FIRST FIVE-YEAR REVIEW REPORT
HIAWATHA BOULEVARD FORMER MANUFACTURED GAS PLANT SUBSITE OF ONONDAGA LAKE SUPERFUND SITE
ONONDAGA COUNTY, NEW YORK

Prepared by

U.S. Environmental Protection Agency
Region 2
New York, New York
May 2017

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May 24, 2017
Date

510540

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List of Abbreviations & Acronyms

bgs	below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cy	cubic yards
DO	Dissolved Oxygen
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
FYR	Five-Year Review
HHRA	Human-Health Risk Assessment
ICs	Institutional Controls
IRM	Interim Remedial Measure
ISS	*In-situ* Stabilization
IUR	Inhalation Unit Risk
MCL	Maximum Contaminant Level
MGP	Manufactured Gas Plant
METRO	Metropolitan Syracuse Sewage Treatment Plant
µg/kg	micrograms per kilogram
µg/l	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
mg/kg	milligrams per kilogram
NAPL	Non-Aqueous Phase Liquid
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OCDWEP	Onondaga County Department of Water Environment Protection
OU	Operable Unit
ORP	Oxidation-Reduction Potential
PAHs	Polycyclic Aromatic Hydrocarbons
PRP	Potentially Responsible Party
PSA	Preliminary Site Assessment
RA	Remedial Action
RAOs	Remedial Action Objectives
RD	Remedial Design
RfD	Reference Dose
RfC	Reference Concentration
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
SMP	Site Management Plan
SSDS	Sub-slab Depressurization System
SVI	Soil Vapor Intrusion
SVOCs	Semi-Volatile Organic Compounds
TAGM	Technical and Administrative Guidance Memorandum
VOCs	Volatile Organic Compounds

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

The Onondaga Lake Superfund site currently includes eleven subsites (subsites are defined as any site that is situated on Onondaga Lake's shores or tributaries that has contributed contamination to or threatens to contribute contamination to Onondaga Lake). Each subsite is an operable unit (OU). This FYR report evaluates OU13, the Hiawatha Boulevard Former Manufactured Gas Plant (MGP) subsite (Subsite).

This is the first FYR for the Subsite. The triggering action for this statutory review is the start of on-property construction on February 27, 2012. An FYR is required at this Subsite due to the hazardous substances, pollutants, or contaminants that remain at the Subsite above levels that will allow for unlimited use and unrestricted exposure.

The Subsite's FYR team was led by Mark Granger, the EPA Remedial Project Manager (RPM). Participants included Edward Modica (EPA hydrogeologist), Nick Mazziotta (EPA human-health risk assessor), Julie McPherson (EPA ecological risk assessor), and Larisa Romanowski (EPA community involvement coordinator). The FYR began on August 31, 2016. The owner of the property, Onondaga County, was notified of the initiation of the FYR.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Onondaga Lake Superfund Site (Hiawatha Former Manufactured Gas Plant Subsite)		
EPA ID: NYD986913580		
Region: 2	**State:** NY	**City/County:** City of Syracuse, Onondaga County
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the site achieved construction completion?** No	
REVIEW STATUS		
Lead agency: State ***[If "Other Federal Agency", enter Agency name]*:**		
Author name (Federal or State Project Manager): Mark Granger		
Author affiliation: EPA		
Review period: 2/27/2012 - 5/5/2017		
Date of site inspection: 6/29/2016		
Type of review: Statutory		
Review number: 1		
Triggering action date: 2/27/2012		
Due date *(five years after triggering action date)*: 2/27/2017		

Site Background

The Subsite is located in an industrial and commercial area at the southeast end of Onondaga Lake, within the City of Syracuse, Onondaga County, New York (see **Figure 1**). The former MGP was located on the northern portion of property currently owned by Onondaga County. The Subsite is currently occupied by the Syracuse Metropolitan Wastewater Treatment Plant's (METRO's) sewage-treatment structures, including clarifiers, aeration tanks, an ammonia and phosphorus removal facility, and secondary bypass disinfection structures. The remainder of the Subsite is primarily covered by driveways and paved parking areas. The existing site layout and limits of the

former MGP are shown on **Figure 2**. The former MGP is approximately twenty acres in area, and is bounded to the north by the Barge Canal, to the east by Hiawatha Boulevard, to the south by the remainder of METRO, and to the west by Onondaga Lake.

The property was originally created by filling in low-lying areas with materials associated with the construction of the Erie Canal and with the rerouting of Onondaga Creek. In the late 1800s, the property was used as a fill area for Solvay Process waste[1]. Manufactured gas was produced here from 1925 to 1958.

The Subsite property and surrounding area is zoned industrial/commercial. With the strong presence of commercial and industrial infrastructure, future land use is anticipated to remain industrial/commercial. The area where the Subsite is located is not known to contain or impact any ecologically-significant habitat, wetlands, agricultural land, or historic or landmark sites.

The production of manufactured gas and the generation of related by-products resulted in the release of hazardous substances into the soil and groundwater. These wastes contained benzene, toluene, ethylbenzene, and xylenes (BTEX), as well as polycyclic aromatic hydrocarbons (PAHs).

There are four principle geologic units at the Subsite: a fill unit (2- to 5-foot thick consisting of poorly sorted clay, sand, silt, gravel, brick, wood, ash, cobbles, and chunks of concrete); a Solvay-waste unit (2 to 12 feet thick consisting predominantly of silt- and fine-sand-sized material with a chalky consistency); a sand unit (30 to 50 feet of native silty fine to coarse sand); and a silt/clay unit underlying the sand unit.

The major hydrologic features near the Subsite are Onondaga Lake and the Barge Canal (which discharges into the Onondaga Lake) (see **Figure 1**). The Barge Canal receives its flow from Onondaga Creek, which drains highly-developed, heavily-commercialized, and industrialized landscapes as it passes through the City of Syracuse. Saturated conditions are first encountered within the upper-fill or Solvay-waste units. Water-level data indicate that the water table beneath the Subsite generally occurs at a depth of approximately 5 to 10 feet below ground surface (bgs). Groundwater and surface-water elevation data indicate that the horizontal direction of groundwater flow is from the southeastern corner of the Subsite to the northeast and to the northwest (*i.e.*, toward the Barge Canal and Onondaga Lake, respectively) (see **Figure 2**). The flow directions diverge along a groundwater divide that trends northwest-southeast through the Subsite.

For more detail related to the background, physical characteristics, geology/hydrogeology, land/resource use, and history related to the Onondaga Lake Superfund site, please refer to:

https://semspub.epa.gov/src/collections/02/SC/NYD986913580

[1] Solvay waste is a waste product associated with the manufacturing of soda ash (sodium carbonate) and related products such as baking soda (sodium bicarbonate) via the Solvay process. It is a white, chalky, calcite-related material primarily composed of calcium carbonate, calcium silicate, and magnesium hydroxide.

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

The Subsite was the subject of a Preliminary Site Assessment/Interim Remedial Measures (PSA/IRM) study conducted by National Grid between August 1995 and September 1998. The PSA/IRM study characterized subsurface conditions and the nature and occurrence of chemical contaminants in soil and groundwater, as well as near-shore sediments in Onondaga Lake.

Building on the PSA/IRM, a remedial investigation (RI) was subsequently conducted to determine the nature and extent of contamination related to the Subsite and to identify and evaluate remedial alternatives to address the contamination. The investigations, conducted in phases between 2000 and 2008, included:

- installation of 64 groundwater monitoring wells;
- collection of 385 subsurface-soil samples from 50 soil borings, 2 test pits, and 16 monitoring wells analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals associated with former MGP residues, particularly BTEX, PAHs, and cyanide;
- collection of several rounds of groundwater samples with analysis for VOCs, SVOCs, and metals;
- collection of sediment samples from seven off-property near-shore sampling locations in Onondaga Lake; and
- a soil-vapor investigation to evaluate the presence, concentration, and distribution of MGP- and non-MGP-related VOCs in on-property soil vapor and to evaluate the potential for soil vapor intrusion (SVI) into existing on-property buildings.

The RI revealed elevated levels of BTEX compounds, PAHs, and cyanide in groundwater and subsurface soils. Elevated levels of PAH compounds in Onondaga Lake and Barge Canal sediments were also found, although in both cases at levels consistent (upgradient, side gradient, and downgradient) with the broader legacy of heavy industry surrounding the Subsite. In addition, the SVI data was reviewed and it was determined that no further actions relative to SVI were necessary.

The baseline human-health risk assessment (HHRA) concluded that an unacceptable risk existed from exposure to groundwater by hypothetical future residents and future construction and utility workers, driven primarily by VOCs and PAHs. The ecological risk assessment concluded that no habitats or species of special concern would likely be affected by site-related contaminants.

Response Actions

Following the completion of the RI and Feasibility Study (FS), a Record of Decision (ROD) was signed in March 2010. The ROD addressed contamination present in subsurface soil and groundwater. The remedial action objectives (RAOs) specified in the ROD were:

- prevent ingestion/direct contact with contaminated subsurface soil;
- prevent migration of contaminants that would result in groundwater or surface water contamination;
- prevent ingestion of groundwater with contaminant levels exceeding drinking water standards;
- prevent contact with contaminated groundwater; and
- prevent discharge of contaminated groundwater to surface water.

The ROD remedy components included:

- *in-situ* solidification (ISS) treatment of subsurface soils from the northeastern portion of the Subsite where non-aqueous phase liquid (NAPL) was identified in lenses and where PAHs were identified at concentrations greater than 500 milligrams per kilogram (mg/kg) to depths of 22 to 24 feet bgs.

- exposed surface soil will be covered with either: a one-foot thick soil cover consisting of clean soil underlain by a demarcation layer; or buildings, treatment structures, pavement, etc.

- enhanced biodegradation of groundwater through the injection of nutrients, sources of oxygen, and/or other amendments. This will occur along the northern property boundary between the Barge Canal and areas where the highest concentrations of BTEX and PAHs were found in groundwater. Modifications to the enhanced bioremediation treatment will be made, as needed, based on monitoring results. Residual groundwater contamination outside of these areas will be allowed to attenuate naturally.

- development of institutional controls (ICs) in the form of an environmental easement that limits the property to industrial use, requires compliance with an approved Site Management Plan (SMP), restricts the use of groundwater as a source of potable or process water without necessary water-quality treatment as determined by the New York State Department of Health (NYSDOH), and requires the completion and submittal of periodic certifications of institutional and engineering controls.

- development of an SMP which will: (1) identify known locations of MGP-impacted soil and groundwater at the property; (2) establish appropriate controls for future disturbances of soil and management of impacted groundwater; (3) set forth the inspection and maintenance activities for the perimeter fencing and vegetation/cover materials; and (4) include a provision to evaluate the potential for vapor intrusion for any buildings developed

on the site, including a provision for mitigation of any impacts identified, and a provision to evaluate the potential for soil vapor intrusion for existing buildings if building use changes significantly or if a vacant building becomes occupied.

NYSDEC and Niagara Mohawk Power Corporation (NiMo) entered into multisite Consent Orders (Orders) in 1992 and 2003. In 2005, NiMo began doing business under the name of its parent company, National Grid. These Orders obligate National Grid to implement a full remedial program for, among other properties, this Subsite.

Response Action Implementation

ISS of Subsurface Soil

The remedial design (RD) of the soil remedy began shortly after the successful completion of an ISS bench-scale treatability study in March 2011. The RD was approved in September 2011. Subsurface soil remedial activities, which were performed from February 2012 to October 2012, involved the removal of surface cover materials (asphalt pavement, sub-base course, and topsoil) and underlying shallow soil to a depth of approximately 4 feet bgs within the excavation/ISS area. This area is in the northeastern portion of the site where NAPL was identified in lenses and PAHs were identified at concentrations greater than 500 mg/kg in subsurface soil, generally, at depths greater than 4 feet bgs (see **Figure 3**). Excavation activities were performed to allow for volume expansion during the subsequent ISS implementation. The ISS extended to depths of approximately 22 to 24 feet bgs within the excavation/ISS area. Approximately 9,700 cubic yards (cy) of contaminated soil were solidified. Sampling was performed to verify that the solidified monolith met the performance criteria.

Between November 2015 and March 2017, the Onondaga County Department of Water Environment Protection (OCDWEP) completed almost all of the construction of secondary bypass-disinfection system improvements. The construction was limited to the western portion of the Subsite, distant from the area treated by the ISS remedy for impacted subsurface soils. Construction activities included soil excavations to various depths ranging from 3 to 25 feet bgs to support construction of a bypass chlorine tank, dewatering pump station, chemical building, associated piping, and chemical unloading pads. Considering that these activities might include the potential for construction worker exposure to impacted soil and groundwater, a *Special Environmental Conditions* document was prepared by National Grid for OCDWEP contractors when handling soil and groundwater during construction. National Grid provided oversight to ensure that the procedures outlined within, designed to meet NYSDEC requirements for proper handling of material impacted with Subsite-related contaminants, were adhered to throughout the construction.

Enhanced Biodegradation of Groundwater

A pilot study was conducted to collect data to support the design of the groundwater remedy by adding amendments to stimulate the naturally occurring anaerobic microbial community and

enhance the degradation of dissolved MGP-related constituents present in groundwater. The groundwater component of the remedy was designed to eliminate or reduce (to the extent practicable) impacted groundwater migration to surface water downgradient from the bioremediation treatment system.

Pilot-study field activities were performed from September 2013 through June 2015. To initiate the study, one injection well, two dose-response wells, and two monitoring wells were installed in the pilot study area (located near the Barge Canal downgradient of the ISS treatment area and about 100 feet northwest of Hiawatha Boulevard) to inject solution and monitor groundwater. Bio-Trap samplers (a passive sampling tool used to collect microbes) were also deployed to evaluate *in-situ* biodegradation potential, estimate naphthalene degradation rates, and assess the microbial communities present. A sulfate and fluorescein dye solution was injected to stimulate microbial activity and evaluate fate and transport. The pilot study area was monitored for concentrations of VOCs, sulfate, and fluorescein dye prior to, during, and after the injection activities.

From the pilot study, it was determined that the amendment of groundwater with sulfate resulted in stimulation of the indigenous sulfate-reducing microbial community capable of enhanced degradation of MGP-related contaminants. Additionally, the use of a lower-solubility (slow-release) form of sulfate amendment (*e.g.,* gypsum) is supported by the pilot study results, based on the relatively slow groundwater velocity observed in the pilot study area. Addition of a slow-release sulfate amendment along transects perpendicular to groundwater flow between the site and the Barge Canal will provide a long term sulfate source to stimulate sulfate reduction and biodegradation of MGP-related constituents. Based on these results, full-scale deployment of sulfate amendments is being pursued.

It is expected that construction of the facilities necessary to deploy the enhanced biodegradation of the groundwater will begin in Fall 2017.

Institutional Controls

The ROD called for the implementation of ICs to, among other things, limit the property to industrial use and restrict the use of groundwater for potable or process-water purposes without necessary water-quality treatment. The on-property ICs will be incorporated into an environmental easement after the construction of the groundwater remedy has been completed. **Table 1** summarizes the status of the ICs.

Table 1: **Summary of Institutional Controls**

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs needed?	ICs called for in the decision documents?	Impacted Parcel(s)	IC Objective(s)	Title of IC Instrument Implemented and Date (or planned)
Soil	Yes	Yes	Subsite property	Restrict the Subsite property to industrial use; Require compliance with an approved SMP including, among other things, provisions to address on-property SVI considerations; and Require the submittal of periodic certifications of institutional and engineering controls.	Environmental Easement planned for 2018.
Groundwater	Yes	Yes	Subsite property	Restrict groundwater use on the Subsite property without necessary treatment.	

Systems Operation/Operation & Maintenance

Operation and maintenance activities began with completion of the ISS component of the remedy in October 2012. The Subsite is inspected periodically as follows:

- the Subsite property to ensure that remedial-related facilities (monitoring wells, fencing, *etc.*) are secure and have not been subjected to damage or vandalism; and

- groundwater monitoring wells for ease of locating, accessibility, operation of locks, and the condition of the surface seals.

Potential impacts on the Subsite from climate change were assessed. The performance of the remedy is currently not at risk due to the expected effects of climate change in the region near the Subsite.

III. PROGRESS SINCE THE LAST REVIEW

This is the first FYR for the Subsite.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

On November 14, 2016, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at 38 Superfund sites in New York and New Jersey, including the Subsite. The announcement can be found at the following web address:

https://www.epa.gov/sites/production/files/2016-11/documents/five_year_reviews_fy2017_final.pdf

In addition to this notification, a notice of the commencement of the FYR was posted on the EPA's Region 2 website and was sent to local public officials. The notice was provided to the City of Syracuse by email on March 30, 2017, with a request that the notice be posted in the respective municipal offices and on the City of Syracuse's webpage. In addition, the notice was distributed via the NYSDEC's Onondaga Lake News email listserv, which includes approximately 14,000 subscribers. The purpose of the public notice was to inform the community that EPA would be conducting an FYR to ensure that the remedy implemented at the site remains protective of public health and is functioning as designed. The notice included contact information, including addresses and telephone numbers, for questions related to the FYR process.

Once the FYR is completed, the results will be made available at information repositories maintained at the NYSDEC Region 7 Office, 615 Erie Boulevard West, Syracuse, New York; NYSDEC Central Office, 625 Broadway, Albany, New York; Onondaga County Public Library, Syracuse Branch at the Galleries, 447 South Salina Street, Syracuse, New York; and Atlantic States Legal Foundation, 658 West Onondaga Street, Syracuse, New York. In addition, efforts will be made to reach out to local public officials to inform them of the results.

Data Review

The data review is based on information acquired from Subsite investigations during the review period, including groundwater-quality and water-level data from monitoring events.

A monitoring network was established along the Barge Canal/Onondaga Lake shore areas consisting of 38 wells to monitor groundwater that flows into the canal and lake. While all of these wells remain available for monitoring, 26 were selected for post-ROD sampling efforts (monitoring was not required of wells where contaminant levels were consistently below cleanup goals).

Groundwater Monitoring Results

Groundwater monitoring was performed from September 2012 through March 2013 to evaluate, among other things, potential changes to groundwater characteristics following ISS. Field activities included: collecting synoptic groundwater levels on a monthly basis; measuring groundwater field parameters; and (at the conclusion of these efforts) collecting a round of groundwater samples for laboratory analysis.

The synoptic groundwater levels from the monthly (September 2012 through March 2013) gauging events were generally consistent with depths measured during the pre-ISS monitoring event (March 2008). The data indicate that the groundwater flow pattern is consistent with historical patterns, that the horizontal direction of groundwater flow is from the southeastern corner of the Subsite to the northeast toward the Barge Canal and to the northwest toward Onondaga Lake, and that flow directions continue to diverge along a groundwater divide that trends northwest-southeast.

Groundwater field parameters measured during this time period included pH, conductivity, dissolved oxygen (DO), oxidation-reduction potential (ORP), temperature, and turbidity. Field-parameter measurements generally indicate that the pH is elevated (due principally to Solvay wastes) and measures between 8 and 14 standard units; that DO concentrations were generally low, an indication that in-situ micro-organisms would likely utilize anaerobic biodegradation processes; and that ORP measurements indicate that a majority of monitoring locations show reducing conditions (a further indication of the potential presence of biodegradation processes).

Laboratory analytical results from the groundwater-sample collection effort indicate that one or more BTEX compounds were identified in the groundwater samples collected from 21 of the 26 wells at concentrations exceeding New York State Ground Water Quality Standards (Technical & Operational Guidance Series 1.1.1). The BTEX concentrations in 10 monitoring wells (MW-3S, MW-11S, MW-12D, MW-21D, MW-25S/D, MW-26S/D, MW-27S, and MW-32D) are generally less than the concentrations identified in the same wells during the pre-ISS sampling events. The BTEX concentrations in the remaining wells appear to be generally consistent with concentrations identified in the same wells during the previous sampling events. Higher BTEX concentrations tend to persist in monitoring well MW-11D, where benzene, ethylbenzene, toluene, and total xylene were reported at concentrations of 190 micrograms per liter (µg/l), 250 µg/l, 180 µg/l, and 360 µg/l, respectively. Similarly, in monitoring well MW-36D, these same chemical constituents were reported at concentrations of 22 µg/l, 150 µg/l, 340 µg/l, and 1,500 µg/l, respectively. Both of these monitoring wells are located immediately downgradient of the ISS treatment area.

Naphthalene was detected in the groundwater samples collected from 18 of the 26 monitoring wells at concentrations exceeding the 10 µg/l groundwater quality guidance value. The naphthalene concentrations are generally consistent with or less than the concentrations identified in the same wells during the previous sampling events. The highest concentrations of naphthalene for the 2013 sampling event were reported for monitoring wells MW-23S at 3,000 µg/l, MW-36D

at 8,700 µg/l, and MW-11D at 4,000 µg/l. These three wells are located immediately downgradient of the ISS treatment area.

Total cyanide was detected in the groundwater samples collected from 14 of the 26 sampled monitoring wells at concentrations exceeding the 200 µg/l groundwater quality standard. Available cyanide was detected in each of the groundwater samples at concentrations of 0.54 µg/l (estimated) to 110 µg/l. The total and available cyanide concentrations were generally consistent with those identified in the same monitoring wells during the previous sampling events and less than property-wide historical maximum concentrations. The highest concentrations of total cyanide for the 2013 sampling event were reported for monitoring wells MW-23S at 2,300 µg/l, MW-36D at 2,000 µg/l, and MW-11S and MW-24S at 1,100 µg/l. These wells are located immediately downgradient of the ISS treatment area.

Post-ISS groundwater-monitoring results indicated that sulfate concentrations are relatively depleted (less than 100 mg/L) in most deep groundwater monitoring wells. The presence of dissolved methane and sulfide, as well as sulfate depletion, indicate that anaerobic hydrocarbon degradation coupled to sulfate reduction is active at the Subsite. However, the limited availability of sulfate as a terminal electron acceptor may slow degradation rates.

Site Inspection

An inspection of the site was conducted on June 29, 2016. In attendance were EPA RPM Mark Granger; Alma Lowry (representing the Onondaga Nation); Jim Morgan (representing National Grid); and John Brussel and Matt Hysell of Arcadis (National Grid's environmental consultant). The property, former treatment areas, roadways, monitoring wells, and other closure-related facilities were all in satisfactory condition at the time of the inspection.

V. TECHNICAL ASSESSMENT

QUESTION A: *Is the remedy functioning as intended by the decision documents?*

The ROD called for ISS of an estimated 14,500 cy of contaminated soil, enhanced bioremediation of contaminated groundwater along portions of the New York State Barge Canal and Onondaga Lake, and ICs.

The ISS remedy was completed in 2012 and has effectively immobilized the contaminants in the ISS source-area subsurface soil, preventing them from further impacting the groundwater downgradient of this area and preventing ingestion/direct contact. Groundwater trends will be monitored in the future under the SMP.

The bioremediation remedy is under final design and the execution of this remedy along with the proposed monitoring plan, are scheduled to be in place in Fall 2017.

The ICs to, among other things, limit the use of the property to industrial use and restrict the use of groundwater will be incorporated into an environmental easement after the construction of the groundwater remedy has been completed. It is anticipated that the ICs will be in place in 2018 (see **Table 1**, above). In the interim, the property is secured by fencing and is completely occupied by METRO-related buildings, process-facilities, and related infrastructure (fencing, signs, roadways, parking spaces, curbing, landscaping, *etc.*), such that exposure to subsurface soils is obviated (see **Figures 2 and 4**). There are no residential receptors on, or near, the site and the area is served by public water. Due to natural saline conditions, it is unlikely that groundwater would be used for any potable purposes as well. On-property ICs will further restrict the use of untreated groundwater.

QUESTION B: *Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?*

Land use assumptions, exposure assumptions and pathways, and clean-up levels considered in the decision document followed the *Risk Assessment Guidance for Superfund* used by EPA and remain valid. Although specific parameters may have changed since the time the risk assessment was completed, the process that was used remains valid.

The HHRA concluded that exposure to site groundwater (via direct contact during construction activities and residential-potable uses) and sediment (via recreational wading) would result in human health risks and hazards exceeding EPA threshold criteria. Exposure to subsurface soils did not yield risk and/or hazard above EPA benchmarks and surface soils had been excavated and regraded previously. The chemicals that contributed most significantly to the cancer risk and non-cancer hazard were benzene, PAHs (specifically benzo(a)pyrene and naphthalene), and arsenic.

In January 2017, a revised toxicological review of benzo(a)pyrene was incorporated into the EPA Integrated Risk Information System, which included updates to the cancer oral slope factor (SF) and inhalation unit risk (IUR). In addition, an oral reference dose (RfD) and inhalation reference concentration (RfC) for noncancer assessment, unavailable in 2009, when the HHRA was completed, were also included. Both the oral SF and IUR decreased from values used in the 2009 risk assessment, and application of these updated cancer toxicity values results in a risk estimate within the EPA acceptable risk range of 1×10^{-6} to 1×10^{-4} for all exposures to sediment. Furthermore, use of the updated RfD for the ingestion of, and dermal contact with, Subsite sediment does not result in a hazard above EPA thresholds, thereby eliminating sediment exposure as a pathway of concern. Application of these toxicity factors to the soil and groundwater pathways does not significantly impact previously-reported estimates of risk and hazard. As such, there have been no changes in toxicity values that would adversely affect the protectiveness of the remedy.

The current Subsite and surrounding land use is primarily commercial and industrial and is not expected to change in the future.

As a result of the modification to the Onondaga Lake Bottom subsite remedy documented in a 2014 Explanation of Significant Differences (ESD), there is a no dredging/capping buffer zone extending between 130 to 200 feet from the Subsite's shoreline area. This modification was implemented due to concerns about potential shoreline and railroad-line instability in the event dredging or capping were to occur. Although no Subsite-related contaminants of concern were identified in the Barge Canal during the RI, and PAH levels in both the Barge Canal and Onondaga Lake are consistent with the broader legacy of heavy industry surrounding the Subsite, nevertheless PAH concentrations from near-shore sediment, within the 130- to 200-foot buffer zone referenced above, contributed to elevated risk for the adolescent recreational wader (1.77×10^{-4}), narrowly exceeding the EPA acceptable upper bound risk range (1×10^{-4}). Exposure to these sediments is the only potentially-complete pathway at the Subsite; however, use of currently-derived toxicity values for benzo(a)pyrene results in a risk and hazard below acceptable thresholds as previously stated. Nevertheless, public access remains limited due to physical constraints present at the Site as there are no nearby residents and the surrounding development is primarily commercial and industrial. It is also unclear whether this potential exposure is Subsite related due to the former widespread presence of PAHs in Onondaga Lake. Sediment deposition from nearby dredging and capping related construction may overlie contaminated sediments expected to be contacted during wading activities as well. Furthermore, access to lake sediments is separated from the Subsite by an active commercial railroad between Onondaga Lake and the Subsite; a six-foot high chain-link barbed wire fence currently inhibits access between the Subsite and railroad and, therefore, Onondaga Lake. The riparian corridor between the lake and railroad is narrow, steep, and considerably vegetated with a rock-strewn terrain, thus, providing an unfavorable setting for regular recreational wading activities. Therefore, although near-shore sediments have not undergone remedial action, impacts to human health resulting from sediment contact are not expected considering exposure is highly unlikely and that the incorporation of updated benzo(a)pyrene toxicity values reduces risks previously identified below EPA benchmarks.

The results from a 2008 SVI investigation indicated the presence of BTEX and other VOCs typically associated with MGP sites at low levels in soil vapor. The compounds detected were commonly found in products relative to ongoing petroleum and solvent use necessary for normal facility operations in on-site buildings. NYSDEC and NYSDOH subsequently determined that no further actions related to SVI were necessary. Because impacted soils have been treated and because VOC concentrations in the groundwater across the Subsite are generally consistent with, or less than, results from previous sampling events, additional SVI investigations are not necessary.

The RAOs implemented at the time of remedy selection remain valid. Remedial goals established in the ROD included the containment and control of contaminants of potential concern in Subsite soils that come into contact with groundwater and the restoration of groundwater quality to levels which meet drinking water standards. The groundwater cleanup goals remain unchanged since the ROD was finalized. The soil and groundwater remedial goals selected at the time of the decision document remain protective of human health and the environment.

With respect to ecological risk characterization, a screening-level ecological risk assessment (SLERA) was performed for the Subsite. The Subsite is located in an urban industrial setting, including industrial and commercial properties which are associated with large paved parking lots. The SLERA concluded that ecological risks at the Subsite are negligible. There is limited vegetation and little to no viable habitat to support ecological receptors (see **Figures 2 and 4**). Future land use will remain industrial for the foreseeable future. Due to the industrial nature of this Subsite and the lack of adequate habitat, there are no complete terrestrial exposure pathways to ecological receptors. Therefore, the Subsite does not appear to provide any appreciable ecological attractiveness and no ecological function is expected. The assumptions used at the time of the remedy remain valid and no further ecological investigation is warranted to evaluate the potential risks to ecological receptors from exposure to contaminants at this Subsite.

QUESTION C: *Has any other information come to light that could call into question the protectiveness of the remedy?*

There is no new information that could call into question the protectiveness of this remedy.

VI. ISSUES/RECOMMENDATIONS

There are no recommendations or follow-up actions resulting from this FYR.

VII. PROTECTIVENESS STATEMENT

Table 2: Protectiveness Statement

Protectiveness Statement	
Operable Unit:	*Protectiveness Determination:*
OU13	**Will be Protective**
Protectiveness Statement:	
The remedy for OU13 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.	

VIII. NEXT REVIEW

The next FYR report for the Hiawatha Boulevard Former MGP Subsite of the Onondaga Lake Superfund site is required five years from the completion date of this review.

APPENDIX A: FIGURES

Figure 1: Site Location

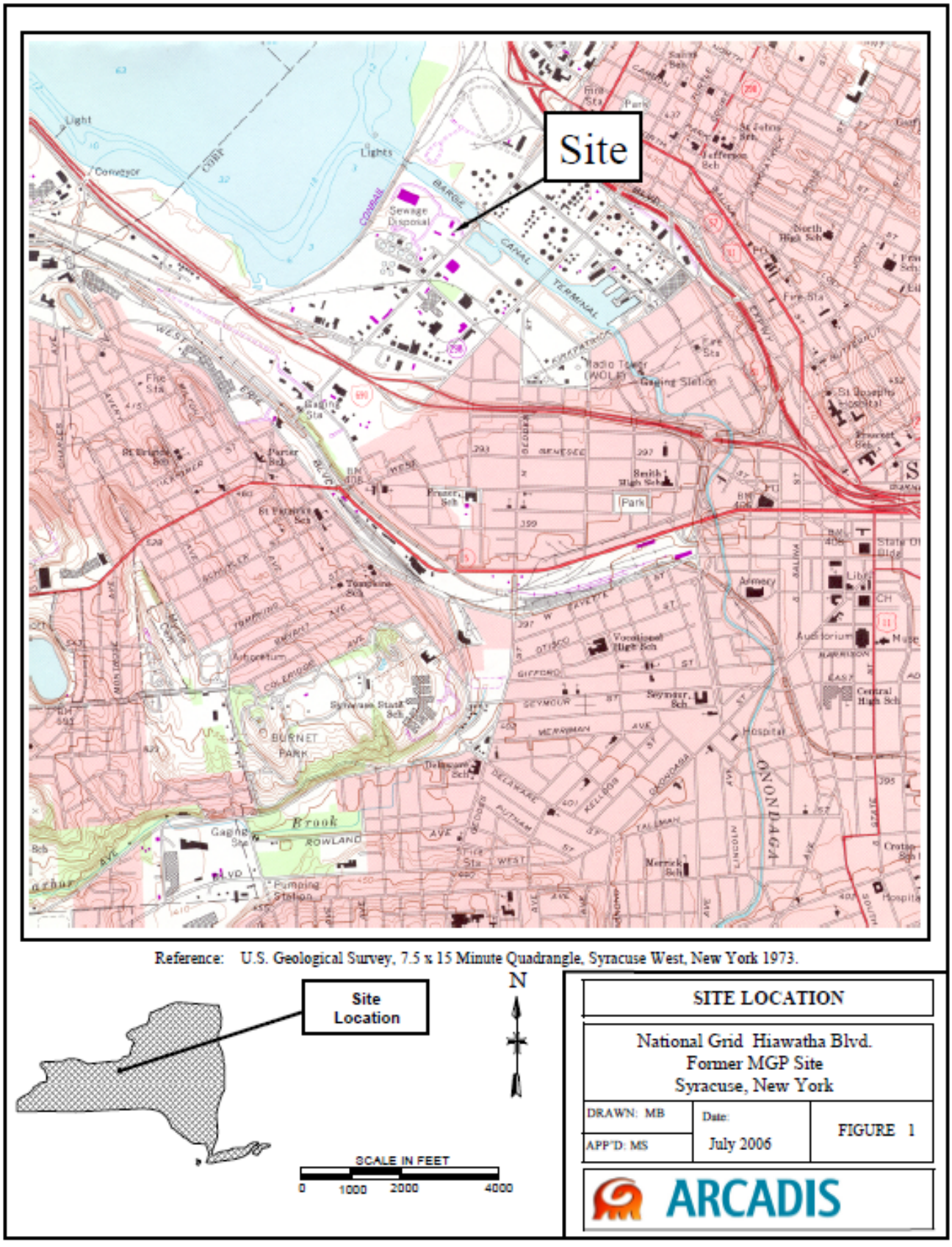


Figure 2: Current Site Layout with Superimposed Former MGP Structures

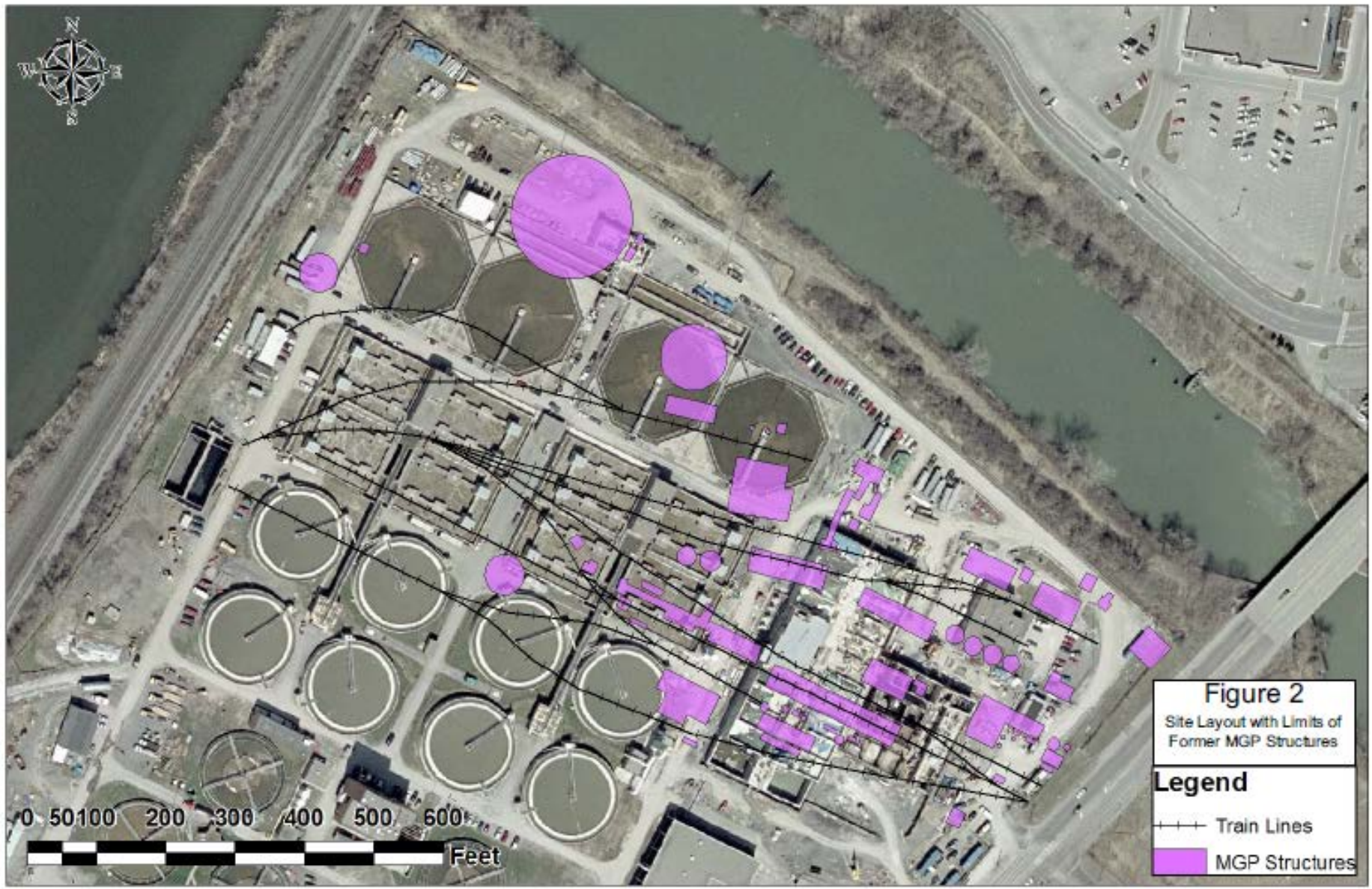


Figure 3: Soil and Groundwater Areas of Concern

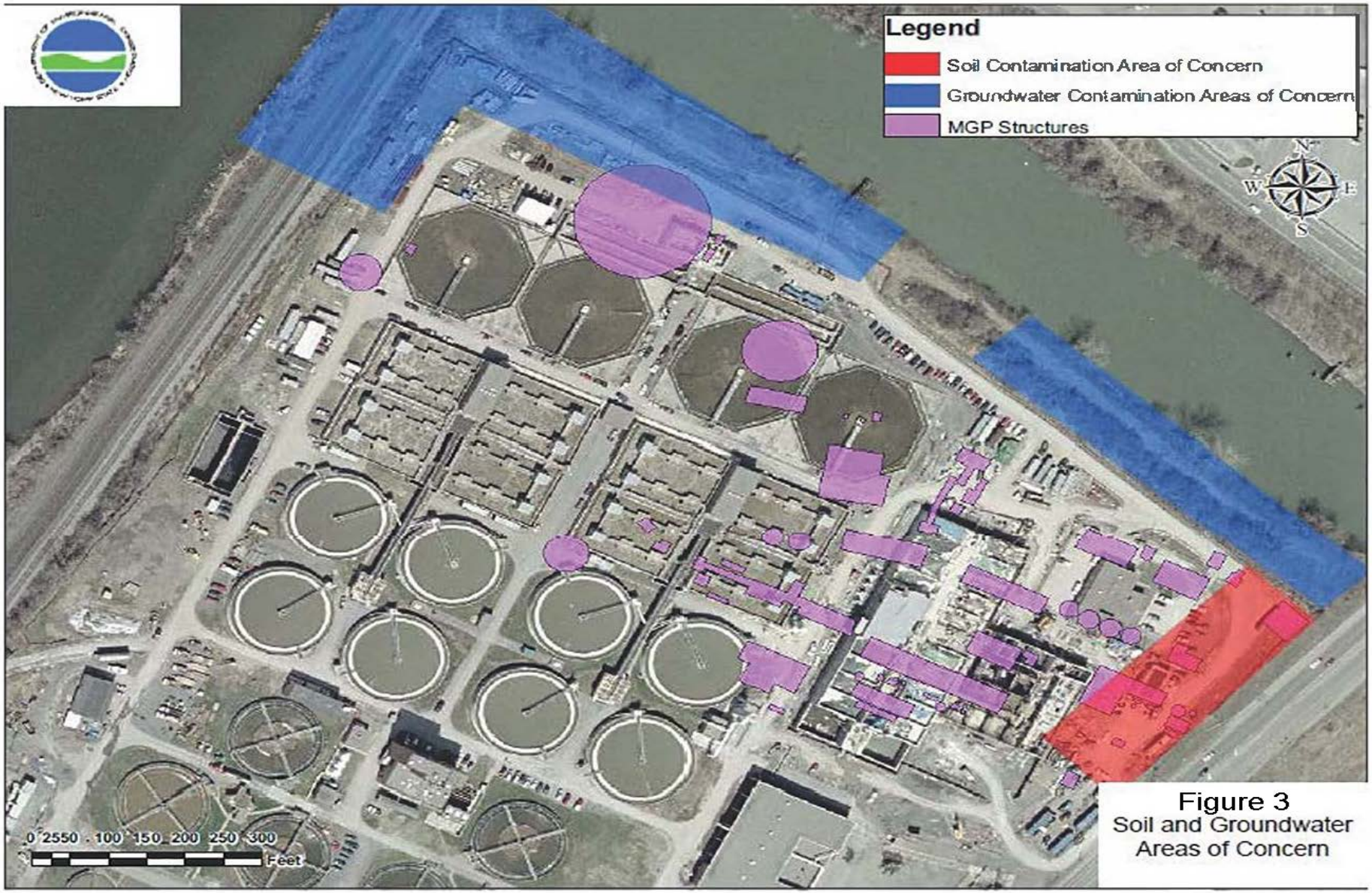
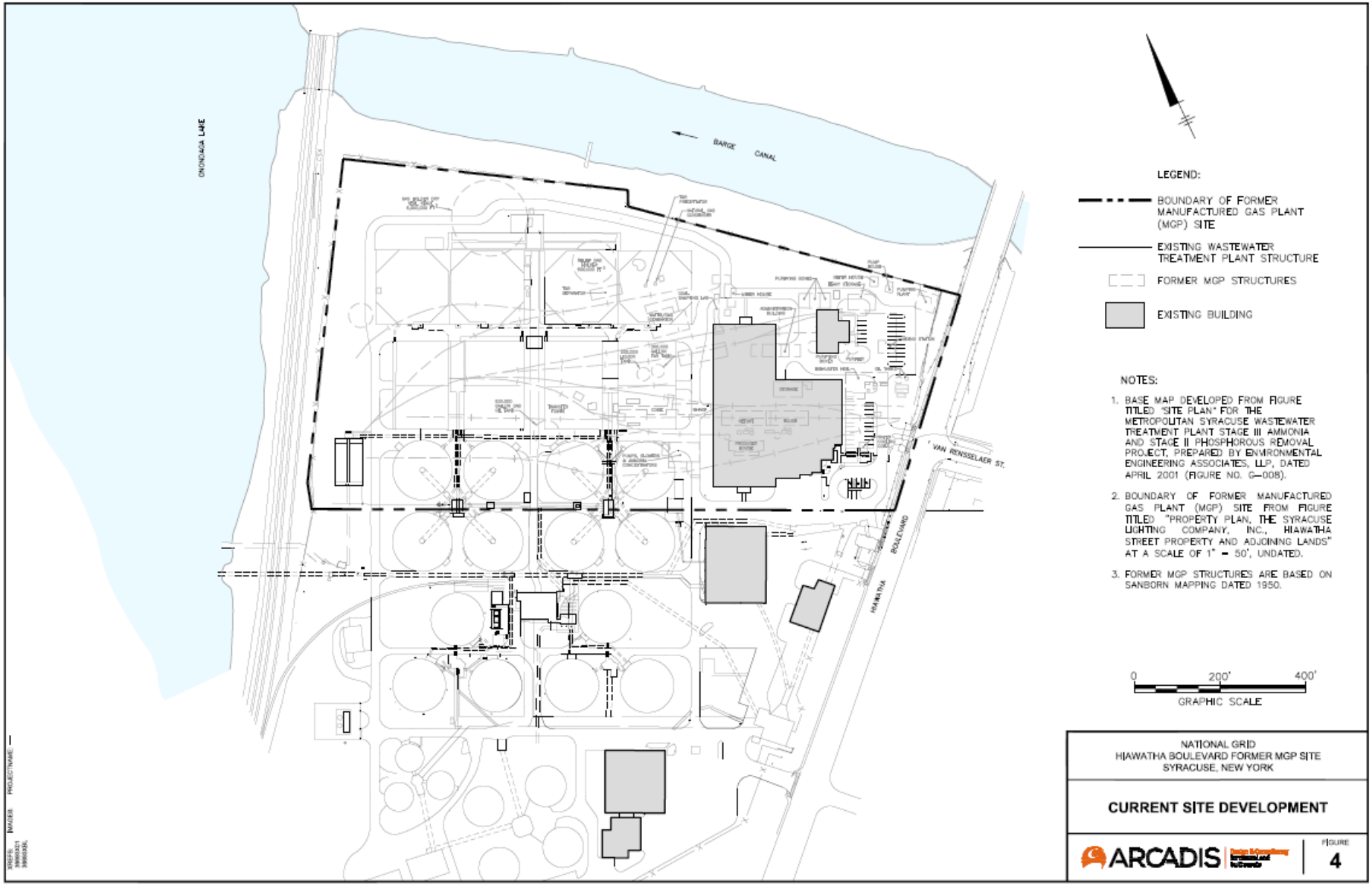


Figure 4: Current Site Development



APPENDIX B: REFERENCES

Arcadis. 2003. *Remedial Investigation Report, Hiawatha Boulevard former MGP Site, Syracuse, New York,* prepared for National Grid (July 2003).

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New York State Department of Environmental Conservation (NYSDEC). 2003. *Order on Consent Index No. A4-0473-0000,* signed by NYSDEC on November 7, 2003.

NYSDEC. 2010. *Record of Decision, Niagara Mohawk (NM) – Hiawatha Boulevard – Syracuse Former MGP Site, Subsite of the Onondaga Lake Site, City of Syracuse, Onondaga County, New York, Site No. 7-34-059.* (March 2010).