

I further certify that I am not a relative or employee of any attorney or of any of the parties nor financially interested in the action.

JOHN DRURY, CSR
Notary Public

WORD INDEX

ALLIED CHEMICAL – WILLIS AVENUE SUBSITE
OF THE ONONDAGA LAKE SUPERFUND SITE
RECORD OF DECISION

APPENDIX V-e

WRITTEN COMMENTS RECEIVED DURING THE COMMENT PERIOD

Smith, Tracy (DEC)

From: Aaron McKeon <aaronjmckeon@gmail.com>
Sent: Tuesday, July 23, 2019 8:46 AM
To: Smith, Tracy (DEC)
Subject: Site No. 734026 - Willis Avenue Superfund Site Cleanup

Tracy-

Regarding cleanup at Allied Chemical:

-what's your projected timeline to begin this work?
-will this site cleanup affect the development of the County's 'Loop the Lake' trail?
-what are some possible post-cleanup uses for the sites?

Thanks.

-Aaron McKeon
Onondaga County Resident

LAW OFFICE OF JOSEPH J. HEATH
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August 21, 2019

Tracy Smith
New York State Department of Environmental Conservation
625 Broadway
Albany, NY 12233-0001
tracy.smith@dec.ny.gov

Re: Proposed Plan for Willis Avenue Subsite

Dear Tracy:

On behalf of the Onondaga Nation, I have reviewed the publicly released Proposed Plan for the Willis Avenue Subsite. The Nation had the opportunity to review an earlier draft of this Proposed Plan during consultation with the Department of Environmental Conservation (DEC). Although some of the procedural concerns raised during the consultation process were addressed, the Nation's substantive concerns with the proposed remedy were not. These comments are reiterated below.

First, the Onondaga Nation continues to support the complete removal of contaminated materials that have been dumped in and around Onondaga Lake rather simply covering these wastes and leaving them in place. Onondaga Lake is sacred to the Onondaga Nation. It is the birthplace and the center of the Haudenosaunee Confederacy. The Willis Avenue site, with its reservoir of chlorobenzene DNAPL (dense non-aqueous phase liquids) on the shoreline parcel and elemental mercury further inland, is a particular affront to the sacred nature of the Lake.

As described in the Proposed Plan, DEC's preferred alternative includes installing a minimum one-foot thick soil cover (with or without a liner) or impermeable paving across the full site, recovery or *in situ* treatment of residual DNAPLs, undetermined "targeted treatment" of elemental mercury and other mercury residuals in conveyance trenches on the main plant site, "monitored natural recovery" of contaminated groundwater at the site boundaries, and a standard range of institutional controls and site

monitoring. While this remedy may contain the toxic materials on this site at present, its success depends upon careful oversight for hundreds of years – a remedy that assumes that Honeywell and DEC will remain active and engaged with this site for many times longer than they have been in existence.

The Nation has a stewardship role with respect to the Lake and its shoreline and takes seriously its duty to ensure that each element of the natural world can fulfill its rightful and traditional role. DEC's preferred alternative will institutionalize the use of a sacred space as an industrial waste and relegate the site and its natural resources to a permanent contaminated state. Natural resources on and around the site will be prevented from returning to their rightful roles as part of a functioning, healthy, sustainable ecosystem. For both of these reasons and to ensure long-term environmental and public health protection, all or most of the contaminated materials within and around the Lake, including those on the Willis Avenue subsite, should be removed.

In its alternative assessment, DEC improperly relies on an "all-or-nothing" approach to removal options. As in past remedial plans, DEC evaluates a range of options to cover or immobilize wastes and leave them in place around the Lake, but evaluates only one token removal option. In this case, Alternative 7 involves full removal of essentially all of the contaminated soil on site, which requires removal and replacement of major roadways, sewer lines, and other infrastructure. None of the reviewed alternatives consider easily identifiable accommodations or exceptions to complete removal that would preserve these roads, sewers, or other infrastructure. As a result, waste removal is characterized as impossibly disruptive and expensive. A more nuanced alternative, which leaves soils that are underneath existing roadways or necessary to support major infrastructure on or around the site, should also be considered. In addition, particularly given the centuries of groundwater contamination projected by DEC and the elemental mercury and chlorobenzene DNAPL remaining on site, DEC should consider the cumulative environmental, and potentially economic, benefits of a truly clean site – benefits that would not be provided by the preferred containment alternatives – to balance the up-front costs of removal.

DEC's decision to rely on Monitored Natural Recovery (MNR) for groundwater remediation at the "Point of Compliance" (POC) or the edges of the subsite is also problematic. Because the Willis Avenue subsite is designated as a "Waste Management Area" (WMA), federal law does not require groundwater beneath the site to reach contaminant levels that are safe for human or ecological exposure. Rather, success is determined by whether groundwater at the POC will meet applicable standards within a <u>reasonable</u> time period. By DEC's own estimation, groundwater at the Willis Avenue subsite will not reach acceptable levels at the POC for at least 43 years and, at most, 700

years. A 700-year degradation process cannot be considered a "reasonable" time frame for remediation under any circumstance. Even the more typical 100- to 200-year process – or the minimum 43-year process – is far too long. DEC should consider remediation alternatives that ensure groundwater recovery within a much shorter time frame of at most 10 – 15 years.

Despite selecting a "preferred alternative," DEC has not identified the specific *in situ* treatments that will be used for DNAPLs or for elemental mercury. The *in situ* treatment for DNAPL is left completely unexplained, while DEC suggest a form of solidification/stabilization or chemical transformation for the elemental mercury. While DEC explicitly recognizes that additional assessment of effectiveness will be necessary once the specific methods are identified, the agency fails to acknowledge that this means the current effectiveness assessment is incomplete or that a proper comparison of alternatives is impossible. DEC should hold the Proposed Plan until specific *in situ* alternatives are identified and can be evaluated.

The Nation also notes that DEC has dropped consideration of two *ex situ* treatment options that would have removed mercury from the soil rather than simply attempting to immobilize mercury. Given the federal preference for remedies that "permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, and contaminants," 42 U.S.C. § 9621(b)(1), permanent removal of contaminants should be preferred to the immobilization of contaminants in materials subject to weathering and degradation over time. This suggests that, at minimum, the *ex situ* treatment options originally considered for mercury should be retained for evaluation in the final work plan.

Finally, while the cover portion of the proposed remedy is more clearly delineated, DEC does not give full consideration to the recreational uses that might be expected on this site, particularly on the Lakeshore Property portion. The proposed remedy – a one-foot thick soil cover or paved walking/biking trail – is assessed for its compliance with passive recreational use standards. According to DEC regulations, passive recreational uses are limited to "public uses with limited potential for soil contact." 6 NYCRR § 375-1.8(g)(2)(iii). Passive recreation is, as indicated in the draft Proposed Plan, considered to be protected by Commercial Use Soil Contaminant Objectives (SCOs). *Id.* Active recreational uses are defined as "public uses with a reasonable potential for soil contact" and are considered to fall under Restricted Residential Use SCOs. 6 NYCRR § 375-1.8(g)(2)(ii)(b).

DEC appears to assume that, because the Lakeshore Property will include a paved trail, sites users will confine their activities to this trail. However, the agency provides no evidence that members of the public will not leave the trail to walk along the shoreline;

picnic; birdwatch; fish; observe or collect rocks, leaves or flowers; search for bugs, frogs, snakes, or other wildlife; or simply view the Lake from a closer vantage point. For all of these perfectly permissible activities, there is a reasonable potential for soil contact. For all these reasons, DEC should consider the entire Lakeshore Area open to active recreational use (use with a reasonable potential for soil contact) and design a remedy accordingly. DEC should reference the Restricted Residential, not Commercial, SCOs to determine the areas subject to remediation and should, at minimum, require the thicker soil cover applied in other acknowledged active recreational areas along Onondaga Lake.

Last, the Proposed Plan does not provide the necessary context for the public to understand and evaluate the safety of the proposed remedy. For example, the environmental and public health significance of elemental mercury or chlorobenzene DNAPL is never discussed. DEC provides a list of contaminants that are present in different areas of the site at levels above industrial or commercial use standards, but provides no information about how widespread those contaminants are or how many samples exceeded applicable standards for each contaminant or by how much. The Plan includes human health risk assessments for "Current Conditions" (Table 10) and "Future Scenarios" (Table 11), but provides no information on the future conditions that were the basis for the "Future Scenarios" evaluation. All of this information is necessary for the public to evaluate the seriousness of the threat posed by this site and the adequacy of the proposed and preferred remedies. DEC should revise this Proposed Plan to remedy these omissions and reissue the Plan as draft to ensure that the public has the proper context to evaluation and respond to the proposal.

Thank you for your attention to these comments. We hope that DEC agrees that additional revision is necessary and that it chooses to issue a revised Draft Proposed Plan for this site rather than moving immediately to a final Plan.

Sincerely,

Alma L. Lowry

Alma L. Lowry, Of Counsel
Law Office of Joseph J. Heath

cc: Council of Chiefs