FIRST FIVE-YEAR REVIEW REPORT
ONONDAGA LAKE SUPERFUND SITE
SEMET RESIDUE PONDS SUBSITE
ONONDAGA COUNTY, NEW YORK

Prepared by

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

September 2015

Approved by:

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Date: Sept. 24, 2015

Contents

Executive Summary

This is the first five-year review for the Semet Residue Ponds Subsite (Subsite) of the Onondaga Lake Superfund Site, located in the Town of Geddes, Onondaga County, New York. The Subsite is being addressed in two operable units (OUs). The first OU focuses on the Semet pond residue material and highly contaminated groundwater. The second OU relates to the contaminated soil below and in proximity to the ponds. Not all of the components of the selected remedy for OU1 have been implemented; a remedy has not been selected for OU2.

The OU1 remedy (*i.e.,* Semet pond residue material and highly contaminated groundwater) is expected to be protective 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.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Onondaga Lake – Semet Residue Ponds Subsite		
EPA ID: NYD986913580		
Region: 2	**State:** NY	**City/County:** Town of Geddes/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]*:** Click here to enter text.
Author name (Federal or State Project Manager): Thomas Mongelli
Author affiliation: EPA
Review period: 5/13/2010 - 5/13/2015
Date of site inspection: 5/27/2015
Type of review: Statutory
Review number: 1
Triggering action date: 5/13/2010
Due date *(five years after triggering action date)*: 5/13/2015

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
None

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): *1*	**Issue Category: Remedy Performance**			
	Issue: After the signing of the 2002 ROD, it became necessary to re-evaluate remedial alternatives for the Semet residues due to a change in market conditions for the product that was to be created from the Semet residues. Treatability studies have been performed to assess various remedial technologies. The ongoing studies have not yet resulted in a change to the remedy and its implementation.			
	Recommendation: The ongoing studies need to be completed, a technology selected in a decision document modification, and the technology implemented.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	State	9/30/2016

OU PROTECTIVENESS STATEMENT		
Operable Unit: 1	*Protectiveness Determination:* Will be Protective	*Addendum Due Date (if applicable):* N/A
Protectiveness Statement: The remedy at Operable Unit 1 is expected to be protective of human health and the environment upon its completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks.		

Introduction

The purpose of a five-year review 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 and is functioning as intended by the decision documents. The methods, findings, and conclusions of reviews are documented in the five-year review. In addition, five-year review reports identify issues found during the review, if any, and document recommendations to address them.

This is the first five-year review for the Semet Residue Ponds Subsite (Subsite) of the Onondaga Lake Superfund Site (Site), located in the Town of Geddes, Onondaga County, New York. This five-year review was conducted by the Environmental Protection Agency (EPA) Remedial Project Manager (RPM) Thomas Mongelli. The review was conducted pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 U.S.C. §9601 *et seq.* and 40 CFR 300.430(f)(4)(ii), and in accordance with the *Comprehensive Five-Year Review Guidance*, OSWER Directive 9355.7-03B-P (June 2001). This report will become part of the site file.

The triggering action for this statutory review is the start of on-site construction of the Tributary 5A Groundwater Remedial Alternative on May 13, 2010. A five-year review is required at the Subsite due to the fact that hazardous substances, pollutants or contaminants will remain at the Subsite above levels that will allow for unlimited use and unrestricted exposure. The Subsite consists of two operable units (OUs). The first OU, the Semet residue material and impacted groundwater, is addressed in this five-year review. A remedy for the second OU, consisting of contaminated soil below and in proximity to the ponds, has not been selected and will not be addressed in this five-year review.

Site Chronology

See Table 1 for the site chronology.

Background

Physical Characteristics

The approximately 40-acre, triangular-shaped Subsite is located in an industrial area along the southern shore of Onondaga Lake. It is bordered on the west and south by Crucible Industries, LLC (Crucible), on the south by CSX railroad tracks and an industrial complex, on the north by Interstate Route 690 (I-690) and State Fair Boulevard, and on the east by the former Willis Avenue Facility. The Subsite includes five irregularly-shaped former waste disposal ponds with an average depth of 9 feet in Pond 4 and between 2.5 to 4 feet in the other four ponds covering a total of 11 acres and a 12-acre brushy cleared area. There are also two smaller ponds, known as the Stringer Ponds, located adjacent to the southwest side of Ponds 3 and 4. These ponds were created to control leakage along the southern edge of the Subsite. The Subsite was partially used as a settling basin for the disposal of Solvay waste, a non-hazardous, grayish-white material consisting of calcium

carbonate and chlorides which was generated during the manufacture of soda ash using the "Solvay process."

Site Geology/Hydrogeology

The Subsite is located along the southern perimeter of the Ontario Lowlands Physiographic Province adjacent to the Onondaga Escarpment. The escarpment marks the boundary between the Ontario Lowlands and the Appalachian Uplands. Ground elevations range from 363 feet above mean sea level (amsl) at the surface of Onondaga Lake to over 900 feet amsl at the escarpment. The Subsite is located about 30 feet above the level of Onondaga Lake and approximately 20 feet higher than the adjoining land to the west and southeast. The Solvay waste ranges from 30 to 50 feet thick. Gravel, fire brick, ash and concrete are comingled with the Solvay waste. The Semet ponds were then excavated into this Solvay waste. Bedrock beneath the waste bed is Silurian age Vernon Shale. Unconsolidated sediments between the bedrock and the waste layer include (ordered from the bedrock up to ground surface): a 2 foot thick till unit consisting of a clay-silt matrix with some sand to gravel-sized particles; a 1 to 15 foot thick medium-to-coarse grained sand with silt unit; a 2 foot thick layer of coarse grained sand and gravel; fine grained sand and silt layer up to 50 foot thick containing clay layers from 2 to 10 feet thick; freshwater marl up to 12 feet thick; and an up to 2 foot thick layer of dark brown-to-black peat.

Groundwater was found in each of the geological units encountered, with the depth to groundwater ranging from 5 to 15 feet below ground surface (bgs) partially due to the topography. The water table is deepest in the northeast portion of the Subsite. Groundwater can be divided into three distinct units. The shallow hydrogeologic unit immediately surrounding the Subsite consists of the Solvay waste and the underlying marl, has an average thickness of 43 feet, and a hydraulic conductivity of $1x10^{-4}$ centimeters per second (cm/s), approximately one order-of-magnitude lower than the shallow hydrogeologic unit upgradient of the Subsite where the Solvay waste is not present. The intermediate hydrogeologic unit, which includes the native silts and fine-grained sands that extend from the marl to the top of the basal sand, ranges in thickness from 10 to 50 feet, and has an average hydraulic conductivity of $5x10^{-5}$ cm/s. The deep hydrogeologic unit is composed of the basal sand and extends to the bedrock, with a thickness of 10 feet or less. The average hydraulic conductivity of this unit is $3x10^{-4}$ cm/s. Groundwater flow direction is generally radial in the shallow unit and north to northeast toward Onondaga Lake in the intermediate and deep units.

Land and Resource Use

The Subsite is located in an industrial area. There is a plume of contaminated groundwater that originates at the Subsite and migrates toward Onondaga Lake and Tributary 5A. Tributary 5A consists of an approximately 0.8-mile long ditch that is culverted in multiple places prior to discharging into Onondaga Lake. It has a drainage area of approximately 0.85 square miles and receives direct surface water runoff and shallow groundwater discharge from the Subsite, the Willis Avenue Chlorobenzene subsite, Crucible, and the former Church and Dwight Facility. Most of the surface flow is attributable to industrial discharges from 12 State Pollutant Discharge Elimination System permitted outfalls from Crucible. The tributary has two main segments: a south-to-north flowing reach (Reach 1) and a west-to-east flowing reach (Reach 2) that are connected by a culvert flowing under the Crucible employee parking lot.

Storm water runoff from the eastern portion of the Subsite is conveyed to Onondaga Lake via the I-690 storm drain system, which is approximately 2,200 feet long and drains an area of approximately 8.6 acres.

In response to an inquiry by the New York State Department of Environmental Conservation (NYSDEC) regarding the Subsite's reasonably anticipated future land use, the Zoning Board Chairman for the Village of Solvay has indicated that the Village of Solvay had no plans to modify the current industrial zoning of the property. The public water supply used by the Village of Solvay is provided by Onondaga County. There are no plans to use the groundwater at the facility for drinking water purposes.

History of Contamination

From 1917 to 1970, the Semet-Solvay Division of Allied Chemical & Dye Company (predecessor to Honeywell International, Inc.) operated the Semet Residue Ponds as depositories for a tarry, organic-based residue generated by the acid washing of coke light oil during the production of benzene, toluene, naphthalene, xylene and "motor benzol" at its BTX (Benzol) Plant located immediately south of the railroad tracks which are on the southern border of the Subsite. Prior to that time, the area was used as a settling basin for the disposal of Solvay waste, known as Waste Bed A.

The ponds were constructed via drag line and bulldozer excavation into Waste Bed A. Dikes bordering the ponds were reportedly built from fill materials including concrete rubble, old electrolytic cell parts, ashes, cinders, soil, Solvay Waste, bricks, stone, etc. In addition to the Solvay waste material, the area received coarse ash and cinders via conveyer buckets from stoker-fired boilers at the nearby Syracuse Works. A calcium carbonate-rich waste material, which originated from a former ammonium chloride operation, was also disposed of adjacent to Pond 2 prior to 1951. The surface of the ponds are approximately four inches thick and appear as a weathered black to brown granular material. Below the granular material is a highly viscous, black material that resembles tar.

Initial Response

A number of response actions have been undertaken to eliminate the migration of waste material and contaminated groundwater from the Subsite.

Beginning in December 1994, an interim remedial measure (IRM) was initiated requiring the covering of Ponds 3 and 4 in order to mitigate the emission of organic vapors from the ponds. The IRM was modified in 1996 to cover the remaining ponds. The cover, a spray-applied, cement-mortar coating, is reapplied to all five ponds on an annual basis, normally in August.

Between 1996 and 1999, the I-690 storm drain system was evaluated and rehabilitated to isolate contaminants from the Subsite and the adjacent Willis Avenue Chlorobenzene subsite from infiltrating into the storm sewer.

Another IRM was performed between September 2001 and June 2002 which included field investigation tasks (*i.e.,* site reconnaissance, soil sampling, subsurface borings and test pits) to

evaluate the presence and extent of Semet material seeps associated with the five ponds. A temporary cover was placed over the observed seeps to minimize direct contact exposure to humans and ecological receptors. Additionally, plastic and earthen material is placed over these areas annually to minimize odors.

From August 2008 to October 2009, a 1,612-foot long sheetpile barrier wall and groundwater collection system was installed along the perimeter of the Subsite in order to eliminate the discharge of contaminated groundwater and non-aqueous phase liquid to Onondaga Lake. This IRM was completed as one phase of a three-phase, 7,600-foot barrier wall system constructed along the southwest shore of Onondaga lake between 2006 and 2012.

In 2011 and 2012, construction activities were taken as part of the Willis Avenue/Semet Drainage Swale (WSD) Project to prevent the migration of contaminated shallow groundwater into Onondaga Lake. A 1,922-foot long groundwater collection trench was installed under the WSD swale footprint parallel to State Fair Boulevard. The collection trench is approximately 2 feet wide and ranges from 1 to 4 feet deep. The collection trench comprises Type "J" select fill (2 to 4-inch rounded stone) wrapped with filter fabric to prevent clogging and settlement of the fine material above the trench. Approximately 10 feet of slotted pipe was installed at the downstream end of the collection trench and connects the trench to an approximately 20 foot long solid wall pipe. The solid wall pipe conveys the collected groundwater to the Tributary 5A Reach 2 Pump Station where it is eventually treated by the Willis Avenue Groundwater Treatment Plant (GWTP), discussed later in this five-year review. Approximately 430 cubic yards of material was removed from the WSD Project Area to accommodate installation of the groundwater collection system, including 280 cubic yards of material from the Semet portion of the WSD.

Basis for Taking Action

A remedial investigation (RI) to determine the nature and extent of contamination was conducted at the Subsite between 1989 and 1995 and included sampling of groundwater, surface water, sediments, soil, air and waste material.

A total of 15 Subsite-related organic compounds were detected in the groundwater. The volatile organic compounds (VOCs) detected include benzene, which ranged from 1 microgram per liter (µg/L) to 55,000 µg/L; toluene, which ranged from 0.6 µg/L to 3,900 µg/L; xylene, which ranged from 0.6 µg/L to 330 µg/L; and 2-butanone, which had concentrations that ranged from 16 µg/L to 710 µg/L. The NYSDEC ambient water quality standards for Class GA groundwater for benzene, toluene, and xylene are 1.0 µg/L, 5.0 µg/L, and 5.0 µg/L, respectively. The NYSDEC ambient groundwater quality guidance value for 2-butanone is 50 µg/L. These compounds can be traced to the material deposited in the ponds or their breakdown products. Semi-volatile organic compounds (SVOCs) detected include phenol, 2-methylphenol, 4-methylphenol, and 2,4-dimethylphenol at concentrations ranging from 2 µg/L to 10,000 µg/L; naphthalene at concentrations ranging from 3 µg/L to 1,100 µg/L; and isophorone at concentrations of 3 and 6 µg/L. The NYSDEC ambient water quality standards for Class GA groundwater for total phenolic compounds is 1.0 µg/L and the ambient water quality guidance values for naphthalene and isophorone are 10 µg/L and 50 µg/L, respectively.

Surface water samples were collected in Onondaga Lake and Tributary 5A during the RI. The samples contained benzene at concentrations ranging from 87 to 110 µg/L in Onondaga Lake and from 18 to 110 µg/L in Tributary 5A. These values exceeded the NYSDEC ambient water quality standard of 10 µg/L for human consumption of fish in Onondaga Lake's Class C waters. The reported groundwater benzene concentration of 55,000 µg/L exceeded the NYSDEC 1998 Water Quality Criterion (WQC) for fish propagation protection of 210 µg/L. The reported toluene groundwater concentration of 3,900 µg/L exceeded the WQC of 100 µg/L. The reported naphthalene concentration of 1,100 exceeded the WQC of 13 µg/L.

The benzene concentration in lake sediment of 16,000 micrograms per kilogram (µg/kg) exceeded the NYSDEC human health bioaccumulation sediment criteria of 18.0 µg/kg. This benzene concentration also exceeded the benthic Class A, B, and C sediment guidance values of <530 µg/kg, 530-1,900 µg/kg, and >1,900 µg/kg, respectively.

Air samples were collected as part of the RI and analyzed for select VOCs and SVOCs. Samples were collected from upwind, on-site, and downwind. Higher VOC concentrations were detected upwind of the Subsite. Benzene was detected upwind at 1.28 micrograms per cubic meter (µg/m^3) and downwind at 0.51 µg/m^3. Toluene was detected upwind at 0.82 µg/m^3 and downwind at 0.43 µg/m^3. Xylene was detected upwind at 0.38 µg/m^3 and downwind at 0.12 µg/m^3. The RI concluded that since downwind concentrations of the above-noted compounds are less than those upwind, the Subsite is not contributing to ambient air concentrations of these compounds.

The residues in the five ponds consist of an organic phase and an acid phase. The organic phase is composed of more than 100 organic compounds, primarily aromatic hydrocarbons, substituted aromatic hydrocarbons, alkanes, substituted alkanes, polyaromatic hydrocarbons, aldehydes, and ketones. Benzene, toluene, xylene, and naphthalene were found to comprise up to 10% of the organic phase of the pond residues. The acid phase of the pond residues is highly acidic with a pH between 1 and 2.6. Based on 6 NYCRR Part 371, this phase is considered to be characteristic hazardous waste as defined by the Resource Conservation and Recovery Act due to its high acid content and a pH less than 2. Therefore, because of the significant toxicity posed by the high acid content and low pH, the residue in the five ponds is a principal threat.

The primary exposure scenario that represents a potential risk to human health involved trespassers who directly contact the pond residue. Direct contact with the pond residue was identified as a primary acute hazard which would result in burns to the skin which could have severe, and potentially fatal effects, due to its acid content (pH of 1 to 2.6). The likelihood of this exposure scenario has been reduced since a six-foot chain-link fence limits access to the Subsite.

Due to its acid content, there exists a significant risk to wildlife should they come in contact with the pond residue. Based upon the use of forage plant uptake factors for benzene from the soil, the concentration of benzene present in the pond residue, and the consideration of a white-footed mouse as a receptor, it was determined that there is a potential ingestion risk to a terrestrial herbivore and higher species. It was also determined that there is a potential risk to vegetation present. In addition, as with human exposure, wildlife coming in direct contact with the pond residue would suffer burns, which could have severe, and potentially fatal effects.

Remedial Actions

Remedy Selection

A Record of Decision (ROD) for OU1 was signed in March 2002. The major components of the selected remedy include the following:

- Excavation and reuse of the material present in the ponds. Specifically, the material will be excavated and processed on-site, primarily for use in the production of a soft tar product (RT-12), which will be used to make driveway sealer at an off-site location;
- Seeps of pond residue material that exist at and in the vicinity of the Subsite including, but not limited to, areas to the north of the Subsite adjacent to the Semet Residue Ponds and south of the Subsite adjacent to the railroad tracks will be covered until the materials are remediated to prevent human or wildlife exposure. The seep materials will be processed to produce RT-12 if this is found to be feasible. Otherwise, the materials will be addressed under a separate OU;
- Installation of a stone-filled shallow groundwater collection trench to prevent groundwater discharges to Tributary 5A and a watertight sheet pile wall, collection trench, and groundwater extraction wells to prevent groundwater discharges to Onondaga Lake;
- Installation of a treatment facility at the Subsite to process wastewater and groundwater collected from the RT-12 processing plant and the groundwater collection system, respectively;
- Maintenance of the existing temporary covers and fencing to limit human and wildlife exposures to contaminated soils and residues while the Semet pond residue is being excavated and processed;
- Implementation of institutional controls (*i.e.,* deed restrictions) to restrict on-site groundwater use;
- Implementation of institutional controls to prevent human exposure to contaminated soils and residues until the pond residue components of the selected remedy are completed; and
- Long-term monitoring of the groundwater.

The remedial action objectives (RAOs) identified in the ROD were established as follows:

- Prevent direct contact (human and wildlife) with the pond residue;
- Reduce volatile emissions from the pond residue; and
- Eliminate, to the extent practicable, migration of groundwater to Onondaga Lake and Tributary 5A that does not attain applicable state and federal water quality criteria for site-related constituents.

No RAOs for groundwater were identified because the Subsite is affected by and commingled with the groundwater contamination emanating from the adjacent Willis Avenue Chlorobenzene subsite, no decision can be made as to whether or not groundwater quality standards can be achieved until a plan for remedial action is developed for the Willis Avenue Chlorobenzene subsite. The aquifer is classified as Class GA (6 NYCRR 701.18) which makes it a potable resource.

Remedy Implementation

Groundwater

Remedial actions to eliminate the migration of contaminated groundwater were described in the December 2008 NYSDEC-approved 95% Remedial Design Report, Semet Residue Ponds Groundwater Remedial Alternative as modified by correspondence dated August 31, 2009 and November 20, 2009. The major elements of this remedial design are:

- Construction of a shallow sand-filled groundwater collection trench with a slotted Fiberglass Reinforced Plastic (FRP) groundwater collection pipe;
- Construction of two groundwater pump stations (GWPSs) designed to convey collected groundwater to the Willis Avenue GWTP;
- Installation of an FRP pipe and Ductile Iron Pipe (DIP) force main;
- Excavation and relocation of Semet material from the Stringer Ponds;
- Excavation and relocation of material from within the Tributary 5A limits;
- Installation of an isolation layer and placement of material within the Tributary 5A limits;
- Culvert cleaning and inspection; and
- Site grading and restoration of the tributary banks and channel.

Remedial activities associated with the above-described remedial design began with a pre-construction meeting on May 13, 2010.

The groundwater collection system includes a six-inch slotted FRP collection pipe buried in sand trenches under, or adjacent to, Tributary 5A. The trenches discharge to pump stations designed to pump collected groundwater to the Willis Avenue GWTP at an estimated flow rate of 40 gallons per minute.

An isolation layer was constructed over the groundwater collection trench and beneath the Tributary 5A stream bed with the primary objective to minimize the potential of discharge of contaminated groundwater into the tributary and subsequently into Onondaga Lake. The layer also minimizes the potential for migration of contaminated sediments into Onondaga Lake and the potential for surface water to enter the collection trench. While Tributary 5A sediment contamination is being addressed as part of the Willis Avenue Chlorobenzene subsite, in order to allow for the placement of this isolation layer, material was excavated from within the tributary limits and relocated on-site.

During installation of the groundwater collection trench conveyance piping, Semet material located in the Stringer Ponds was excavated and relocated to Semet Residue Pond 2. The Stringer Ponds are located between the Semet Residue Ponds and Reach 1. Approximately 5,200 cubic yards of material were removed from the Stringer Ponds.

As part of the remedial activities, a 60-inch culvert between Reach 2 and Onondaga Lake and a 72-inch culvert connecting Reach 1 and Reach 2 were inspected. Sediment was removed from the 60-inch culvert using high pressure water from a jet truck commencing at the Reach 2 inlet and working toward Onondaga Lake. Cleaning of the 72-inch culvert was completed via manual

excavation and hydraulic flushing. Sediment from both culverts was collected and relocated on-site. After removing sediment from the 72-inch culvert, it was observed that its deteriorated condition allowed for groundwater infiltration. As a result, the existing 72-inch corrugated metal pipe was replaced by a 72-inch centrifugally cast fiberglass polymer mortar pipe.

Site restoration included placement of a minimum of six inches of topsoil to achieve the final designed grade at the Subsite along with seeding with a seed mix indigenous to the area to minimize erosion. Fencing and asphalt surfaces disturbed during construction were replaced. Approximately 12,880 cubic yards of material was excavated from within the Tributary 5A boundary, consolidated at the Willis Avenue staging area, graded into a single pile, and seeded. Erosion control fencing was subsequently replaced with a wood chip control berm. Similarly, approximately 9,600 cubic yards of non-tributary material was excavated during the construction of the pump stations and the 72-inch culvert replacement. These non-tributary wastes were consolidated at the Semet staging area, graded into a single pile, covered with six inches of topsoil and seeded.

Semet Pond Material

As noted previously, the ROD called for the excavation and on-site processing of Semet material into a driveway sealer known as RT-12. This portion of the selected remedy was largely based on a 1999 Petition for Beneficial Use Determination (BUD) that was approved by NYSDEC in January 2002. However, after the signing of the ROD, it became necessary to re-evaluate remedial alternatives for the Semet residues due to a change in market conditions for RT-12. This re-evaluation included a fuel recycling pilot study that was completed in 2005. The results of this study were documented in a March 2005 Synthetic Fuel Recycle Pilot Program report, a July 2006 Focused Feasibility Study (FFS) and a second BUD that was finalized in August 2006. The 2006 BUD proposed an on-site treatment process using a rotary distiller to separate the Semet residue into two products--a liquid consisting largely of benzene, toluene and xylene to be used as a feed stock for benzene-derived products and a solid, called Semet heel, to be used as a commercial fuel product, with properties similar to that of coal.

In 2009, a volume verification investigation was conducted as a pre-remedial design activity to more accurately estimate the volume of Semet residue in order to allow proper sizing of remedial components. The volume verification investigation indicated less volume of Semet residue (approximately 21.1 million gallons) than initially estimated (between 50 and 80 million gallons), necessitating further volume refinement prior to implementation of remedial design/remedial action activities. A pre-design investigation was conducted in 2010 to refine the estimated volume of Semet residue, which confirmed a lower volume than assumed in the 2006 FFS. An FFS amendment was subsequently initiated in order to conduct a revised evaluation of remedial alternatives for the Semet residue. The FFS amendment concluded that two alternatives, on-site distillation for beneficial reuse and off-site thermal treatment/reuse, should be further evaluated prior to identifying an alternative remedial alternative. At an October 2010 meeting with NYSDEC, Honeywell proposed to perform treatability studies to reduce uncertainties in the implementation of two potential remedial alternatives.

A Semet Residue Characterization for Thermal Treatment Remedy Selection Treatability Study (RSTS) was conducted to provide a range of dewatered Semet residue samples to off-site thermal

treatment facilities for evaluation, characterize a range of dewatered Semet residue samples for evaluation of on-site distillation for beneficial reuse and to identify target compounds for future air monitoring programs. Samples were collected in December 2010. Analytical data indicated that Ponds 3 and 4 contain a higher fraction of light hydrocarbons than Ponds 1, 2 and 5. While the generic New York State Department of Health guideline for acceptable perimeter limits for total VOCs in air is 5 parts per million (ppm) via a photoionization detector, air monitoring data revealed that the primary (approximately 66%) VOC constituent was benzene, which has a short-term guideline of 0.4 ppm. Therefore, a project specific VOC perimeter limit of 1.2 ppm was proposed for the Subsite and approved by NYSDEC for subsequent treatability studies.

A Cold and Hot Weather RSTS was conducted between April 5, 2011 and May 27, 2011 (cold weather) and between July 11, 2011 and July 25, 2011 (hot weather) to identify differences in material handling properties and fugitive emission rates attributed to ambient temperature conditions. This RSTS concluded, among other things, that density, moisture content, emissions potential, and viscosity of Semet residue varied from pond to pond and between the cold weather and hot weather studies, free liquid collected could be removed using a dewatering screw conveyor to allow for off-site shipment, and that further full-scale testing was necessary. An Expanded RSTS (ERSTS) was therefore conducted from July to October 2012 (hot trial), January to February 2013 (below freezing trial), and March to June 2013 (thaw trial). During the ERSTS, Semet residue from Ponds 1, 2, 5, and the Stringer Ponds were directly loaded to double-lined shipping containers during the hot trial and portions of the thaw trial when no free aqueous phase was observed at rates ranging from 10 to 90 tons per hour (tph) and averaging 40 tph. Excavation rates for Ponds 3 and 4 were limited by the dewatering rate to between 1 and 5 tph. Approximately 532 tons of material were excavated and shipped to off-site vendors for testing as a potential fuel product. The ERSTS also determined that treatment of aqueous phase was technically feasible at the Willis Avenue GWTP.

A Demonstration Program was undertaken in 2014 in order to provide further refinement of treatment options for the Semet residue. Removal, direct loading, and shipment of Semet residue from Ponds 2 and 5 were performed from July 30, 2014 to December 5, 2014. A total of 3,178 tons of material (2,946 tons from Pond 2 and 232 tons from Pond 5) were shipped to Green America Recycling, LLC located in Hannibal, Missouri. Full-scale loading of material, up to five trailers per day, was achieved due to a lack of free aqueous phase in these ponds. A newly designed dewatering screw was set up and tested at Pond 3 between October 27, 2014 and November 10, 2014. The dewatering screw was able to produce a shippable product, but only at a lower throughput than anticipated. Modifications to the system were designed but were unable to be tested due to temperature constraints. Additional trials are planned to confirm these modifications will allow operation of the dewatering screw at higher speeds and throughput. If confirmed, it is anticipated that these modifications will be memorialized in an amendment to the ROD.

System Operations/Operation and Maintenance

The operation of the Tributary 5A collection system consists of the automatic control of the wet well submersible pumps and the monitoring of the collection pipe line and force main. The pumps are operated based on the groundwater level within the wet wells as measured by a submersible level transducer. The pump stations are designed to operate at a constant level set below the invert of the LLDPE liner.

The Operations and Maintenance Plan originally called for weekly inspections focusing on preventative maintenance, groundwater collection system maintenance, pump station maintenance, and restored area maintenance. Some items included in these inspections are site security inspections, pump operation inspections, inspection and cleaning of observation ports, collection pipes, and force mains, cleaning of pumps and wet wells, mowing, reseeding, etc.

Site monitoring and verification includes evaluation of the collection trench for the presence of contaminated overburden groundwater discharged to Tributary 5A. To document an inward hydraulic gradient for groundwater control, groundwater elevations are measured at observation ports along Reach 1 and Reach 2. Monitoring also includes annual sampling of six sediment and surface water locations, as well as monitoring of vegetation and tributary channels. One sediment and surface water sampling location was added in 2014 at the outfall of the 60-inch culvert connecting Reach 2 to Onondaga Lake.

Air monitoring associated with the 2014 Demonstration Program was conducted at or within the Subsite perimeter and consisted of real-time continuous monitoring for total VOCs (TVOCs) and dust (PM_{10}), and routine periodic (grab) air monitoring for hydrogen sulfide (H_2S) and odors. One of the conditions requested by the NYSDEC in their acceptance of the full-scale Demonstration Program Community Air Monitoring Plan was that corrective actions to reduce odors not be predicated on quantitative odor measurements [such as odors greater than 7 odor units, as proposed] but rather on "excessive odors [that] are observed to be migrating off-site." Therefore, corrective actions were initiated when odors increased above typical levels and had the potential to migrate at those levels off-site. Air monitoring limits are summarized in Table 4.

Evaluation of the overall vegetative establishment indicates that restoration efforts continue to be successful. Tributary 5A continues to meet the vegetative cover, invasive species, and shrub survival performance standards identified in the Tributary 5A Groundwater Remedial Alternative Monitoring and Verification Plan of 85%, less than 5%, and 90%, respectively. Tributary banks and channels are largely in stable condition with the exception of small, localized areas of sloughing and erosion. Corrective actions such as placement of additional rip-rap and topsoil and regrading and reseeding of impacted areas are underway or scheduled to be completed in late summer 2015. Seven Semet material seeps were observed in 2014 and were collected and transported to Semet Residue Pond 4. The exposed areas were covered with poly-sheeting and stone.

Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to the expected effects of climate change in the region and near the Subsite.

Progress Since Last Five-Year Review

This is the first five-year review for the Subsite.

Five-Year Review Process

Administrative Components

The five-year review team included Thomas Mongelli (EPA-RPM), Ed Modica (EPA-Hydrologist), Chloe Metz (EPA-Human Health Risk Assessor), Mindy Pensak (EPA-Ecological Risk Assessor) and Larisa Romanowski (EPA-Community Involvement Coordinator). This is a PRP-lead site.

Community Involvement

A notice of the commencement of the five-year review was posted on the EPA's website and sent to local public officials.

Once the five-year review is completed, the results will be made available at the site repositories, which are the Atlantic States Legal Foundation Depository Library, 658 West Onondaga Street, Syracuse, New York 13204-3711, the Onondaga County Public Library, Central Branch at the Galleries, 447 South Salina Street, Syracuse, New York 13202, the Solvay Library, 615 Woods Road, Solvay, New York 13209, the New York State Department of Environmental Conservation, 625 Broadway, Albany, New York 12233-7016, and the New York State Department of Environmental Conservation, Region 7, 615 Erie Boulevard West, Syracuse, New York 13204-2400. In addition, efforts will be made to reach out to local public officials to inform them of the results.

Document Review

The documents, data and information which were reviewed in completing this five-year review are summarized in Table 3.

Data Review

<u>Groundwater</u>

Initial performance verification of the groundwater collection system began in October 2013 with an initial performance criterion of maintaining groundwater elevations below the isolation layer liner invert elevation and an operational criterion of maintaining groundwater elevations below the bottom elevation of Tributary 5A. Groundwater elevations in 2013 were consistently below the operational criterion at all six monitoring locations with the exception of spikes at monitoring location R1CO-1 (See Figure 1) on October 22, November 14, and November 25, 2013. Additionally, due to the fact that groundwater elevations at three monitoring locations (R1CO-1, R1OM-5, and R2OM-1) were consistently above the performance criterion, yet still below the operational criterion, it was decided that the initial performance verification of the groundwater collection system would continue in 2014.

Groundwater elevation data collected in 2014 showed a general increasing trend. Groundwater elevations in Reach 1 were consistently observed to be above the liner invert, tributary invert, and surface water elevations at locations R1CO-1 and R1OM-5 beginning in late February 2014. Following cleaning and flushing of the collection system piping on September 30, 2014,

groundwater elevations decreased below the liner invert at R1OM-5 and above the liner invert but below the tributary invert at R1CO-1. Following the collection pipe flushing, Reach 1 monitoring locations were compliant with the performance criterion over 70% of the time with non-compliant elevations typically coinciding with collection system maintenance shutdowns. Groundwater elevations in Reach 2 were compliant over 94% of the time in 2014. At location R2CO-1, numerous groundwater elevation spikes were observed beginning in March 2014 that exceeded surface water elevations. The frequency of these spikes reduced following the repair of a 42-inch sanitary sewer that was observed to have water overflowing during rainfall events. Groundwater elevations at R2OM-1 were consistently above the liner invert but below the tributary invert. However, the monitoring location was adjacent to a culverted section of the tributary and at a higher elevation than the nearby liner invert. After moving the monitoring location to R2CO-3, the next downstream cleanout, groundwater elevations were consistently below the liner invert. Groundwater elevation data at monitoring location R2CO-8, was consistently below the liner invert. See Figure 1 for groundwater monitoring locations.

Groundwater samples are not collected for analysis purposes, as the ROD called for a containment remedy and since the Subsite is affected by and commingled with the groundwater contamination emanating from the adjacent Willis Avenue Chlorobenzene subsite, no decision can be made as to whether or not groundwater quality standards can be achieved until a plan for remedial action is developed for the Willis Avenue Chlorobenzene subsite. Groundwater is collected and treated by the Willis Avenue GWTP. Since remedial activities have not been conducted to address the Semet residue material, it is reasonable to assume that groundwater contamination concentrations are similar to those found during the RI and discussed earlier in this report.

Surface Water

VOCs were detected in four of the five surface water sampling locations that were monitored in 2013 and in all six locations monitored in 2014. However, no VOCs were detected above NYSDEC Class C Surface Water Standard and Guidance Values. The maximum VOC detection in 2013 was benzene at 6.9 µg/L and the maximum VOC detection in 2014 was chloroform at 3.6 µg/L. SVOCs were not detected in either 2013 or 2014. In 2013, aluminum, cobalt, and iron concentrations exceeded New York State Class C Surface Water Standard and Guidance Values in at least one location. In 2014, aluminum and vanadium exceeded these standards. None of these metals are associated with the Subsite and are entering the tributary from an off-site source, most likely from outfalls from the Crucible facility.[1] See Figure 2 for surface water sampling locations.

[1] A Consent Order was signed between the NYSDEC and Crucible on January 9, 2015, requiring the implementation of temporary measures, including placement of booms and sweeps near outfalls, as well as investigation of the source of contamination and additional sampling, cleaning, and rehabilitation of the storm lines leading to the outfalls if effluent samples or inspections indicate that the storm lines continue to be a source of contamination to Tributary 5A. Sampling will continue on a semiannual basis until a reasonable determination can be made by the NYSDEC that there is no further discharge of contaminants to the tributary from Crucible. Crucible is also required to improve oil removal performance at their wastewater treatment plant and perform additional sampling, remediation, and restoration of Tributary 5A that have resulted from the discharge of contaminants from their facility. Crucible is expected to meet Unrestricted Use Soil Cleanup Objectives in the Tributary 5A sediment. Any remediation and restoration measures undertaken by Crucible must be completed in a way so as not to impact or damage the remediation fixtures (*i.e.,* the liner, groundwater collection system, etc.) already installed by Honeywell.

Based on the decrease in surface water VOC and SVOC concentrations, it appears that the groundwater trench is effectively containing the Semet residue plume.

Sediment

Actions taken to date for the OU1 remedy mitigate the release of contaminated groundwater and overland transport of Subsite contaminants to Tributary 5A, but the final remediation of Tributary 5A sediments awaits the selection and implementation of a remedy for the Willis Avenue Chlorobenzene subsite, along with NYSDEC-directed response actions at Crucible. Sediment samples collected as part of the Subsite's monitoring program are for the limited purpose of assessing the performance of the Subsite remedy. NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives were used to assess the performance in this monitoring effort. [2]

VOCs were detected in all five sediment samples collected in 2013 and all six samples collected in 2014. In both years, acetone was the only VOC to exceed its NYSDEC Part 375 Unrestricted Use Soil Cleanup Objective at a maximum concentration of 143 µg/kg in 2013. SVOCs were detected in all five sediment samples collected in 2013 and five of the six samples collected in 2014. The highest SVOC concentration detected in 2013 was phenanthrene with a concentration of 26,900 µg/kg, and the highest SVOC concentration detected in 2014 was fluoranthene with a concentration of 27,000 µg/kg; both exceeded their NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives. Six other SVOCs exceeded their NYSDEC Part 375 Unrestricted Use Soil Cleanup Objective in 2014, including five which also exceeded their soil cleanup objective in 2013. Inorganic contaminants including barium, chromium, copper, lead, manganese, mercury, nickel, and zinc were also detected at concentrations above their NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives. Chromium, copper, mercury, and silver also exceeded their NYSDEC Freshwater Sediment Guidance Values for Class C sediments. Non-halogenated organics including diesel range, oil range, and, in 2014, gasoline range organics were detected in multiple sediment samples. Diesel range organics were detected in the highest concentration both years at 4,630,000 µg/kg and 4,800,000 µg/kg in 2013 and 2014, respectively. None of the sediment contaminants observed above their respective soil cleanup objectives are associated with the Subsite and are entering the tributary from off-site sources, such as from the adjacent Willis Avenue Chlorobenze subsite and outfalls from the Crucible facility (see Footnote 1). See Figure 2 for sediment sampling locations.

Air

As part of the 2014 Demonstration Program, community air monitoring was conducted a total of 61 days during excavation/intrusive work and/or dewatering operations, and no control level or work perimeter limit exceedances were observed for either TVOCs, PM_{10}, or H_2S.

The community air monitoring program also assessed potential nuisance odors that might result

[2] Soil brought on-site as part of the Tributary 5A Groundwater Remedial Alternative remedial action was screened against NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives to ensure that contaminated materials were not being placed on-site, making these values the appropriate screening values to ensure that groundwater contaminants are not being discharged to surface water and the OU1 groundwater remedial action remains effective. Any future remediation of Tributary 5A sediment by Honeywell will take place as part of the Willis Avenue Chlorobenzene subsite remedial action.

from the demonstration program activities. Odors were normally measured at or below 2 "odor units[3]," and this quantitative measure of odor was established as a baseline, or "typical" level. Occasional exceedances of "typical" odor levels during intrusive activities were quickly addressed.

Site Inspection

The inspection of the Subsite was conducted on May 27, 2015. In attendance were Thomas Mongelli and Robert Nunes of EPA; Tracy Smith, Valerie Ellis, Tara Blum and Val Murakami of NYSDEC; Curtis Waterman, Thane Joyal, Alma Lowry and Leigh Preston representing the Onondaga Nation; and Paul Shultz, Ethan Shapiro and Dave Edwards of O'Brien & Gere and Steve Miller of Parsons, contractors for Honeywell.

During the inspection, several areas of minor erosion were noted along Reach 1 of Tributary 5A. O'Brien & Gere is aware of the issue and repair work is planned. A large number of phragmites were also noted approaching the downstream end of Reach 1 near the 72-inch culvert. Removal of the phragmites is planned for the end of summer 2015. Semet material odors were present during the walkthrough of the ponds but were not present elsewhere on-site.

Interviews

No interviews were conducted for this five-year review, other than those discussions that took place during the site inspection. Due to the fact that work is ongoing, all stakeholders maintain regular contact.

Institutional Controls Verification

Institutional controls to restrict the use of on-site groundwater are required as part of the remedy selected in the ROD. These institutional controls are not yet in place, but will be implemented after the completion of all construction activities associated with the selected remedy. The ROD also called for the "implementation of institutional controls to prevent human exposure to contaminated soils and residues until the pond residue components of the selected remedy are completed." While an institutional control is not in place, human exposure is being prevented by an engineering control (*i.e.,* the site perimeter fence).

Technical Assessment

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

The implemented component of the remedy (*i.e.,* the groundwater remedial alternative) is functioning as intended by the ROD. Although there has been a general increasing trend in groundwater elevations from 2013 to 2014, implemented maintenance measures including cleaning and flushing of the collection system piping have brought the groundwater elevation levels back into compliance with the performance criterion of being below the elevation of the liner invert over 70% of the time in Reach 1 and 94% of the time in Reach 2. The majority of non-

[3] "Odor units" are defined as the ratio of the volume of carbon filtered air to the volume of odorous ambient air needed to make an odor non-detectable. These measurements were made using a real-time field olfactometer.

compliance elevations are related to system maintenance shutdowns. To date, approximately 20 million gallons of groundwater were collected and treated at the Willis Avenue GWTP.

As noted previously in this report, several inorganic contaminants were found to exceed their respective NYSDEC Class C Surface Water Standard and Guidance Values and NYSDEC Freshwater Sediment Guidance Values, while NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives were exceeded for one VOC and several SVOCs, inorganic contaminants, and non-halogenated organic contaminants in sediment. However, none of these exceedances are associated with Subsite-related contaminants. Based on the locations of the observed exceedances, the Crucible outfalls located between monitoring locations T5A-SW/SED-16 and T5A-SW/SED-17 were determined to be the likely source.

Semet material emission control measures appear to be working as intended. There were no odor complaints received during the 61 days of monitoring during the 2014 Demonstration Program, and when odors increased above typical levels, they were quickly controlled by the application of a spray cover or dissipated by cessation of excavation. A fiber-based spray cover was applied to the excavation area at the end of the work day and as needed consistent with the ERSTS. Cracks in the Pond surfaces were also sprayed to reduce the potential for background readings. The surfaces of dump trailers were also sprayed with a fiber-based spray cover prior to sealing for transport to minimize odors/emissions.

Institutional controls are not yet in place at the Subsite. They are planned to be implemented after the completion of construction activities associated with the remedy selected in the ROD. In the interim, engineering controls are in place to prevent exposure to site-related contaminants. These engineering controls include fencing around the perimeter of the Subsite, spray cover applied to the surface of the Semet Residue Ponds, poly-sheeting and stone cover of Semet material seeps, and all components of the completed groundwater collection system.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

The baseline risk assessment evaluated the health effects which could potentially result from ingestion of groundwater by residents, as well as inhalation of air, ingestion of game and dermal contact with pond residue by trespassers. The exposure assumptions and the toxicity values that were used to estimate the potential risk and hazards to human health followed the general risk assessment practice at the time the risk assessment was performed. Although the risk assessment process has been updated since then and specific parameters and toxicity values may have changed, the risk assessment process that was used is still consistent with current practice and the need to implement a remedial action remains valid.

There are no changes in the physical conditions of the site or site uses that would affect the protectiveness of the selected remedy. The Subsite is fenced and secure and contaminated material is not available for contact. The residue ponds are covered to prevent emissions and regular air monitoring indicates that the levels have remained below those established in the community air monitoring plan, with the exception of occasional exceedances of odor levels during intrusive activities, which were quickly addressed. As recommended in the ROD, an institutional control that restricts groundwater use will be put on the property upon completion of the remedy. In the meantime, no one is drinking the water since the area is served by a public supply. Currently, the property is zoned as industrial/commercial and is expected to remain as such. Further, data from the groundwater treatment system and Tributary 5A surface water indicate that contaminated groundwater from the Subsite is no longer impacting surface water or Onondaga Lake.

One exposure pathway not considered in the original risk assessment for the Subsite is soil vapor intrusion (SVI). Groundwater remains contaminated at levels that could potentially cause vapor intrusion to occur should buildings be constructed on the Subsite. However, because no buildings currently exist on the property, this pathway is not complete. It will be evaluated in future five-year reviews and decision documents.

A habitat-based ecological assessment was conducted in accordance with the ecological risk assessment practices at the time the assessment was performed. The assessment identified the habitat cover types present, along with wildlife potentially inhabiting the area. The assessment noted that the physical effects from dermal exposure outweigh the exposure from incidental ingestion due to the extreme corrosiveness (pH <1) of the waste material. Further, ingestion of plant material was associated with an unacceptable risk to benzene. Although the values and methodologies used may have changed, the risk assessment remains valid. The waste material has been covered, which minimizes exposure to Semet residue material for smaller ecological receptors. It is acknowledged though that larger ecological receptors would likely still be able to contact the Semet residue material through the temporary cover. Furthermore, since little, if any, vegetation is present on the ponds, there is not expected to be extensive wildlife activity on the Semet residue material. Therefore, while not currently protective, the remedy will be protective of ecological receptors upon completion of the RA.

No cleanup levels were identified for the soils, because any residual contamination from removal of the tar residue will be addressed by OU2, which does not yet have a ROD. Groundwater restoration will be addressed by the Willis Avenue Chlorobenzene subsite remedy.

The RAOs are still valid.

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

No other issues have been identified that could call into question the remedy's protectiveness.

Technical Assessment Summary

The implemented components of the remedy (*i.e.,* the groundwater remedial alternative) are currently functioning as intended by the ROD. Surface water and sediment contaminants above

the cleanup criteria are attributable to Crucible outfalls that discharge into Tributary 5A and will be addressed through the recently signed Consent Order between NYSDEC and Crucible. Tributary 5A is also being evaluated as part of the Willis Avenue Chlorobenzene subsite. While institutional controls are not yet in place, engineering controls are currently in place to prevent exposure to humans and ecological receptors. There are no changes in the physical condition of the Subsite or other issues that could call into question the protectiveness of the remedy.

Issues, Recommendations and Follow-Up Actions

Table 5 summarizes the recommendations and follow-up actions stemming from this five-year review.

Protectiveness Statement

The remedy at OU1 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.

Next Review

The next five-year review report for the Subsite is required five years from the completion date of this review.

Tables

Table 1: Chronology of Site Events

Event	Date(s)
Semet Residue Ponds Created	1917-1970
Fence Installed	1979
Final NPL Listing	1994
RI/FS Consent Order with NYSDEC	1989
Fly-Ash/Cement Cover IRM	1995-Present
Remedial Investigation Complete	1995
I-690 Rehabilitation IRM	1996-1999
Feasibility Study Complete	2001
Semet Seeps IRM	2002-2009
ROD signature	2002
RD/RA Order of Consent with NYSDEC	2004
Groundwater Remedial Alternative Design Start	2004
Focused Feasibility Study Complete	2006
Groundwater Remedial Alternative Design Complete	2009
On-site Groundwater RA Construction Start	2010
Cold and Hot Weather Remedy Selection Treatability Study	2011
Willis Avenue/Semet Drainage Swale Project	2011-2012
Expanded Remedy Selection Treatability Study	2012-2013
Groundwater RA Construction Complete	2013
Groundwater Remedial Alternative 2013 Annual Report	2014
Demonstration Program	2014-Present
Groundwater Remedial Alternative 2014 Annual Report	2015

Table 2a: Remediation Goals for Soil (all concentrations in mg/kg)[2] From the OU1 ROD			
Contaminants of Concern	**Soil - Protection of Groundwater**	**Protection of Ecological Resources**	**Remediation Goals**
Benzene	0.06	70	0.06
Carbon Disulfide[3]	2.7	-	2.7
Naphthalene	12	-	12
Phenol	0.33	30	0.33
Toluene	0.7	36	0.7
Xylene (total)	1.6	0.26	0.26

Table 2b: Remediation Goals for Groundwater (all concentrations in µg/L)[4] From the OU1 ROD		
Contaminants of Concern	**New York State Ambient Water Quality Standards and Guidance Values**	**Remediation Goals**
Aniline	5	5
Benzene	1	1
Benzoic Acid	50	50
Benzyl Alcohol	50	50
2-Butanone	50	50
Carbon Disulfide	50	50
2,4-Dimethylphenol	1	1
Isophorone	50	50
2-Methylnapthalene	10	10
2-Methylphenol	1	1
4-Methylphenol	1	1
Naphthalene	10	10
Phenol	1	1
Toluene	5	5
Xylene (total)	5	5

Table 2c: Remediation Goals for Surface Water (all concentrations in µg/L)[3] From the OU1 ROD		
Contaminants of Concern	**New York State Ambient Water Quality Standards and Guidance Values**	**Remediation Goals**
Benzene	10	10
Naphthalene	13	13
Toluene	100	100
Xylene (total)	65	65

[2] 6 NYCRR Part 375 Table 6.8(a)
[3] NYSDEC CP-51/Soil Cleanup Guidance Table 1, October 2010
[4] NYSDEC TOGS1.1.1

Table 3: Documents, Data and Information Reviewed in Completing the Five-Year Review	
Document Title, Author	**Submittal Date**
Remedial Investigation, Semet Residue Ponds, Revised, O'Brien & Gere	May 1992
Record of Decision, Semet Residue Ponds Site, Sub-Site of the Onondaga Lake Superfund Site, EPA	March 2002
Focused Feasibility Study, Semet Residue Ponds Site, O'Brien & Gere	July 2006
Semet Residue Ponds Volume Verification Investigation Report, O'Brien & Gere	July 2009
Semet Residue Characterization for Thermal Treatment Remedy Selection Treatability Study Report, O'Brien & Gere	June 2011
Cold and Hot Weather Remedy Selection Treatability Study, O'Brien & Gere	December 2011
Interim Remedial Measure Construction Completion Report, Willis Portion, Willis Avenue/Semet Tar Beds Sites IRM, Parsons	February 2012
Tributary 5A Groundwater Remedial Alternative Operations and Maintenance Plan, O'Brien & Gere	August 2013
Tributary 5A Groundwater Remedial Alternative Site Monitoring and Verification Plan, O'Brien & Gere	August 2013
2012 and 2013 Source Control Summary for the Onondaga Lake Bottom Subsite, Parsons	December 2013
Tributary 5A Groundwater Remedial Alternative Construction Completion Report, Revised, O'Brien & Gere	February 2014
Semet Residue Ponds Expanded Remedy Selection Treatability Study, O'Brien & Gere	March 2014
2014 Source Control Summary for the Onondaga Lake Bottom Subsite, Parsons	July 2014
Semet Residue Ponds Groundwater Remedial Alternative Tributary 5A 2013 Annual Report, Revised, O'Brien & Gere	September 2014
Semet Residue Ponds Site 2014 Demonstration Program Report, O'Brien & Gere	February 2015
Semet Residue Ponds Groundwater Remedial Alternative 2014 Annual Report, O'Brien & Gere	March 2015
Comments on Draft Five-Year Review Report, Onondaga Nation	September 2015
Response to Comments on Draft Five-Year Review Report, EPA	September 2015

Table 4: Demonstration Program Air Monitoring Limits and Levels			
Continuous Air Monitoring			
Parameter	**Investigate Level**	**Control Level**	**Work Perimeter Limit**
TVOCs at Ponds 1, 2, and 5 [parts per million(ppm)]	0.5	0.9	1.2
TVOCs at Ponds 3 and 4 (ppm)	0.5	0.7	0.9
PM_{10} [micrograms per cubic meter ($\mu g/m^3$)]	100	125	150
Periodic Air Monitoring			
H_2S [parts per billion (ppb)]	6	8	10

Table 5: Issues and Recommendations Identified in the Five-Year Review

OU(s): *1*	**Issue Category: Remedy Performance**			
	Issue: After the signing of the 2002 ROD, it became necessary to re-evaluate remedial alternatives for the Semet residues due to a change in market conditions for the product that was to be created from the Semet residues. Treatability studies have been performed to assess various remedial technologies. The ongoing studies have not resulted in a change to the remedy and its implementation.			
	Recommendation: The ongoing studies need to be completed, a technology selected in a decision document modification, and the technology implemented.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	State	9/30/2016

Figures

Figure 1 – Performance Verification Monitoring Locations

Figure 2 – Surface Water and Sediment Monitoring Locations