McKesson Envirosystems Site

ONONDAGA COUNTY, NEW YORK

Site Management Plan

NYSDEC Site Number: 7-34-020

Prepared for:

McKesson Corporation
One Post Street, 34th Floor, San Francisco, California 94104

Prepared by:

ARCADIS of New York, Inc.
6723 Towpath Road, Syracuse, New York 13214-0066
(315) 446 9120

Revisions to Final Site Management Plan:

Revision #	Submitted Date	Summary of Revision	DEC Approval Date
1	June 11, 2015	• Addressed NYSDEC comments received on April 16, 2015. • Edits to make current, particularly in Section 3 (Site Monitoring Plan). • Provided the executed Deed Restrictions in Appendix A.	

JUNE 2015

CERTIFICATION STATEMENT

I, Dawn Elaine Penniman, certify that I am currently a NYS registered professional engineer and that this *Site Management Plan* (dated June 2015) for the McKesson Envirosystems Site (NYSDEC Site Number 7-34-020) was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the *DER Technical Guidance for Site Investigation and Remediation* (DER-10) (NYSDEC 2010b).

Dawn Elaine Penniman — 6-11-15

Signature — Date

Dawn Elaine Penniman, P.E.
NYS PE License No. 077678

ARCADIS of New York, Inc.
6723 Towpath Road, PO Box 66
Syracuse, New York 13214-0066
315.446.9120

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1.0 INTRODUCTION AND DESCRIPTION OF REMEDIAL PROGRAM

1.1 INTRODUCTION

This document has been prepared at the request of the New York State Department of Environmental Conservation (NYSDEC) to be an element of the remedial program at the McKesson Envirosystems Site (the Site) under the New York State Inactive Hazardous Waste Disposal Site Remedial Program administered by the NYSDEC. A draft version of this Site Management Plan (SMP) was submitted to NYSDEC in September 2013 and was subsequently revised and finalized to address NYSDEC comments received in February 2014 (NYSDEC 2014). The final SMP was certified by a New York State (NYS) registered professional engineer and submitted to NYSDEC in July 2014 (ARCADIS 2014). NYSDEC subsequently provided additional comments on the SMP (NYSDEC 2015) that have been addressed herein; this SMP (Revision No. 1) supersedes the July 2014 version.

The Site was remediated in accordance with the Consent Order (Case # R7-07660-84-03, Site #7-34-020) entered into between McKesson Corporation of San Francisco, California; Safety-Kleen Envirosystems Company of Elgin, Illinois; and NYSDEC. The Consent Order was executed on June 10, 1987 and amended on June 20, 1990 (NYSDEC 1987, 1990). Since 1998, following the completion of remedial construction activities for Operable Unit 2 (OU-2), operation, maintenance, and monitoring activities have been performed in accordance with the *Site Operation and Maintenance Plan* (Site O&M Plan; Blasland, Bouck & Lee, Inc. [BBL] 1999a) and subsequent NYSDEC-approved addenda to the Site O&M Plan in 1999 and 2010 (BBL

1999b, ARCADIS 2010a, and NYSDEC 2010a). The Site O&M Plan for management of the Site is superseded by the SMP.

1.1.1 General

As identified above, a Consent Order was executed to remediate an 8.6-acre property located in Syracuse, New York. This Consent Order required the Remedial Parties, McKesson Corporation and Safety-Kleen Envirosystems Company, to investigate and remediate contaminated media at the Site. The site location and boundaries are shown on Figures 1 and 2, and the boundaries of the Site are more fully described in the metes and bounds site description that is part of the deed restrictions (Appendix A).

NYSDEC divided the Site into two operable units to facilitate remediation of the Site. NYSDEC defined OU-1 as unsaturated soils (i.e., soils above the groundwater table) and Operable Unit 2 (OU-2) as saturated soils and groundwater. A Record of Decision (ROD) for OU-1 was issued by the NYSDEC in March 1994, identifying four Remedial Action Objectives (RAOs) and specifying *in-situ* bioremediation as the remedy for OU-1. The establishment of Deed Restrictions was also identified in the OU-1 ROD to prevent future use of and potential human exposure to Site groundwater (NYSDEC 1994a). The OU-1 RAOs are as follows:

- Reduce, control, or eliminate the contamination present within the unsaturated soils on site.
- Eliminate a threat to surface waters by eliminating any future contaminated surface runoff from the contaminated soils on site.
- Eliminate the potential for direct human or animal contact with the contaminated soils on site.
- Monitor the impacts of contaminated groundwater to the environment.

Upon completion of the OU-1 remedial work, a *Remedial Design/Remedial Action (RD/RA) Report for OU-1 – Unsaturated Soils* ([BBL 1995) was prepared and submitted to the NYSDEC in September 1995. The OU-1 RD/RA Report was approved by the NYSDEC in a September 28, 1995 letter from Robert W. Schick, P.E. of the

NYSDEC, to David J. Ulm of BBL. That letter also stated that the NYSDEC considered remediation of OU-1 complete, and did not require the establishment of institutional controls (ICs) or engineering controls (ECs) as a condition of completion (NYSDEC 1995).

In March 1997, the NYSDEC issued a ROD for OU-2 saturated soils and groundwater, which established three RAOs for OU-2 and specified *in-situ* anaerobic bioremediation as the remedy to attain the RAOs. In addition, the OU-2 ROD stated that the Site will be reclassified to a Class 4 site once the remedy is in place (indicating that the remedial action is in place and only operation and maintenance is required) and that the Site will be considered for delisting from the New York State Registry of Inactive Hazardous Waste Disposal Sites (Registry) upon completion of the remediation, as demonstrated by the monitoring programs (NYSDEC 1997a). The OU-2 RAOs are as follows:

- Reduce, control, or eliminate the concentrations of constituents of concern (COCs) present within the saturated soils at the Site.
- Attain the NYSDEC Class GA Groundwater Quality Standards (NYSDEC 1998), to the extent practicable, for the COCs present in on-site groundwater.
- Mitigate the potential for migration beyond the Site boundary of groundwater that contains concentrations of COCs in excess of their respective NYSDEC Class GA Groundwater Quality Standard.

Remedial construction activities for OU-2, as described in the *Remedial Design/Remedial Action Report for OU-2* (BBL 1999c), were completed in 1998. The OU-2 RD/RA Report provided a description of the *in-situ* anaerobic bioremediation system and summarized the treatment and monitoring activities conducted during the first year (i.e., July 1998 through July 1999). The OU-2 RD/RA Report was approved by the NYSDEC in a February 22, 2000 letter to Jean A. Mescher of McKesson from Robert W. Schick, P.E. of NYSDEC (NYSDEC 2000). The OU-2 remedial and monitoring activities are ongoing, and the remedy has continued to remain protective of public health and the environment.

A comprehensive evaluation of the monitoring data from 1998 to October 2012 was conducted and the results were presented in the January 2013 Periodic Review Report (PRR; ARCADIS 2013). As detailed in that PRR, the RAOs for OU-2 have been attained (ARCADIS 2013), and NYSDEC guidance for initiating remedial process closure identified in NYSDEC's *Technical Guidance for Site Investigation and Remediation DER-10,* Section 6.4(a) (NYSDEC 2010b) have been met because:

- the remedy has achieved the bulk reduction of groundwater contamination
- the remedy has been properly implemented and optimized to its fullest extent
- public health and the environment are protected

NYSDEC verbally approved the shutdown of the *in-situ* bioremediation treatment system (hydrogen peroxide amendments and oxygen diffusion) and closed loop hydraulic system on April 9, 2013, and required a post-shutdown process control monitoring program to determine the continued effectiveness of the remedial action on the remaining contamination and to evaluate the need to re-start remedial processes (i.e., the *in-situ* bioremediation treatment system and the closed loop hydraulic system). Accordingly, the systems were shutdown on April 10, 2013. The NYSDEC approved the shutdown of the systems in writing on April 11, 2013 (NYSDEC 2013a). The required monitoring program is outlined in Section 3.0 of this SMP and is referred to as the "post-shutdown process control monitoring program."

The monitoring results from the post-shutdown process control monitoring program are evaluated to determine the continued effectiveness of the remedial action and to evaluate the need (if any) to re-start the remedial processes. The remedial action will be considered to have "continued effectiveness" if the post-shutdown groundwater COC concentrations continue to attain the RAOs identified in the OU-2 ROD (NYSDEC 1997a) and remain consistent with NYSDEC guidance for initiating remedial process closure, as set forth in DER-10, Section 6.4 (NYSDEC 2010b).

When it has been demonstrated that the remedial action continues to maintain its effectiveness, and upon approval by the NYSDEC and New York State Department of Health (NYSDOH) that monitoring is no longer required, the OU-2 remedial activities

will be considered complete and site closeout activities will commence, including (but not limited to) the following activities:

- Deconstructing and removing the *in-situ* bioremediation treatment system, existing above-grade structures, and equipment
- Decommissioning monitoring wells and piezometers.

Additionally, delisting of the Site from the Registry is anticipated after completing the monitoring program. The Site may be delisted upon completion of the remediation, as specified in the OU-2 ROD (NYSDEC 1997a), and when a certificate of completion (or similar site closure document) has been issued (6NYCRR Part 375-2.7(e)(4); NYSDEC 2006). A work plan for site closeout activities will be developed and submitted to the NYSDEC for approval when appropriate.

This SMP was prepared to manage remaining contamination at the Site until the Deed Restrictions are extinguished in accordance with Environmental Conservation Law Article 71, Title 36 (New York State 2013). All reports associated with the Site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State.

1.1.2 Purpose

The Site contains some remaining contamination consistent with the OU-1 and OU-2 RODs issued by the NYSDEC for the Site (NYSDEC 1994a, 1997a). Deed Restrictions (Appendix A), recorded with the Onondaga County Clerk, require compliance with this SMP and any ICs placed on the Site. The ICs place restrictions on site use, and mandate operation, maintenance, monitoring, and reporting measures for all ECs and ICs. This SMP specifies the methods necessary to ensure compliance with all ECs and ICs required by the Deed Restrictions for the remaining contamination at the Site. Upon the NYSDEC's approval of this SMP, compliance with this plan is required by the grantor of the Deed Restrictions and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

This SMP provides a detailed description of the procedures required to manage the remaining contamination at the Site, including: (1) implementation and management

of all ECs and ICs; (2) groundwater monitoring; (3) operation and maintenance (O&M) of the Site; (4) O&M of the treatment system in the event that OU-2 remedial processes must be re-started; (5) performance of periodic inspections, certification of results, and submittal of PRRs; and (6) defining criteria for termination of treatment system operations.

To address these needs, this SMP includes three plans: (1) an Engineering and Institutional Control Plan (EC/IC Plan) for implementation and management of ECs and ICs; (2) a Monitoring Plan for implementation of a post-shutdown process control monitoring program; and (3) an Operation and Maintenance Plan for the implementation of post-remedial activities during the shutdown of treatment and closed loop hydraulic systems, as well as the O&M of these systems in the event that OU-2 remedial processes must re-commence. This plan also includes a description of PRRs for the periodic submittal of data, information, recommendations, and certifications to the NYSDEC.

1.1.3 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's Project Manager. In accordance with the Deed Restrictions for the Site, the NYSDEC will provide a notice of any approved changes to the SMP and append these notices to the SMP that is retained in its files.

1.2 SITE BACKGROUND

This section describes the site location, history, and nature and extent of contamination at the Site, both before and after the remedy.

1.2.1 Site Location and Description

The Site is located at 400 Bear Street West in the City of Syracuse, County of Onondaga, New York and is divided into two parcels, identified as Block 115-03-07 (801 Van Rensselaer Street) and Block 116-01-09 (800 Van Rensselaer Street) on the City of Syracuse, Onondaga Tax Maps (Figure 1). The Site is an approximately 8.6-acre area and the two parcels are separated by Van Rensselaer Street. The parcel north of Van Rensselaer Street is within 150 feet of the Barge Canal, and the entire Site is bordered by

Bear Street West to the east and other properties to the west and south (Figure 2). The boundaries of the Site are more fully described in the Deed Restrictions provided in Appendix A.

Historically, the Site was zoned for commercial and industrial use. The Site has since been re-zoned as a Lakefront Zoning District (T5) as part of the City of Syracuse Lakefront Master Plan[1], which was adopted in March 1999. This zoning designation permits mixed uses of the Site as an urban center, including commercial and residential uses (City of Syracuse 2013).

The Site is currently classified as a Class 2 Inactive Hazardous Waste Disposal Site, representing a significant threat to public health and/or the environment and requiring action. Upon NYSDEC's approval of the SMP, the Site is anticipated to be reclassified to Class 4, which is assigned to a site that has been properly closed, but requires continued site management consisting of operation, maintenance, and monitoring (6NYCRR Part 375-2.7(b)(3)(iv); NYSDEC 2006, 2013b, 2015). As specified in the OU-2 ROD, the Site will be considered for delisting upon completion of the remediation (NYSDEC 1997a). Groundwater underlying the Site and downgradient of the Site has historically not been used, nor is currently being used, as a drinking water source. The Deed Restrictions prohibit the use of groundwater underlying the Site without necessary water quality treatment rendering it safe for intended use and approval to do so from the NYSDEC.

1.2.2 Site History

Past uses of the Site, ownership, and remedial activities that have been completed at the Site are listed below. This information has been detailed in numerous site-related documents, including the *Final Remedial Investigation Report* (Blasland & Bouck Engineers, P.C. [BBEPC] 1990) for information prior to 1990. Other references are cited below, and a complete list is provided in Section 6.0.

[1] The City of Syracuse zoning map is available online at: http://www.syracuse.ny.us/ZoningAtlas/Map06.pdf.

Operational/Disposal History

Prior to 1920s

- The Site was a low-lying swamp with Onondaga Creek flowing through the center from east to west.

Late 1920s

- The land was made suitable for commercial use by the placement of fill material and was occupied by various salt companies.

1922

- The Barge Canal and barge loading terminal were constructed along the east side of the Site.
- Onondaga Creek was routed away from the Site to the southern end of the canal.

1928-1973

- Various oil companies, including Atlantic Richfield Company and its predecessors and BP Oil Corporation, used the Site for the storage and distribution of petroleum and petroleum products.

1973-1981

- Inland Chemical Corporation (ICC) purchased the Site in 1973 and used it for the storage of a variety of chemical waste streams and recycled chemicals, including methanol, methylene chloride, and other solvents, until December 1981.

December 1981

- ICC merged into Safety-Kleen Envirosystems Company (later named McKesson Envirosystems Company), which became the owner/operator of the Site.
- Safety-Kleen Envirosystems discontinued operations at the Site.

Remedial History

1980

- ICC filed a Part A Permit Application for interim status as a hazardous waste storage facility under the Resource Conservation Recovery Act (RCRA).

1981-1983

- Aboveground storage tanks and associated piping were decontaminated and the underground storage tanks used for storing petroleum products for truck refueling were removed (BBEPC 1990).

1987

- Site ownership was transferred to McKesson Corporation, which has since carried out the remedial program.
- A Revised Part A Application for closure was submitted to the NYSDEC.
- McKesson Corporation signed a Consent Order (Case # R7-07660-84-03) with the NYSDEC, which was executed on June 10, 1987.

1988-1990

- A NYSDEC-approved RCRA closure program for the facility was conducted. The closure program included verifying decontamination of 11 aboveground storage tanks, removing distribution piping associated with the aboveground tanks, and removing the aboveground tanks.
- A Remedial Investigation (RI), consisting of a Hydrogeologic Investigation, an Interim Remedial Soils Investigation, and a Risk Assessment, was conducted in 1988 and 1989 to define the nature and extent of contamination resulting from previous activities at the Site.
- Notification from the NYSDEC was received by McKesson Corporation that the facility was officially closed and that corrective actions would proceed under the Consent Order (NYSDEC 1987, 1990).

- A *Final Remedial Investigation Report* was issued describing the field activities and findings of the RI (BBEPC 1990).
- McKesson Corporation signed a Consent Order Amendment (Case #: R7-07660-84-03) with Safety-Kleen Envirosystems Company and NYSDEC that went into effect on June 20, 1990.

1991-1996

- A Soil Bioremediation Pilot Study was conducted at the Site using both *in-situ* and *ex-situ* techniques in 1993. A Feasibility Study (FS) and results of the Soil Bioremediation Pilot Study were completed for unsaturated soils in November 1993 (BBEPC 1993).
- The Site was separated by NYSDEC into two OUs – OU-1: unsaturated soils and OU-2: saturated soils and groundwater.
- A remedy was selected for unsaturated soils at the Site, which was presented in NYSDEC's ROD for OU-1 (NYSDEC 1994a).
- A *Remedial Design/Remedial Action (RD/RA) Work Plan for OU-1* (BBL 1994) was approved by the NYSDEC in May 1994, and the selected remedy for unsaturated soils – *in-situ* bioremediation – was implemented.
- OU-1 remedial activities were completed in May 1995 and documented in the OU-1 RD/RA Report (BBL 1995).
- The OU-1 RD/RA Report was approved by the NYSDEC in a September 28, 1995 letter from Robert W. Schick, P.E., NYSDEC, to David J. Ulm, BBL.
- A Supplemental Saturated Soil and Groundwater Investigation (BBL 1996b) was conducted in 1995 to update existing data regarding the distribution of COCs in the saturated soil and groundwater and as a preliminary component of the FS for OU-2 (BBL 1996a).
- The FS Report for OU-2 was completed in September 1996 (BBL 1996a) and subsequently approved by NYSDEC in December 1996 (NYSDEC 1996).

1997-1998

- NYSDEC issued a ROD for OU-2 in March 1997 for saturated soils and groundwater (NYSDEC 1997a).
- A RD/RA Work Plan for OU-2 was approved by the NYSDEC in September 1997 (NYSDEC 1997b) and design/construction of the selected remedy – *in-situ* anaerobic bioremediation treatment (including establishment of a closed loop hydraulic system) – was completed in 1997 and 1998.
- Remedial construction activities were documented in the OU-2 RD/RA Report (BBL 1999c), which was approved by the NYSDEC in a February 22, 2000 letter to Jean A. Mescher of McKesson from Robert W. Schick, P.E. of NYSDEC (NYSDEC 2000).

1998-April 8, 2013

- *In-situ* bioremediation treatment was conducted and hydraulic control was maintained.
- The progress of the OU-2 remedial activities was monitored and the results were evaluated periodically to determine if the remedy met the objectives of the 1997 ROD for OU-2.
- The results from initiation of the OU-2 remedial activities in 1998 through October 2012 indicated that the remedy had attained the RAOs specified in the OU-2 ROD, and that the Site was ready for shutdown of the *in-situ* bioremediation treatment and closed loop hydraulic systems.

April 9, 2013-Present

- On April 9, 2013, the NYSDEC approved the shutdown of the OU-2 *in-situ* bioremediation treatment and closed loop hydraulic systems. The systems were shutdown on April 10, 2013.
- A post-shutdown process control monitoring program is used to determine the continued effectiveness of the remedial action on the remaining contamination and evaluate the need (if any) to re-start the remedial processes.

1.2.3 Geologic Conditions

Stratigraphy

OU-2 consists of two relatively permeable hydrogeologic units sandwiched between three fine-grained confining units. From shallowest to deepest, these units are as follows:

- *Upper Silt and Clay* – a fine-grained, poorly permeable deposit that ranges from approximately 8 to 15 feet below ground surface (bgs)
- *Fine Sand* – moderately permeable fine sand that ranges from approximately 15 to 22 feet bgs
- *Middle Silt and Clay* – a relatively thin deposit of silt and clay that that ranges from approximately 20 to 22 feet bgs
- *Sand and Gravel* – a relatively coarse-grained, permeable deposit that ranges from approximately 24 to 61 feet bgs
- *Lower Silt and Clay* – a fine-grained, poorly permeable deposit with an average thickness of 20 to 30 feet

The upper silt and clay unit is overlain by a surficial layer of clean sand and gravel fill that was graded over the Site during the OU-1 remediation (BBEPC 1990; BBL 1999c). A geologic cross-section is shown on Figure 3.

Hydrogeology

Based on the above stratigraphy, two hydrogeologic flow systems were identified at the Site: (1) a deep hydrogeologic unit consisting of the sand and gravel unit, and (2) a shallow hydrogeologic unit that extends from the water table to the base of the fine sand unit. The water table typically occurs near the top of the upper silt and clay; except in the northeastern portion of the Site, where it dips into the fine sand unit near the Barge Canal. The water table during the April 2013 hydraulic monitoring event prior to system shutdown is shown on Figure 3. The two hydrogeologic units are hydraulically separated by the middle silt and clay unit, and the deep hydrogeologic unit is further separated into

a shallow freshwater zone and a deeper saltwater zone (Figure 3). Groundwater moving through both hydrogeologic units discharges into the Barge Canal.

One component of the OU-2 site remedy involved withdrawing groundwater, amending it with nutrients or a source of oxygen, and re-injecting it, forming a closed loop hydraulic system. That component is described in Section 1.4, but generally consisted of a withdrawal trench and a series of parallel infiltration trenches that bracketed a region of the upper hydrogeologic unit where groundwater required remediation. Groundwater withdrawn from the withdrawal trench was amended (as necessary) and routed to the infiltration trenches. When operating, the groundwater in the shallow hydrogeologic unit near the trenches was recirculated, instead of discharging to the Barge Canal as it would have if the system was not operating. Groundwater in the underlying deep hydrogeologic unit was essentially unaffected by the closed loop hydraulic system. Figure 4 depicts the potentiometric surface of the shallow hydrogeologic unit at the Site using the data from the April 2013 hydraulic monitoring event. Note that the closed loop hydraulic system was operating at that time.

A regional groundwater flow system underlies the local flow system described above. Although not a concern at the Site, the groundwater in that deeper, regional system moves northwestward and discharges to Onondaga Lake (see Figure 1).

1.3 SUMMARY OF REMEDIAL INVESTIGATION FINDINGS

An RI was performed in 1988 and 1989 to characterize the nature and extent of contamination at the Site. To update RI data regarding the distribution of COCs in the saturated soil and groundwater, a supplemental investigation of saturated soil and groundwater was performed in 1995. This work was conducted as a preliminary component of the FS for OU-2. The results of the RI and Supplemental Investigation (SI) are described in detail in the following reports:

BBEPC. 1990. Final Remedial Investigation Report McKesson Corporation Bear Street Facility. Vol. 1 – 3. April.

BBL. 1996b. Supplemental Saturated Soil and Groundwater Sampling Investigation Report, Operable Unit No. 2- Saturated Soil and Groundwater. February, Revised September.

The COCs detected at the Site are associated with past storage activities and include various volatile and semivolatile organic compounds (VOCs and SVOCs). Specifically, the investigations identified the following COCs for the Site (NYSDEC 1997a):

- VOCs: benzene, toluene, ethylbenzene, xylenes, trichloroethene, methylene chloride, acetone, and methanol
- SVOCs: aniline and N,N-dimethylaniline

Below is a summary of site conditions from the RI and SI (BBEPC 1990; NYSDEC 1997a):

Unsaturated Soil

The unsaturated soils at this Site (prior to the OU-1 remedial activities) were approximately 4 feet bgs. COCs were detected in soils located at and adjacent to past material handling locations, in the diked areas at former aboveground storage tanks, and near the location of former underground storage tanks. Maximum concentrations of the COCs detected in unsaturated soil during the RI and identification of the borings from which the samples were taken are presented in Table 1. These soil boring locations are shown on Figure 5A.

Site-Related Groundwater

Groundwater contamination was also identified beneath the Site. The RI and SI determined that COCs were not being transported off site with groundwater flow (NYSDEC 1997a). Maximum concentrations of COCs observed in groundwater during the RI and SI are presented in Table 1. Groundwater sample locations are shown on Figure 2. The investigations identified that the highest concentration and areal distribution of COCs in groundwater (and saturated soils) at the Site were associated with three distinct on-site areas within the shallow hydrogeologic unit; these are designated as Areas 1, 2, and 3, as shown on Figure 2.

Site-Related Soil Vapor Intrusion

No site-related soil vapor intrusion samples have been collected. There is no potential for site-related soil vapor intrusion under existing Site conditions because groundwater contamination (as discussed above) is limited to three on-site areas and he Site has been unoccupied since operations were discontinued in December 1981.

1.4 SUMMARY OF REMEDIAL ACTIONS

The Site has undergone remedial activities in accordance with the NYSDEC-approved *RD/RA Work Plan Operable Unit No. 1- Unsaturated Site Soils* and *RD/RA Work Plan Operable Unit No. 2 - Saturated Soils and Groundwate*r (BBL 1994, 1997). Ongoing O&M activities and supplemental remedial activities were performed in accordance with the Site O&M Plan, (BBL 1999a), NYSDEC-approved addendums to the Site O&M Plan (BBL 1999b, ARCADIS 2010a, NYSDEC 2010a), and NYSDEC-approved recommendations proposed in various Biannual Process Control Monitoring Reports (BBL 2004, 2007; ARCADIS 2010b, 2010c).

The Site is divided into three areas (Areas 1, 2, and 3), as shown on Figure 2, and consists of two parcels. Additionally, the Site is divided vertically into two OUs: OU-1 – Unsaturated Soils, and OU-2 – Saturated Soils and Groundwater. Remedial activities for OU-1 involved *in-situ* aerobic bioremediation of unsaturated soils (i.e., soils above the groundwater table using actual groundwater elevations to govern the treatment depths), and remedial activities for OU-2 involved *in-situ* anaerobic and aerobic bioremediation of groundwater and saturated soils and establishment of a closed loop hydraulic system.

The following is a summary of the remedial actions performed at the Site for each operable unit. Detailed descriptions of remedial activities can be found in the NYSDEC-approved OU-1 RD/RA Report (BBL 1995; NYSDEC 1995) and NYSDEC-approved OU-2 RD/RA Report (BBL 1999c; NYSDEC 2000). Descriptions of remedial activities performed subsequent to those described in these RD/RA reports are provided in the reports cited below.

OU-1 Remedial Activities

1. Biological treatment was implemented using *in-situ* soil blending of the unsaturated soils at the Site that contained COCs at concentrations greater than or equal to 5 parts per million (ppm).
2. Post-remediation soil verification sampling determined that ROD-specified soil cleanup objectives had been achieved.
3. A minimum of 12 inches of clean fill was installed, graded, and seeded to promote surface water runoff and limit infiltration of rain and surface water into the remediated areas.
4. Additional groundwater monitoring wells were installed to supplement the existing Site perimeter groundwater monitoring network and were monitored and sampled to verify that the COCs were not migrating beyond the property boundary.

Remedial activities for OU-1 were completed at the Site in December 1994/May 1995. The OU-1 RD/RA Report was approved by the NYSDEC in September 1995 and the NYSDEC considered remediation of OU-1 complete (NYSDEC 1995).

OU-2 Remedial Activities: 1998-Present

The components of the OU-2 remedy are summarized below. These components were installed/initiated in 1998 and have remained in place to the present. Since 1998, the remedial components and ongoing O&M activities have been periodically modified with approval from the NYSDEC. The initial remedial components are summarized below, followed by descriptions of the modifications, which are summarized by the affected time period. Locations and detailed diagrams of the various treatment system components are shown on Figure 2 and in Appendix B, respectively. A more detailed discussion of the treatment and closed loop hydraulic systems is provided in Section 1.4.2.

- A groundwater infiltration trench and withdrawal trench (including a 4-foot diameter collection sump) were installed upgradient and downgradient, respectively, of Area 3 as a means to introduce groundwater amended with Revised Anaerobic Mineral

Media- (RAMM-) into the shallow hydrogeologic unit and maintain hydraulic control. RAMM consists of specific chemicals that supply macronutrients and micronutrients to enhance naturally occurring anaerobic biodegradation of COCs.

- Two additional infiltration trenches were installed in Area 3 to increase the distribution of RAMM-amended groundwater within this area.
- An *in-situ* anaerobic bioremediation treatment system was constructed and contained in a 12-by-24 foot treatment building, located northwest of the main infiltration trench. The treatment building consists of a process room containing all process control equipment and secondary containment diking, and a separate electrical room.
- Two infiltration trenches were installed in Areas 1 and 2. RAMM-amended groundwater was periodically introduced into these trenches by manually filling standpipes screened within the filter pack of these trenches (i.e., within the shallow hydrogeologic unit).
- RAMM was introduced into the shallow hydrogeologic unit within each of the three areas at discrete locations throughout each area using a truck-mounted vertical injection mast. Two discrete RAMM injection events were conducted in August 1998 and August 2000.
- A process control monitoring program was initiated in 1998 to monitor the effectiveness of the *in-situ* anaerobic bioremediation treatment system. The program included hydraulic, biological, and COC monitoring.

2004-2005

In 2004, the periodic review of the data obtained from the process control monitoring program suggested that concentrations of aniline and N,N-dimethylaniline near MW-8S, MW-27, and MW-28 in Area 3, TW-02R in Area 2, and MW-33 in Area 1 were not being reduced as successfully as in other areas of the Site (BBL 2004). As a result, the following remedial activities were performed:

1. Approximately 65, 1, and 6 cubic yards of soil were removed to an estimated depth of 20 feet bgs from the areas surrounding MW-8S, MW-27, and TW-02R, respectively, to reduce concentrations of aniline and N,N-dimethylaniline. Locations of the

excavation areas are shown on Figure 5A. The excavation areas surrounding MW-27 and TW-02R were backfilled with bentonite and imported clean fill material (pea stone), which was amended with RAMM (in addition to Suga-Lik™ [Blackstrap Molasses] at MW-27). The excavation area surrounding MW-8S was backfilled with stockpiled clean soil from the top 6 feet of soil bgs (this material is the clean fill installed during the OU-1 remedial activities), RAMM-amended clean material (pea stone), and bentonite.

2. Eight well points were installed around monitoring wells MW-27, MW-28, and MW-33 for monthly additions of RAMM and Suga-Lik™.

3. The biological portion of the monitoring program was eliminated in 2005 after collecting 6 years of data that consistently verified that saturated soils/groundwater in the shallow hydrogeologic unit were conducive to bioremediation.

2006-2009

In 2006, the periodic review of the COC data suggested that the *in-situ* anaerobic treatment program was effectively reducing the concentrations of VOCs, but concentrations of SVOCs (aniline and N,N-dimethylaniline) were not being reduced in a timely manner. The OU-2 *in-situ* anaerobic bioremediation treatment program was modified to an *in-situ* aerobic bioremediation treatment program in August 2006 (BBL 2007). The following remedial activities were performed between August 2006 and January 2009:

1. The RAMM amendment was replaced in each of the three areas by the introduction of groundwater amendments with an oxygen source (i.e., hydrogen peroxide) and macronutrients (i.e., Miracle Gro®).

2. The *in-situ* aerobic bioremediation treatment program was modified in October 2008 to provide a new and continuous source of oxygen to Areas 2 and 3. Hydrogen peroxide continued to be added to Area 1. The modifications included the following:

    - Constructing an oxygen gas infusion system in both Areas 2 and 3 (Figures 6 and 7)

- Installing an aerator stone in the equalization tank of the Area 3 treatment system in January 2009 to add oxygen gas to the groundwater before it was pumped into the infiltration trenches

3. Macronutrient amendments were discontinued in Areas 1, 2, and 3 in October 2008.

2010-2011

In 2010, the periodic review of the data obtained as part of the monitoring program suggested that concentrations of aniline in the area between TW-02RR and MW-36 were not being reduced as successfully as in other areas of the Site (ARCADIS 2010b, 2010c; NYSDEC 2010a). The following remedial activities were performed:

1. Approximately 117 tons of soil were excavated from Area 2 to an estimated depth of 10 feet bgs and disposed off site in November 2010.
2. The excavated area in Area 2 was backfilled with pea stone amended with Oxygen Release Compound (ORC®) and stockpiled clean soil from the upper soil interval (0 to 6 feet bgs) within the excavation area. This upper soil interval is the clean fill installed during the OU-1 remedial activities.
3. The process control monitoring program was modified beginning in October 2010 as follows (ARCADIS 2010a; NYSDEC 2010a):

    - Discontinued methanol analyses of data from wells/piezometers MW-3S, MW-4S, MW-33, MW-36R, MW-8SR, MW-27, MW-29, MW-30, PZ-4S, and PZ-4D based on a demonstrated history of not being detected
    - Decommissioned and abandoned monitoring wells/piezometers MW-1, MW-2S, MW-6S, MW-13S, MW-15S, MW-19, MW-26S, PZ-5S, PZ-9S, and PZ-9D as they were no longer included in the COC and/or hydraulic monitoring program and they were located outside of the estimated groundwater flow path of site-related contaminants
    - Removed deep monitoring wells/piezometers MW-3D, MW-6D, MW-9D, MW-11D, MW-18, MW-23I, MW-24DR, and MW-25D from the hydraulic monitoring

program due to the consistency of data from the deep hydrogeologic unit and the lack of upconing

4. The *in-situ* aerobic bioremediation treatment program was modified in June 2011 to include monthly injections of ORC®-amended groundwater into 5 standpipes that were installed in the Area 2 excavation area. Monthly injections ended in December 2011.

2012-2013

Remedial activities for OU-2, which included hydrogen peroxide amendments (Area 1), oxygen diffusion (Areas 2 and 3), and closed loop hydraulic activities (Area 3) continued through April 10, 2013. NYSDEC verbally approved the shutdown of the *in-situ* bioremediation treatment and closed loop hydraulic systems on April 9, 2013. NYSDEC approved this in writing on April 11, 2013 (NYSDEC 2013a).

1.4.1 Removal of Contaminated Materials from the Site

OU-1

During the OU-1 remedial activities conducted in 1994/1995, the following contaminated materials were removed from the Site:

- A former distribution piping network and an underground storage tank were uncovered during site preparation activities in the unsaturated soil zone and decontaminated using a high pressure hot water wash. The liquids present within the distribution piping and the wash water from the piping and underground tank decontamination were collected, stored in 55-gallon drums, and characterized for disposal. The liquids collected from the piping network were disposed at Ensco, Inc., El Dorado, Arkansas. The piping and underground storage tank were subsequently disposed at Roth Steel, Syracuse, New York as scrap metal (BBL 1995).
- Concrete grade rings and a 6-inch thick concrete slab (approximately 100 feet in diameter) were removed from the former tank areas. The concrete grade rings and slab were treated by scarifying the concrete surfaces to remove 0.6 centimeters of the concrete surface to provide a clean debris free surface. The residue generated from

the scarification activities was collected, characterized, and disposed of at Wayne Disposal, Inc., Bellville, Michigan in accordance with applicable rules and regulations (BBL 1995).

OU-2

Following the completion of the trench installation activities associated with the *in-situ* anaerobic treatment systems for OU-2, approximately 2,100 tons of non-hazardous soils and miscellaneous debris (e.g., low permeability liners) were transported and disposed off site at CWM Chemical Services, Inc.'s High Acres facility located in Fairport, New York (BBL 1999c).

In 2004, an excavation program was designed and implemented for the removal of approximately 65 cubic yards of saturated soil near MW-8S (in Area 3), 1 cubic yard of saturated soil near MW-27 (Area 3) and approximately 6 cubic yards of saturated soil around TW-02R (in Area 2). Areas where excavation was performed are shown on Figure 5A. To facilitate soil removal activities, monitoring wells MW-8S and TW-02R were removed and subsequently replaced. Drill cuttings and excavated soil were containerized in lined roll-offs, characterized, and disposed off site at CWM Chemical Services, LLC in Model City, New York as non-hazardous soil (BBL 2004).

In 2010, an excavation program was designed and implemented for the removal of approximately 117 tons of saturated soil from Area 2, as shown on Figure 5A. The excavated soil was containerized in lined roll-offs, characterized, and disposed off site as non-hazardous waste at Casella's Ontario County Landfill in Stanley, New York (ARCADIS 2010b).

1.4.2 Site-Related Treatment Systems

The following subsections describe the components of the *in-situ* bioremediation treatment and closed loop hydraulic systems that were installed on site during OU-2 remedial activities (BBL 1999a; ARCADIS 2013). The operation and maintenance procedures for the treatment systems are presented in the Operation and Maintenance Plan of this SMP (Section 4.0). Both of these systems were shut down on April 10, 2013 with the approval of the NYSDEC.

1.4.2.1 Area 3 *In-Situ* Bioremediation System

The *in-situ* bioremediation system at Area 3 withdraws groundwater from the shallow hydrogeologic unit downgradient of Area 3, transports the collected groundwater to a treatment building for amendment, and conveys the amended groundwater into the infiltration trench in Area 3.

Since the initiation of OU-2 remedial activities in 1998, a closed loop hydraulic system has been incorporated into the Area 3 *in-situ* bioremediation system as an EC. The closed loop hydraulic cell is created by withdrawing groundwater to induce a hydraulic gradient in Area 3 from the perimeter monitoring wells toward the withdrawal trench (see Figure 4).

The major components of the Area 3 treatment and closed loop hydraulic system are listed below and are shown on the figures included in Appendix B.

- A 140-foot withdrawal trench installed into the upper portion of the sand layer of the shallow hydrogeologic unit in Area 3. The withdrawal trench consists of two high density polyethylene (HDPE) drain pipes embedded within a filter pack (i.e., New York State Department of Transportation [NYSDOT] No. 1 crushed stone) that is wrapped with a geotextile, and drains to a 4-foot diameter and approximately 15-foot deep concrete collection sump. The collection sump contains a submersible pump and associated level controls. The pump is connected to piping that transports recovered groundwater to the treatment building.
- Three infiltration trenches (140 feet, 95 feet, and 95 feet in length) installed in the middle/lower portion of the sand layer of the shallow hydrogeologic unit in Area 3 consisting of a single HDPE drain pipe embedded in NYSDOT No. 1 crushed stone.
- A wood framed treatment building containing all process control equipment and a separate electrical room. The main process control equipment installed in the treatment building include the following:
    - 1,000-gallon equalization tank manufactured of one-piece, seamless, linear polyethylene
    - Aerator stone installed in the equalization tank

- 1,000-gallon mix tank with a hinged cover, agitator, and metering pump
- Building sump
- Submersible pump located in the building collection sump
- Transfer pump
- Influent and three effluent flow meters
- Odor control system consisting of a blower, vapor phase carbon unit, and pressure switches
- Pump and associated control panels in the separate electrical room
- Autodialer phone system located in the separate electrical room

- An oxygen infusion system that delivers a continuous source of oxygen gas to groundwater via iSOC® units and eight infusion wells (Figure 7).

1.4.2.2 Areas 1 and 2 *In-Situ* Bioremediation System

Two infiltration trenches were installed in both Areas 1 and 2 (see Figure 2 for locations and the figures included in Appendix B for construction details). An infiltration trench was installed upgradient of the portion of Areas 1 and 2 observed to contain relatively higher concentrations of COCs based on results of the RI (BBEPC 1990) and Supplemental Groundwater Investigation (BBL 1996b). A second infiltration trench was installed along the length of each area, toward the downgradient portion.

These trenches were constructed the same as the infiltration trenches described above for Area 3 with the exception of the horizontal drain piping. Instead, vertical polyvinyl chloride (PVC) standpipes screened in the crushed gravel were installed within each of these infiltration trenches. The standpipes are manually filled (as needed) with amended groundwater.

Area 2 also has an oxygen infusion system to provide a continuous source of oxygen gas to groundwater via iSOC® units and 5 oxygen infusion wells (Figure 6).

1.4.3 Remaining Contamination

Unsaturated Soils (OU-1)

During remedial activities for OU-1, unsaturated soils within the four Treatment Areas delineated on Figure 5A were treated using *in-situ* soil blending. These Treatment Areas represent the actual soil areas subjected to treatment. These areas were expanded beyond the limits of unsaturated soils containing COCs at concentrations greater than or equal to 5 ppm and the treatment limits identified in the OU-1 ROD (BBL 1995). Unsaturated soils were treated to different depths based on actual groundwater elevations in each of the four Treatment Areas. Unsaturated soils in Treatment Areas 1 and 4 were treated to a minimum depth of 365 feet above mean sea level (AMSL), and unsaturated soils in Treatment Areas 2 and 3 were treated to a minimum depth of 366 feet AMSL (see Figure 5A for the Treatment Area locations).

At the completion of the OU-1 remedial activities, results of the soil verification sampling indicated that the unsaturated soils in the Treatment Areas were successfully treated using the *in-situ* bioremediation remedy. These results are provided in Appendix C and summarized in Table 2. The data indicate that the residual concentrations of COCs present in the unsaturated treated soils were significantly less than the NYSDEC-specified cleanup levels of 10 ppm (NYSDEC 1994a). Figure 5B presents the remaining COC concentrations for OU-1.

Prior to the OU-1 remedial activities in Treatment Areas 1, 2, 3, and 4, a pilot study was conducted in 1993 to test the *in-situ* soil blending technology (see Figure 5A for the pilot study area location). During the study, this area was extensively sampled. In a letter dated November 14, 1994 from the NYSDEC to BBL, NYSDEC approved the use of analytical data generated during the pilot study as final soil verification data for this area (NYSDEC 1994b). COC concentrations in pilot study samples were below the NYSDEC-specified cleanup level of 10 ppm specified in the 1994 ROD for OU-1 (NYSDEC 1994a). Analytical results from the pilot study are provided in Appendix C.

Outside of the OU-1 and pilot study Treatment Areas, COC concentrations in RI soils samples were all non-detect, except for seven locations where one to three COCs

were detected with concentrations ranging from 0.006 to 2.3 ppm, which were below the OU-1 ROD cleanup level of 10 ppm (BBEPC 1990). The RI soil sample locations and the COC concentrations detected outside of the Treatment Areas are shown on Figure 5A. Figure 5B presents the remaining COC concentrations for OU-1. Upon completion of the OU-1 remediation activities, the Site was covered with clean fill and graded to promote surface water runoff and limit infiltration into the remediated areas. NYSDEC approved the RD/RA Report for OU-1 and considered the remediation of OU-1 to be complete (NYSDEC 1995). No further action for OU-1 was required.

Saturated Soils and Groundwater (OU-2)

In-situ bioremediation treatment programs have successfully reduced a majority of COC concentrations to below their respective NYSDEC Class GA Groundwater Quality Standard (NYSDEC 1998) in each of the three areas. However, a few COCs continue to be present in specific wells at concentrations greater than their respective NYSDEC Groundwater Quality Standard, as shown on Figures 8 and 9. Since April 2010, COCs have not been detected in groundwater at concentrations exceeding the NYSDEC Groundwater Quality Standards beyond the Site boundary.

2.0 ENGINEERING AND INSTITUTIONAL CONTROL PLAN

2.1 INTRODUCTION

2.1.1 General

This EC/IC Plan describes the procedures for the implementation and management of all ECs and ICs at the Site upon discontinuation of the *in-situ* bioremediation treatment and closed loop hydraulic systems. This Plan also describes the ECs and ICs that will be implemented and managed in the event that these systems must be re-started following evaluation of the post-shutdown process control monitoring data. The EC/IC Plan is one component of the SMP and is subject to revision by the NYSDEC.

2.1.2 Purpose

This plan describes the following:

- All ECs and ICs on the Site
- Basic implementation and intended role of each ECs and IC
- Key components of the ICs set forth in the Deed Restrictions
- Features to be evaluated during each required inspection and periodic review
- Plans and procedures to be followed for implementation of ECs and ICs, such as the implementation of the Excavation Work Plan (EWP) for the proper handling of remaining contamination that may be disturbed
- Any other provisions necessary to identify or establish methods for implementing the ECs and ICs required by the site remedy, as determined by the NYSDEC

2.2 ENGINEERING CONTROLS

Two ECs have been established at the Site: (1) fencing/access control and (2) groundwater containment. The groundwater containment EC is not in effect when the closed loop hydraulic system is shutdown, as approved by NYSDEC. As noted previously, this system has been operating since 1998 and NYSDEC approved a shutdown in April 2013.

2.2.1 Engineering Control Systems

2.2.1.1 Fencing/Access Control

Access to the Site is restricted by a fence with locked gates located around the perimeter of the Site. The fence was erected around the former storage areas of the Site prior to the initiation of the RI and was expanded to the entire Site perimeter following the completion of OU-1 remedial activities. Although the fence was not identified in the OU-1 ROD as a component of the remedy, the property owner agreed to place fencing around the Site. Signs placed along the fence on either side of Van Rensselaer Street and Bear Street West notify the public about restricted access to the Site. Fencing and access control measures will be routinely monitored during site-wide inspections, as described in the Site Monitoring Plan (see Section 3.0). Procedures for maintaining and, at the appropriate time, removal of the fencing and signage are documented in the Operation and Maintenance Plan (see Section 4.0). Maintenance procedures will be implemented until OU-2 remedial activities are considered complete. At the completion of the OU-2 remedial activities, a written request will be submitted to the NYSDEC (via a PRR) for removal of this EC from the Site (NYSDEC 2010b).

2.2.1.2 Groundwater Containment

The groundwater containment EC (i.e., closed loop hydraulic system) installed as part of OU-2 remedial activities is part of the *in-situ* bioremediation treatment system in Area 3 and was installed to prevent the potential migration of COCs beyond the Site boundary towards the Barge Canal. The closed loop hydraulic system consists of a withdrawal trench upgradient of Area 3, a collection sump, process control equipment

and piping, and infiltration trenches to provide active hydraulic control within this area. The components of the system are described in Section 1.4.2 of this SMP.

On April 10, 2013, the *in-situ* bioremediation treatment system and closed loop hydraulic system were discontinued at the Site with NYSDEC's approval because it is believed that the *in-situ* bioremediation remedy has been effective in satisfying the goals of the OU-2 ROD. In the event that the remedial action does not demonstrate continued effectiveness and the treatment system must be re-started, the components of the closed loop hydraulic system will be monitored, operated, and maintained following the procedures outlined in the Operation and Maintenance Plan (Section 4.0). At the completion of OU-2 remedial activities, a written request will be submitted to the NYSDEC (via a PRR) for removal of this EC from the Site (NYSDEC 2010b).

2.2.2 Criteria for Completion of Remediation/Termination of Remedial Systems

The remedial systems for the Site are associated with OU-2. Generally, remedial processes are considered completed when effectiveness monitoring indicates that the remedy has achieved the RAOs identified by the decision document (i.e., OU-2 ROD, NYSDEC 1997a). The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10 (NYSDEC 2010b).

Post-shutdown process control monitoring data are evaluated after each monitoring event, as described in the Site Monitoring Plan (Section 3.0), to determine the continued effectiveness of the remedial action and the need (if any) to re-start the remedial processes. Post-shutdown monitoring activities will continue, as determined by the NYSDEC, until it is demonstrated that post-shutdown groundwater COC concentrations continue to attain RAOs as stated in the OU-2 ROD (NYSDEC 1997a) and remain consistent with NYSDEC guidance for initiating remedial process closure, as set forth in DER-10 Section 6.4 (NYSDEC 2010b). Upon satisfying these conditions, the OU-2 remedial activities will be considered complete and the Site can be evaluated by the NYSDEC for delisting from the Registry.

2.3 INSTITUTIONAL CONTROLS

The Site has a series of ICs in the form of Deed Restrictions – one for 800 Van Rensselaer Street and one for 801 Van Rensselaer Street (Appendix A). The Deed Restrictions prohibit the use of groundwater underlying the Site without necessary water quality treatment rendering it safe for intended use and approval to do so from the NYSDEC. Adherence to these ICs is required by the Deed Restrictions and will be implemented under this SMP. These ICs are as follows:

- Compliance with the Deed Restrictions and this SMP by the Grantor and the Grantor's successors and assigns.
- All ECs must be operated and maintained as specified in this SMP.
- All ECs on the Site must be inspected at a frequency and in a manner defined in the SMP.
- Groundwater monitoring must be performed as defined in this SMP.
- Data and information pertinent to management of the Site must be reported at the frequency and in a manner defined in this SMP.

ICs identified in the Deed Restrictions may not be discontinued without an amendment to or extinguishment of the Deed Restrictions. If it is necessary to replace, modify, or extinguish ICs due to changes in Site conditions over time or changes to the ICs themselves, the current property owner must submit a written request to the NYSDEC for approval that the IC be modified or removed (NYSDEC 2010c). Upon delisting the Site from the Registry, the only ICs that will remain in effect are the land use and groundwater use restrictions, as stated in the Deed Restrictions (6NYCRR Part 375-2.7(e); NYSDEC 2006). Site restrictions that apply to the Site, as stated in the Deed Restrictions are:

- The property may only be used for restricted residential and commercial use provided that the ECs and ICs included in this SMP are employed. Future use of the Site is dependent on zoning and future site owners.

- The property may not be used for a higher level of use, such as unrestricted residential use, without the express written waiver of such prohibition by the NYSDEC.
- All future activities on the property that will result in the disturbance or excavation of the Site that threatens the integrity of the ECs or which results in unacceptable human exposure to remaining contamination must be conducted in accordance with this SMP.
- The use of the groundwater underlying the property is prohibited without treatment, as determined by the NYSDOH or the Onondaga County Department of Health, to render it safe for intended use.
- Vegetable gardens and farming on the property are prohibited.
- The site owner or remedial party will submit to the NYSDEC a written statement certifying, under penalty of perjury, that: (1) controls employed at the Site are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP; (3) nothing has occurred that would constitute a violation or failure to comply with the SMP for this Site; and (4) access to the Site will continue to be provided to NYSDEC to evaluate the remedy, including access to evaluate the continued maintenance of this control. This certification will be submitted to NYSDEC on an annual basis or for a period as otherwise determined by the NYSDEC, and will be made by an expert that the NYSDEC finds acceptable.

2.3.1 Excavation Work Plan

Any future intrusive (i.e., excavation) work that will encounter or disturb remaining contamination will be performed in compliance with the EWP that is attached as Appendix D to this SMP.

Any work conducted pursuant to the EWP must also be conducted consistent with the procedures defined in a Health and Safety Plan (HASP) and Community Air

Monitoring Plan (CAMP) to be prepared for the future intrusive work. The HASP, which includes a CAMP (see Section 6 of the HASP), currently employed at the Site is attached as Appendix E to this SMP, and is in current compliance with DER-10, 29 CFR 1910, 29 CFR 1926, and other applicable Federal, State and local regulations. This HASP and CAMP will be updated (as necessary) based on future changes to state and federal health and safety requirements. Additionally, based on specific methods employed by future contractors, a new work-specific HASP and CAMP will be developed and submitted with the notification to the NYSDEC described in Section 2 of the EWP. Any intrusive construction work will be performed in compliance with the EWP, HASP, and CAMP, and will be included in the periodic inspection and certification reports submitted under the PRR (see Section 5.3).

The site owner, associated parties preparing the remedial documents submitted to the State, and parties performing this work are responsible for the safe performance of all intrusive work, the structural integrity of excavations, proper disposal of excavation de-water, control of runoff from open excavations into remaining contamination, and for structures that may be affected by excavations (such as building foundations). The site owner will ensure that site development activities will not interfere with, or otherwise impair or compromise, the ECs described in this SMP.

The EWP, as part of the SMP, will remain in effect until the Deed Restrictions are extinguished. Once the Deed Restrictions are extinguished, a written request will be submitted to the NYSDEC for approval that the EWP be removed from the SMP (NYSDEC 2010c).

2.3.2 Soil Vapor Intrusion Evaluation

Prior to the construction of any enclosed structure(s) that is planned to be occupied and located over areas that contain remaining contamination, a soil vapor intrusion (SVI) evaluation will be performed and, if necessary, mitigation measures implemented to eliminate potential exposure to COCs (if any) in soil vapor that may affect the indoor air quality of the proposed structure. Alternatively, an SVI mitigation

system may be installed as an element of the building foundation without first conducting an evaluation.

Prior to conducting an SVI evaluation or installing a mitigation system, a work plan will be developed and submitted to the NYSDEC and NYSDOH for approval. This work plan will be developed in substantial conformance with the most recent NYSDOH *Guidance for Evaluating Vapor Intrusion in the State of New York.* SVI sampling results, evaluations, and follow-up actions will be summarized in the subsequent PRR.

2.4 INSPECTIONS AND NOTIFICATIONS

2.4.1 Inspections

Inspections of all remedial components installed at the Site will be conducted at the frequency specified in the Monitoring/Inspection Schedule (Table 5; Section 3.1.2). A comprehensive site-wide inspection will be conducted annually, regardless of the frequency of the PRR. The inspections will be used to determine and document the following:

- Whether ECs continue to perform as designed
- If these controls continue to be protective of human health and the environment
- Compliance with requirements of this SMP and the Deed Restrictions
- Achievement of remedial performance criteria when the treatment and closed loop hydraulic systems are operating
- Sampling and analysis of appropriate media during monitoring events
- If site records are complete and up to date
- Changes, or needed changes, to the remedial or monitoring system

Inspections will be conducted in accordance with the procedures set forth in the Monitoring Plan of this SMP (see Section 3.0). The reporting requirements are outlined in the PRR section of this plan (see Section 5.3).

If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs, an inspection of the Site will be conducted within 5 days of the event to verify the effectiveness of the ECs and ICs implemented at the Site by a qualified environmental professional, as determined by the NYSDEC.

2.4.2 Notifications

Notifications will be submitted by the property owner to the NYSDEC as needed for the following reasons:

- 60-day advance notice of any proposed changes in site use that are required under the terms of the Consent Order (NYSDEC 1987, 1990), 6 NYCRR Part 375 (NYSDEC 2006), and/or Environmental Conservation Law (New York State 2013).
- 15-day advance notice of any proposed ground-intrusive activities pursuant to the EWP.
- Notice within 48-hours of any damage or defect to ECs that reduces or has the potential to reduce the effectiveness of an EC and likewise any action to be taken to mitigate the damage or defect.
- Verbal notice by noon of the following day of any emergency, such as a fire, flood, or earthquake, that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action will be submitted to the NYSDEC within 45 days and will describe and document actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the Site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser has

been provided with a copy of the Consent Order, and all approved work plans and reports, including this SMP.

- Within 15 days after the transfer of all or part of the Site, the new owner's name, contact representative, and contact information will be confirmed in writing.

2.5 CONTINGENCY PLAN

This Contingency Plan outlines response activities to be implemented in the event of an emergency. Emergencies may include injury to personnel, fire or explosion, environmental release, or serious weather conditions.

2.5.1 Emergency Telephone Numbers

In the event of any environmentally-related situation or unplanned occurrence requiring assistance, the Owner or Owner's representative(s) should contact the appropriate party from the contact lists in Tables 4 and 5 below. For emergencies, appropriate emergency response personnel should be contacted. Prompt contact should also be made to the McKesson Corporation Project Manager. These emergency contact lists must be maintained in an easily accessible location at the Site.

Table 3: Emergency Contact Numbers

LOCAL EMERGENCY Medical, Fire, and Police	911
HOSPITAL-EMERGENCY St. Joseph's Hospital	(315) 448-5111
One Call Center	(800) 272-4480 (3 day notice required for utility markout)
Poison Control Center	(800) 222-1222
Pollution Toxic Chemical Oil Spills	(800) 424-8802
NYSDEC Spills Hotline	(800) 457-7362
National Response Center	(800) 424-8802 or (202) 267-2675
CHEMTREC-Chemical emergencies	(800) 262-8200

Table 4: Additional Contact Numbers

James Fleer, McKesson Corporation Project Manager	(913) 238-8348
Dawn Penniman, ARCADIS Project Manager	(315) 671-9229 – office (315) 345-9051 – mobile
Payson Long, NYSDEC Project Manager	(518) 402-9814
Richard Jones, NYSDOH Project Manager	(315) 477-8148

Note: Contact numbers subject to change and should be updated as necessary

2.5.2 Map and Directions to Nearest Health Facility

Site Location: 400 Bear Street West, Syracuse, NY 13204

Nearest Hospital Name: St. Joseph's Hospital

Hospital Location: N. Townsend St., Syracuse, NY 13203

Hospital Telephone: (315) 448-5111

Directions to the Hospital (see Figure 10):

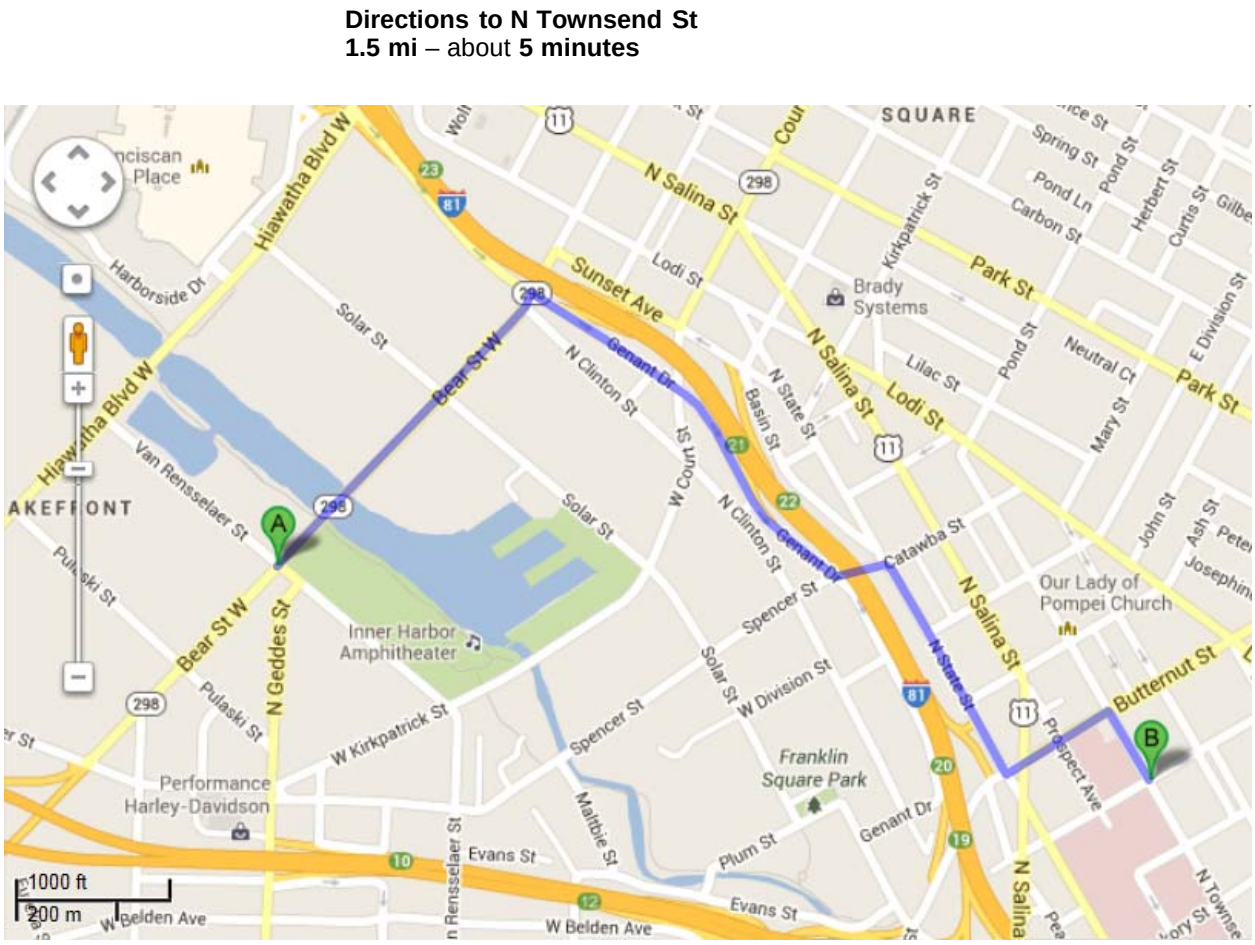
1. Head **northeast** on Bear St. W. toward Solar St.
2. Take the **3rd right** onto Genant Dr.
3. Turn **left** onto Spencer St.
4. Take the **1st right** onto N. State St.
5. Take the **3rd left** onto Butternut St.
6. Take the **3rd right** onto N. Townsend St.

   The Emergency Department will be on the **right**.

Total Distance: 1.5 miles

Total Estimated Time: 5 minutes

Figure 10: Map Showing Route from the Site to the Hospital



2.5.3 Spill Control and Response Procedures

Spill control and response procedures have been developed for responding to unplanned releases of oil, products, materials, hazardous wastes and other similar materials to soil, surface water, or groundwater. All spills of such materials at the Site will be reported immediately to the McKesson Corporation Project Manager (Table 4). In addition, reportable spills will be called in to the NYSDEC spills hotline within 2 hours of discovery (Table 3). Spill notifications and reporting to the necessary agencies will be coordinated by ARCADIS and/or McKesson Corporation.

As appropriate, the fire department and other emergency response group will be notified immediately by telephone. The emergency telephone number list is provided in

Table 3. The list will also be posted prominently at the Site and made readily available to all personnel at all times.

Properly trained personnel will implement the following general response procedures (when possible):

- Stop/Isolate Source: As conditions allow, attempt to stop or isolate the source of the spill by closing valves and/or shutting down affected vehicles or equipment.
- Containment: If the spilled material is floating on a water surface, spill-absorbent pads/booms will be placed across the path of the floating spill. If the spilled material sinks below the water surface, a dam, weir, or other containment method will be used to stop the flow of the spilled material. If the spill occurs on land, a containment unit will be constructed to stop the flow of the spilled material and sorbents will be applied as necessary.
- Cleanup: Spills in water will be recovered using pumps and sorbents as necessary until the spilled material is recovered and no sheen or other evidence of the spill is observed on the water surface. Spills on land will be recovered using pumps, sorbents, and heavy equipment, as necessary until the spilled material is recovered. Construction vehicles and equipment used in the clean-up, or otherwise affected by the spill will also cleaned/decontaminated.
- Collection, Storage, and Disposal: Impacted materials, sorbents, and other wastes will be collected and stored in NYSDOT-approved containers. The containers will be labeled with the waste type and date of accumulation, and will be transported off site for disposal at a permitted facility in accordance with all applicable laws and regulations.
- Post-Spill Maintenance: Following the clean-up of the spill, verify that impacted materials, vehicles, and equipment have either been transported off site for disposal, or decontaminated, as appropriate. The vehicle or piece of equipment that may have caused the spill will also be repaired. If the vehicle or piece of equipment cannot be repaired, it will be removed from the Site and replaced.

In the event that the release is of sufficient magnitude and cannot be controlled by diking, damming, absorbing, or other method(s), the local fire department, NYSDEC, and the National Response Center will notified.

2.5.4 Evacuation Plan

In the event of an emergency that requires site evacuation, on-site personnel will vacate the Site as directed by on-site fire/police/rescue responders. In the event of an injury to site personnel, emergency procedures outlined in the HASP will be followed.

2.5.5 Amendments to the Contingency Plan

With NYSDEC notification, this Contingency Plan and/or emergency contact list will be periodically updated to reflect changes in contacts or site information.

3.0 SITE MONITORING PLAN

3.1 INTRODUCTION

3.1.1 General

The Monitoring Plan describes the measures for implementing the post-shutdown process control monitoring program. This monitoring program is a continuation of the COC and hydraulic process control monitoring program that has been conducted since treatment activities commenced in 1998. Monitoring of ECs is described in Section 4.2 of this Plan. This Monitoring Plan may only be revised with the approval of the NYSDEC.

3.1.2 Purpose and Schedule

Groundwater monitoring will be performed if NYSDEC requests an additional sampling event to assess the continued effectiveness of the OU-2 remedial action and to confirm that no further remedial action and monitoring are necessary (beyond what is proposed). Following each monitoring event, groundwater COC concentrations and groundwater elevation data will be evaluated to determine if the remedy continues to be effective in achieving the OU-2 RAOs (NYSDEC 1997a) and remains consistent with NYSDEC DER-10 Section 6.4 guidance for initiating remedial process closure (NYSDEC 2010b). A summary of results, conclusions regarding site contamination, the status of the remedial treatment and closed loop hydraulic systems, and recommendations for any necessary changes to the monitoring program and/or remedial activities will be presented in a monitoring memo and/or PRR to the NYSDEC. .

This Monitoring Plan describes the methods to be used for the following:

- Sampling and analysis of groundwater
- Assessing compliance with applicable NYSDEC standards, criteria, and guidance, particularly NYSDEC Groundwater Quality Standards (NYSDEC 1998)

- Assessing the continued achievement of the OU-2 RAOs (NYSDEC 1997a) and consistency with NYSDEC DER-10 Section 6.4 guidance for initiating remedial process closure (NYSDEC 2010b)
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment
- Preparing the necessary reports for the various monitoring activities

To adequately address these issues, this Monitoring Plan provides information on:

- Sampling locations, protocol, and frequency
- Information on all designed monitoring systems (e.g., well logs)
- Analytical sampling program requirements
- Reporting requirements
- Quality Assurance/Quality Control (QA/QC) requirements
- Inspection and maintenance requirements for monitoring wells/piezometers
- Monitoring well/piezometer repair, replacement, and decommissioning procedures
- Annual inspection and periodic certification

Post-shutdown process control monitoring of the continued effectiveness of the remedial action was conducted for 2 years (from July 2013 to July 2015). Quarterly monitoring occurred during the first year (2013 to 2014), and biannual monitoring occurred during the second year (2014 to 2015). No further groundwater monitoring will occur unless the NYSDEC requests additional sampling events. Monitoring and inspection programs are summarized in Table 5 and outlined in detail in Sections 3.2 and 3.3, respectively.

Table 5: Monitoring/Inspection Schedule

Monitoring Program	Frequency	Matrix	Analysis
Post-Shutdown Process Control Monitoring	Quarterly (2013-2014)	Groundwater	• Groundwater Elevations • Barge Canal Surface Water Elevation • COCs
Post-Shutdown Process Control Monitoring	Biannually (2014-2015)*	Groundwater	• Groundwater Elevations • Barge Canal Surface Water Elevation • COCs
Site-wide Inspection	Annually	Site	• Conduct a visual inspection of ECs and overall site conditions until OU-2 remedial activities are considered complete • Conduct visual inspections for compliance with ICs (i.e., land and groundwater use)

* Note: No further groundwater monitoring will occur unless the NYSDEC requests additional sampling events.

3.2 POST-SHUTDOWN PROCESS CONTROL MONITORING PROGRAM

A network of groundwater monitoring wells and piezometers was installed to monitor both upgradient and downgradient groundwater conditions at the Site via implementation of a COC and hydraulic process control monitoring program. Figure 2 shows the network of groundwater monitoring wells and piezometers for the Site. Monitoring well boring and construction logs are included in Appendix F.

Monitoring wells and piezometers have been monitored biannually as part of the process control monitoring program since 1998 and prior to the April 2013 shutdown of the bioremediation treatment and closed loop hydraulic systems. These wells and piezometers may continue to be sampled during the post-shutdown process control program. Monitoring wells/piezometers currently used for groundwater COC monitoring are listed in Table 6 and presented below by location:

- Area 1 (MW-9S, MW-31, MW-32, MW-33, and TW-01)
- Area 2 (MW-34, MW-35, MW-36R, and TW-02RRR)
- Area 3 (MW-8SR, MW-27, MW-28, MW-29, and MW-30)
- Sentinel (MW-3S and MW-4S)
- Downgradient perimeter (MW-17R, MW-18, MW-23I, MW-23S, PZ-4S, and PZ-4D)

Monitoring wells/piezometers and other features currently used for hydraulic monitoring are listed in Table 6 and presented below by location:

- Area 1 (PZ-F, PZ-G, PZ-HR, PZ-P, PZ-Q, PZ-R, and PZ-S)
- Area 2 (PZ-I, PZ-J, PZ-T, PZ-U, and PZ-V)
- Area 3 (MW-11S, PZ-A, PZ-B, PZ-C, PZ-D, PZ-E, PZ-K, PZ-M, PZ-N, PZ-L, PZ-O, and the Collection Sump)
- Downgradient perimeter (MW-23S, MW-24SR, MW-25S, PZ-4D, PZ-5D, and the Barge Canal)

Groundwater monitoring data for April 2010 to April 2013 (prior to the shutdown of the *in-situ* bioremediation treatment and closed loop hydraulic systems) are shown on Figures 8 and 9. Pre-shutdown groundwater hydrologic conditions are shown on Figure 4. Collectively, these data represent groundwater conditions during the operation of the *in-situ* bioremediation treatment and closed loop hydraulic systems, and form a basis of comparison during the post-remedial process control monitoring data evaluations.

The SMP will be modified to reflect changes in sampling plans approved by the NYSDEC. Deliverables for the groundwater monitoring program are specified in Section 3.5 and Table 7.

3.2.1 Sampling Protocol

All monitoring well sampling activities will be recorded in a field notebook and/or Groundwater-Monitoring Well Sampling Log, as presented in the Field Sampling Plan (FSP; Appendix G). Other observations (e.g., well integrity, etc.) will be documented as detailed in the FSP.

Post-shutdown process control monitoring consists of measuring groundwater or surface water elevations at the locations identified with an "H" in Table 6 and collecting groundwater samples from the monitoring wells and piezometers identified with a "C" in Table 6.

Groundwater levels will be measured and groundwater samples will be collected using the Water Level Measurement procedures and Low-flow Groundwater Sampling procedures, as specified in the FSP (Appendix G). The surface water level of the Barge Canal will be measured from a reference point demarcated along the center of the Bear Street Bridge, which crosses over the canal. Field QA/QC samples (trip blanks, field duplicate samples, and matrix spike/matrix spike duplicate samples) will be collected during each groundwater sampling event, as detailed in Section 3.4. Groundwater samples and all field QA/QC samples will be sent to a qualified NYSDOH Environmental Laboratory Approval Program-certified laboratory for analysis.

Detailed information on groundwater sampling procedures and analytical methodology are presented in the FSP (Appendix G) and Quality Assurance Project Plan (QAPP; Appendix H).

3.2.2 Monitoring Well Repairs, Replacement, and Decommissioning

Monitoring wells will be repaired, replaced, and decommissioned as needed. When damage is observed, an assessment will be made as to whether the well can be repaired or must be replaced, based on structural integrity and overall performance. If determined to be repairable, the necessary repairs will be made. Included under the general term of "monitoring well repairs" is well redevelopment. Any well/piezometer included in the post-shutdown process control monitoring program will be redeveloped if:

1. Its yield is observed to decrease over time during successive sampling events. Specifically, if the pumping rate used at a given well/piezometer must be decreased by more than 50 percent in order to maintain the same level of drawdown achieved during the previous sampling event.

2. More than 20 percent of the total length of the well/piezometer screen is occupied by accumulated sediment.

Decreases in yield are most-often associated with biofouling or excessive siltation of the well screen.

If a damaged monitoring well/piezometer is judged to be irreparable, it will be properly decommissioned and replaced (as per the FSP) at the nearest available location, unless otherwise approved by the NYSDEC. NYSDEC will be notified prior to any repair, replacement, or decommissioning of monitoring wells/piezometers, and the repair or replacement process will be documented in the subsequent monitoring memo or PRR. Well decommissioning without replacement will be done only with the prior approval of the NYSDEC and will be performed in accordance with the NYSDEC's CP-43 Groundwater Monitoring Well Decommissioning Policy (NYSDEC 2009).

Monitoring wells/piezometers will be visually inspected for damage during the annual site-wide inspection, as described in the following section.

If biofouling or silt accumulation occurs in the on-site and/or off-site monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced (as per the Monitoring Plan), if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring network will be performed based on assessments of structural integrity and overall performance.

Monitoring wells that are decommissioned because they have been rendered unusable will be reinstalled in the nearest available location, unless otherwise approved by the NYSDEC.

3.3 SITE-WIDE INSPECTION

Site-wide inspections will be performed on a regular schedule at a minimum of once a year (Table 5). Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring wells/piezometers. During these inspections, a Site-wide Inspection Form will be completed (Appendix I). The form will

compile sufficient information to document an assessment of compliance with the SMP, potentially including the following:

- Compliance with all ICs, including site usage
- An evaluation of the condition and continued effectiveness of ECs
- General site conditions at the time of the inspection
- An evaluation of the above-grade conditions of monitoring wells/piezometers
- The site management activities being conducted
- Compliance with monitoring and maintenance schedules included in the Operation and Maintenance Plan
- Site records are up-to-date

3.4 MONITORING QUALITY ASSURANCE/QUALITY CONTROL

All sampling and analyses will be performed in accordance with the requirements of the QAPP prepared for the Site (Appendix H). Main components of the QAPP include:

- QA/QC objectives for data measurement
- Sampling program
    - Sample containers will be properly washed, decontaminated, and appropriate preservative will be added (if applicable) prior to their use by the analytical laboratory. Containers with preservative will be tagged as such.
    - Sample holding times will be in accordance with the NYSDEC Analytical Services Protocol (ASP) requirements.
    - Field QC samples (e.g., trip blanks, coded field duplicates, and matrix spike/matrix spike duplicates) will be collected as necessary.
- Sample tracking and custody
- Calibration procedures

- All field analytical equipment will be calibrated immediately prior to each day's use. Calibration procedures will conform to manufacturer's standard instructions.
- The laboratory will follow all calibration procedures and schedules as specified in USEPA SW-846 (USEPA 2007) and subsequent updates that apply to the instruments used for the analytical methods.

- Analytical procedures
- Preparation of a Data Usability Summary Report, which will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and Chain-of-Custody procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method
- Internal QC and checks
- QA performance and system audits
- Preventative maintenance procedures and schedules
- Corrective action measures

3.5 MONITORING REPORTING REQUIREMENTS

Forms and any other information generated during regular monitoring events and inspections will be kept on file. Forms used during the annual site-wide inspections will be: (1) subject to approval by the NYSDEC and (2) submitted at the time of the PRR, as specified in Section 5.3 of this SMP.

Depending on the PRR submittal schedule, monitoring results may be reported to the NYSDEC in a monitoring memo. The main objective of the monitoring memo is to provide timely updates of groundwater conditions. The memo will include, at a minimum:

- Date of events
- Personnel conducting sampling

- Description of the activities performed
- Type of samples collected (i.e., groundwater)
- Copies of field forms (as detailed in the FSP and QAPP)
- Sampling results in comparison to appropriate standards/criteria
- A figure illustrating sample type and sampling locations
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted electronically in a NYSDEC-approved format.
- Any observations, conclusions, or recommendations
- A determination as to whether groundwater conditions have changed since the last reporting event
- An evaluation to determine the continued effectiveness of the remedial action

The PRR will include the following monitoring reporting requirements as stated in Section 5.3 of this SMP:

- Summary of the results
- Copies of the completed Site-wide Inspection Form and IC/EC certification forms
- Sampling results in comparison to appropriate standards/criteria
- A figure illustrating sample type and sampling locations
- Any observations, conclusions, or recommendations
- A determination as to whether groundwater conditions have changed since the last reporting event

Data will be reported in hard copy or digital format as determined by the NYSDEC. A summary of the monitoring program deliverables are summarized in Table 7 below.

Table 7: Schedule of Monitoring/Inspection Reports

Post-Shutdown Process Control Monitoring Frequency	Deliverable	Reporting Frequency*
Quarterly (2013-2014)	Monitoring Memo	A Monitoring Memo was submitted quarterly after the following post-shutdown process control monitoring events: • Monitoring Year 1: July 2013, October 2013, January 2014, and April 2014
Biannually (2014-2015)	Monitoring Memo*	A Monitoring Memo was submitted after the following post-shutdown process control monitoring events: • Monitoring Year 2: October 2014 and April 2015
Annual or as requested by NYSDEC	PRR	PRR will be submitted on an annual basis or for a period as otherwise determined by NYSDEC.
--	Site-wide Inspection Form	Annually

* Note: No further monitoring memos will be prepared unless the NYSDEC requests additional groundwater sampling events.

4.0 OPERATION AND MAINTENANCE PLAN

4.1 INTRODUCTION

This Operation and Maintenance Plan describes the measures necessary to operate, monitor, and maintain the mechanical components of the OU-2 remedy. The *in-situ* bioremediation treatment and closed loop hydraulic systems were shutdown in April 2013. Operation and maintenance of these systems is not applicable when shut down; however, in the event that the remedial processes must be re-started, the measures necessary to operate and maintain the mechanical components are described in this Plan.

This Operation and Maintenance Plan:

- Includes the steps necessary to allow individuals unfamiliar with the Site to operate and maintain the ECs and *in-situ* bioremediation treatment systems
- Includes an operation and maintenance contingency plan
- Will be updated periodically to reflect changes in site conditions or the manner in which the systems are operated and maintained

The monitoring programs for ECs and *in-situ* bioremediation treatment and closed loop hydraulic systems are summarized in Table 8 and outlined in detail in the following sections. Additionally, the on-site building, shed, and landscape will be maintained, including (but not limited to), mowing the grass and trimming the vegetation along the fence.

Table 8: Monitoring Schedule for ECs and *In-Situ* Bioremediation Treatment and Closed Loop Hydraulic Systems

Monitoring Program	Frequency*	Matrix	Analysis
Engineering Control Monitoring	Annually	Fence/Access Control	• Fence • Signs • Fence Gate Locks
	During each post-shut down process control monitoring event	Groundwater Containment	• Groundwater Elevations • Barge Canal Surface Water Elevation
In-Situ Bioremediation System Monitoring	Weekly	Area 3 *In-Situ* Bioremediation Treatment System	• Treatment System Components • Conductivity Measurements • Aerator Stone
	Monthly	Groundwater	• Dissolved Oxygen Concentrations (Areas 1, 2, and 3)
	Monthly	Area 2 and 3 Oxygen Infusion System	• iSOC© Unit Inspections

*Notes: The frequency of monitoring events will be conducted as specified until the OU-2 remedial activities are considered complete or otherwise requested by the NYSDEC and NYSDOH.

A copy of this Operation and Maintenance Plan, along with the complete SMP, will be kept at the Site and in the project files. This Operation and Maintenance Plan is not to be used as a stand-alone document, but rather as a component document of the SMP.

4.2 ENGINEERING CONTROL SYSTEM OPERATION AND MAINTENANCE

This section describes the procedures required for O&M of the ECs established at the Site.

4.2.1 Fencing/Access Control

4.2.1.1 Scope

A fence is erected around the entire perimeter of the Site to restrict public access to the Site. In addition, signs are located along the fence to clearly notify the public of restricted access. The fence/access control measures will be routinely monitored (as detailed below) and maintained such that they remain intact and effectively restrict public access to the Site until OU-2 remedial activities are considered complete.

4.2.1.2 Routine Engineering Control Monitoring and Maintenance Procedures

Routine monitoring and maintenance includes visual inspections to confirm that the fence, gate locks, and signage around the Site are intact. Visual inspections of this EC will be conducted during annual site-wide inspections, as described in the Monitoring Plan (Section 3.3). If the fence and/or signage are in need of repair or replacement, the appropriate personnel (see Table 4) will be notified immediately and the necessary repairs will be made in a timely manner.

4.2.2 Groundwater Containment

4.2.2.1 Scope

Groundwater containment was included in the OU-2 remedial activities as an EC in Area 3 to prevent the potential migration of groundwater COCs beyond the Site boundary. Groundwater containment involves the establishment of a closed loop hydraulic cell in Area 3 between the upgradient infiltration trenches and the downgradient withdrawal trench (see Figure 2 for the locations of the infiltration and withdrawal trenches). In April 2013, this EC was removed following the shutdown of the Area 3 remedial processes. In the event that the remedial processes are re-started, based on evaluation of the post-shutdown process control monitoring data, groundwater containment will be re-established.

4.2.2.2 Routine Engineering Control Operation and Maintenance Procedures

The groundwater containment system in Area 3 is designed to withdraw groundwater from the shallow hydrogeologic unit downgradient of Area 3, transport the

collected groundwater to the treatment building, and convey the treated groundwater upgradient of Area 3. The system has been consistently demonstrated to operate automatically and require only periodic monitoring and maintenance. O&M procedures for the mechanical components of this EC are included as part of the O&M procedures for the Area 3 *in-situ* bioremediation treatment system, which is described below in Section 4.3.

4.2.2.3 Engineering Control Performance Monitoring

The performance of the groundwater containment EC will be monitored during each hydraulic process control monitoring event and results will be summarized in the subsequent PRR and/or monitoring memo. This monitoring program was established to: (1) confirm that groundwater containment has been established, and (2) verify that groundwater withdrawal rates in Area 3 do not cause the freshwater/saltwater interface (see Figure 3) to upcone to the bottom of the withdrawal trench

During the hydraulic process control monitoring program, groundwater elevations are measured from select monitoring wells/piezometers (see Monitoring Plan Section 3.2.1) that are screened entirely within the sand layer of the hydrogeologic unit and located in and around Areas 1, 2, and 3. Additionally, the Barge Canal surface water elevation is obtained from measurements made from a reference point on the Bear Street Bridge, which passes over the canal. The groundwater elevation measurements are used to create a potentiometric map of the Site's shallow hydrogeologic unit to confirm that a closed loop hydraulic cell is maintained in Area 3.

Weekly conductivity measurements of groundwater pumped from the withdrawal trench in Area 3 are also recorded and compared to conductivity measured in the deep unit to verify that the Area 3 treatment system has not caused the freshwater/saltwater interface to upcone to the base of the withdrawal trench.

4.3 *IN-SITU* BIOREMEDIATION TREATMENT SYSTEM OPERATION AND MAINTENANCE

In April 2013, the NYSDEC approved the discontinuation of the *in-situ* bioremediation treatment system in Areas 1, 2, and 3, including discontinuation of hydrogen peroxide amendments in Area 1, oxygen diffusion in Areas 2 and 3, and the

closed loop hydraulic system in Area 3 (NYSDEC 2013a). In the event that remedial processes must be re-started, this section describes the O&M activities for the *in-situ* aerobic bioremediation treatment system, including the following:

- Starting up the Area 3 *in-situ* bioremediation treatment system
- Performing routine operation, monitoring, and maintenance of the Area 3 *in-situ* bioremediation treatment system
- Introducing hydrogen peroxide amendments to Area 1
- Performing routine operation and maintenance of the Areas 2 and 3 oxygen infusion system

4.3.1 Area 3 *In-Situ* Bioremediation Treatment System Start-Up Procedures

The following steps will be taken to start-up the Area 3 *in-situ* bioremediation treatment system:

1. Observe that all manually-actuated valves associated with water flow through the system and air flow through the carbon treatment system are in the correct position based on the desired operating conditions.
2. Proceed to the blower manual motor start switch on the wall of the process room and place the switch in the "On" position.
3. Energize the pump control panel in the electrical room and place the collection sump pump and transfer pump manual/off/auto switches in the "Auto" position. If the level of water within the collection sump is sufficient, the collection sump pump will start.
4. Check the pump operation by observing the influent flow meter.
5. During the operation of the collection sump pump, adjust the ball valve accordingly to achieve a flow rate less than 10 gallons per minute.
6. Observe that the "Start" level probe in the equalization tank turns the transfer pump on.
7. Adjust the ball valves for each effluent infiltration line and the influent line accordingly based on the desired operating conditions.

8. Turn on the autodialer.

4.3.2 Area 3 *In-Situ* Bioremediation Treatment System Operation: Operation and Monitoring Procedures

In order to verify that the Area 3 *in-situ* bioremediation treatment system is operating satisfactory, O&M personnel will conduct weekly observations of the system. An *In-Situ* Bioremediation System Operation and Maintenance Log Sheet (Appendix J) will be completed during each weekly observation event. Non-routine monitoring of the system will be conducted, as needed, particularly following activation of the alarm system or severe weather conditions. The following provides a description of the main treatment system components and activities that will be conducted as part of the weekly system monitoring. If any equipment readings are not within their typical range, any equipment is observed to be malfunctioning, or the system is not performing within specifications, maintenance and repair will be performed as outlined in Section 4.3.3.

Collection Sump

The collection sump is located approximately 150 feet northeast of the treatment building as shown on Figure 2. The collection sump consists of a 4-foot-diameter, approximately 15-foot-deep concrete manhole containing one submersible pump and associated level controls. The pump is connected to a 2-inch-diameter PVC discharge pipe; the pipe converts to a 2-inch-diameter HDPE pipeline, which transports recovered groundwater to the 1,000-gallon equalization tank located inside the treatment building.

The groundwater recovered from the collection sump is measured by a disc flow meter located within the treatment building. This flow meter is equipped with a totalizer and rate indicator. The collection sump is governed by a control panel containing a main breaker switch, manual/off/auto switches for the collection pump, and an alarm light.

The submersible pump is controlled by three float-type level-control and associated alarm switches that are supported within the collection sump by a weighted chain. The three floats (start, stop, and high) and their corresponding control/alarm depths are determined based on field hydraulic conditions and the RAOs for OU-2.

Collection Sump Monitoring Procedures

- Open the access way and visually observe the collection sump interior without entering the collection sump.
- Check the floats to observe if they are hanging properly and are free from obstruction.
- Observe the groundwater contained in the collection sump. Make note of unusual odors, floating debris, water clarity, etc.
- If the collection sump pump is running, listen for unusual sounds and observe the discharge piping (if possible) within the manhole for leaks.

Treatment Building: Equalization Tank and Transfer Pump

Groundwater recovered from the collection sump is pumped into the 1,000-gallon equalization tank located inside the treatment building, and is subsequently conveyed to the infiltration trenches via a transfer pump. A manually operated sampling port and flow meter were installed in-line and just prior to the equalization tank to allow influent water samples to be collected and the influent flow rate to be documented. Water level probes were installed in the equalization tank to prevent overflow and maintain equalization between the groundwater recovered from the collection sump and the infiltration rate from the equalization tank into the infiltration trenches.

Flow meters were installed in-line of each of the three effluent pipes to the infiltration trenches in order to monitor and document the flow into each infiltration trench.

An aerator stone (i.e., Oxygen Edge Unit) located inside the equalization tank provides a continuous source of oxygen gas to groundwater before it is discharged to the infiltration trenches.

Treatment Building Monitoring Procedures

- Observe the transfer pump and listen for unusual sounds if the pump is running. Also check to confirm that the pump is properly secured to the floor.

- Check the floats in the equalization tank to observe whether they are hanging properly and are free from obstruction. Also observe the groundwater contained in the equalization tank. Make note of any unusual observations such as odors, floating debris, water clarity, or the amount of solids on the bottom of the tank.
- Observe the flow meters for proper operation by checking the instantaneous flow measurement. If the flow meters appear to be inoperable, clean the flow meter in accordance with the manufacturer's recommendations.
- For all four flow meters, record the current meter reading in total gallons. Compare this reading with the previous reading and calculate the total volume (gallons) measured since the previous reading and gallons per minute.
- Visually observe and clean, as necessary, the influent y-strainer.
- Observe and clean (weekly) the aerator stone in the equalization tank for proper operation in accordance with the manufacture's recommendations.
- Measure and record the influent conductivity (periodically) of the groundwater.
- Observe the blower for proper operation.
- Record the pressure readings for the following (if applicable):
    - The collection sump influent discharge
    - The effluent discharge from the equalization tank
    - The effluent discharge to Infiltration Trench A
    - The effluent discharge to Infiltration Trench B
    - The effluent discharge to Infiltration Trench C
- Record the pressure reading associated with the vapor phase activated carbon unit in inches of water.
- Observe the treatment building piping for signs of leaks.
- Exercise all valves (once per month) by opening and then closing them.
- Check that the heating, ventilation, and lighting systems are operational.

- Record the electric meter reading.

4.3.2.1 System Alarms and Warning Devices

The collection sump and equalization tank are equipped with alarm systems to regulate the amount of groundwater flowing through the system at any given time. The alarm systems operate as follows:

Collection Sump

As groundwater enters the collection sump, the submersible pump will start up when the "start" level probe is activated at the designated elevation. The pump will run until the water level is lowered and activates the "stop" level probe. If the water level within the collection sump reaches the "high" level alarm elevation, the alarm will be activated and will activate the autodialer which will notify O&M personnel by telephone of the alarm. The following presents a brief description of the alarm conditions associated with the collection sump operations:

- High Level – high water level in the collection sump will activate the autodialer as described above
- Treatment Building Equalization Tank High Level – high water level in the equalization tank located in the treatment building will shut off the collection sump pump and activate the autodialer
- Treatment Building Sump High Level – high water level in the treatment building sump will shut off the collection sump pump and activate the autodialer

Equalization Tank

As groundwater enters the equalization tank, the transfer pump will start when the "start" level probe is triggered. The transfer pump will run until the water level is lowered and activates the "stop" level probe. Similar to the collection sump, a high water "alarm" level probe has been installed in the equalization tank and connected to the autodialer which will notify O&M personnel by telephone if this alarm is activated. This "alarm" level probe is also connected to a switch that will automatically shut off the collection sump pump if the "alarm" level probe is activated. As an additional precaution, a sump is

located in the concrete floor of the process room with a sump pump and "alarm" level probe. The "alarm" level probe is connected to a control switch that automatically activates the sump pump, shuts off the collection sump pump, and activates the autodialer, which will notify O&M personnel by telephone of the alarm.

Autodialer

The collection sump, equalization tank, treatment building sump, and vapor control system are interfaced with a Verbatim™ autodialer manufactured by RACO Manufacturing and Engineering Company, Inc. When an alarm is activated, the autodialer calls a preprogramed telephone number and relays voice grade alarm messages upon connection to a local Syracuse area answering service, which is staffed with an operator 24 hours-per-day. The answering service will then immediately contact the O&M personnel by placing a call to the appropriate personnel.

Upon receipt of the alarm message, the O&M personnel will call into the autodialer to confirm the alarm condition.

Once the alarm is confirmed, the O&M personnel will mobilize to the Site and take appropriate action to rectify the operating condition causing the alarm. O&M personnel will only respond to the high water level in the treatment building sump alarm during non-business hours and will use the "buddy" system. All other alarms that occur during non-business hours will be addressed during normal business hours. Alarms and associated corrective actions (if necessary) will be noted in the subsequent PRR.

4.3.3 Area 3 *In-Situ* Bioremediation Treatment System Operation: Equipment Maintenance

If system repairs and/or replacement of Area 3 *in-situ* bioremediation treatment system components are necessary based on O&M personnel observations, O&M personnel will conduct the appropriate system maintenance/repair activities. Manufacturer’s specifications and/or operation manuals for the treatment system components are maintained in the project file. In the instance(s) that O&M personnel need to conduct system shutdown or maintenance/removal of the collection sump pump, the following procedures are followed.

System Shutdown

The system is designed to run continuously except during planned equipment maintenance/cleaning shutdowns. In the event that a system shutdown becomes necessary, the following steps should be followed:

1. Shut off the autodialer.
2. Shut down both water pumps (collection sump pump and transfer pump).
3. Shut down the blower by placing the manual motor start switch to the "Off' position.
4. Shut off and lock out the power at the main disconnect switch on the control panel if more than a temporary shutdown is anticipated.

Collection Sump Pump Removal and Replacement

The collection sump is designed so that pump removal/replacement can be accomplished without entering the collection sump. Two people are required to remove/replace the pump using the following procedures:

- Tum off and lock out the power to the treatment building.
- Close the ball valve in the collection sump to the pump to be removed.
- Uncouple the union in the collection sump on the line to the pump to be removed.
- Unfasten the end of the pump removal chain from the chain support eyehook and pull the pump, along with the discharge piping, out of the collection sump (as the pump is pulled up, it will be necessary to clip each plastic cable tie that secures the power cable to the discharge pipe).
- Disconnect the electrical power cable from the removed pump and reinstall the power cable on the new pump.
- Unscrew the discharge piping from the pulled pump and reinstall the piping on the new pump.
- Unbolt the pump removal chain from the pulled pump and install it on the new pump.

- Lower the new pump into position (secure the power cable to the pump discharge pipe with plastic cable ties as the pump is being lowered into the collection sump) and secure the end of the pump removal chain to the chain support eyehook.
- Couple the pump discharge pipe union together and open the ball valve.
- Tum on the power to the system.
- With the pump running, check it for proper operation, and check the piping in the collection sump for leaks.

4.3.4 Hydrogen Peroxide Amendments: Routine Operation Procedures

Hydrogen peroxide amendments are added to Area 1 piezometers and standpipes once a month. To apply the hydrogen peroxide amendments, the following procedures are followed:

- Pump groundwater from the Area 2 infiltration trenches into 55-gallon stainless steel drums.
- Add hydrogen peroxide to the groundwater stored in the drums.
- Pump the hydrogen peroxide-amended groundwater into the piezometers and standpipes located in Area 1.

4.3.5 Area 2 and 3 Oxygen Infusion System: Routine Monitoring and Maintenance Procedures

A continuous source of oxygen gas is added to groundwater in Areas 2 and 3 via iSOC® units. To maintain proper functioning, the iSOC® units are removed for monthly inspections and cleaning, as necessary.

Dissolved oxygen concentrations are recorded in all Areas once a month from monitoring wells MW-33 in Area 1, MW-36R and TW-02RRR in Area 2, and MW-27, MW-28, and MW-8SR in Area 3.

4.4 MAINTENANCE REPORTING REQUIREMENTS

Maintenance reports and other pertinent information generated during regular operations at the Site will be kept on file. All reports, forms, and other relevant information generated will be available upon request to the NYSDEC and pertinent information about maintenance activities will be summarized and included as part of the PRR, as specified in the Section 5.3 of this SMP.

A maintenance form (*In-Situ* Bioremediation System Operation and Maintenance Log Sheet; Appendix J) will be completed for the O&M of the various components of the *in-situ* bioremediation systems performed at the Site. The form includes, but is not limited to the following information:

- Date
- Name, company, and position of person(s) conducting maintenance activities
- Maintenance activities conducted
- Any modifications to the system
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet)

5.0 INSPECTIONS, REPORTING AND CERTIFICATIONS

5.1 SITE INSPECTIONS

5.1.1 Inspection Frequency

All inspections will be conducted at the frequency specified in the schedules provided in the Monitoring Plan (Section 3.0) and the Operation and Maintenance Plan (Section 4.0) of this SMP. At a minimum, a site-wide inspection will be conducted annually. Inspections of operating mechanical remedial components will also be conducted when an alarm has occurred or whenever a severe condition has taken place, such as an erosion or flooding event that may affect the ECs.

5.1.2 Inspection Forms, Sampling Data, and Maintenance Reports

All inspections, monitoring events, and maintenance activities during the post-shutdown process control monitoring program and annual site-wide inspections will be recorded on the appropriate forms, which are contained in Appendix I (Site-wide Inspection Form) and the FSP (Appendix G; Groundwater Monitoring Well Sampling Log Form). In the event that the remedial processes are re-started, inspections and maintenance activities of ECs and the *in-situ* bioremediation treatment system will also be recorded on the Site-wide Inspection Form and *In-Situ* Bioremediation System Operation and Maintenance Log Sheet included in Appendices I and J, respectively. These forms are subject to NYSDEC revision.

The Site-wide Inspection Form completed during the annual site-wide inspection will be provided in electronic format in the PRR. All other applicable inspection forms and other records, including groundwater monitoring well sampling log forms and bioremediation treatment system maintenance log sheets, generated for the Site during the reporting period will be kept in the project file.

5.1.3 Evaluation of Records and Reporting

The results of the inspection and site monitoring data will be evaluated as part of the IC/EC certification to confirm that the:

- IC/ECs are in place, are performing properly, and remain effective
- The SMP is being implemented
- O&M activities are being conducted properly; and, based on the above items
- The site remedy continues to be protective of public health and the environment and is performing as designed in the RD/RA Work Plan for OU-2 (BBL 1997) and OU-2 RD/RA Report (BBL 1999c)

5.2 CERTIFICATION OF ENGINEERING AND INSTITUTIONAL CONTROLS

Per NYSDEC requirements identified in DER-10 (Table 1.5), the person certifying will depend on the status of the site at the time of the certification (i.e., whether there are engineering controls and/or monitoring requirements in-place). Accordingly, the site owner (or remedial party), qualified environmental professional, or professional engineer licensed to practice in New York State will prepare the following certification, on an annual basis or for a period as otherwise determined by the NYSDEC, after the site-wide inspection is completed:

For each IC or EC identified for the Site, I certify that all of the following statements are true (only statement applicable to the NYSDEC-required ICs, ECs, and monitoring requirements in-place at the time of the certification will be used in the certification):

- The inspection of the Site to confirm the effectiveness of the ICs and ECs controls required by the remedial program was performed under my direction.
- The ECs and/or ICs employed at this Site are unchanged from the date the control was put in place, or last approved by the NYSDEC.
- Nothing has occurred that would impair the ability of the control to protect the public health and environment.

- Nothing has occurred that would constitute a violation or failure to comply with the SMP for this control.
- Access to the Site will continue to be provided to the NYSDEC to evaluate the remedy, including access to evaluate the continued maintenance of this control.
- Use of the Site is compliant with the Deed Restrictions.
- The EC systems are performing as designed and are effective.
- To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices.
- The information presented in this report is accurate and complete.

In addition, the certification of ICs/ECs will include the following NYSDEC-required certification statement:

- I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner or Owner's Designated Site Representative] [I have been authorized and designated by all Site owners to sign this certification] for the Site.

The signed certification will be included in the PRR described below.

5.3 PERIODIC REVIEW REPORT

A PRR will be submitted to the NYSDEC on an annual basis or for a period as otherwise determined by the NYSDEC. The PRR will be prepared in accordance with NYSDEC DER-10 (NYSDEC 2010b) and submitted within 30 days of the end of each certification period. The PRR will include the information identified below that is necessary to document the basis for the IC/EC certification:

- Identification, assessment, and certification of all ECs/ICs required by the remedy for the Site.

- Results of the required annual site inspections and severe condition inspections, if applicable.
- Description of pertinent maintenance activities performed on site, if applicable.
- An electronic copy of the annual Site-wide Inspection Form generated for the Site.
- List of groundwater level measurements and a potentiometric map of the shallow hydrogeologic unit generated for the reporting period, if applicable.
- Data summary tables and graphical representations of COCs in groundwater (as necessary), which include a listing of all compounds analyzed for the reporting period (if any), along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends.
- A Site evaluation, which includes the following:
    - The compliance of the remedy with the requirements of the OU-2 ROD (NYSDEC 1997a).
    - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring Plan for the groundwater being monitored.
    - Recommendations regarding any necessary changes to the remedy, Monitoring Plan, and/or O&M activities.
    - A determination as to whether groundwater conditions have changed since the last reporting event.
    - The overall performance and effectiveness of the remedy.
- Performance summary for treatment systems at the Site that were operating during the reporting period (if any), including information such as:
    - The number of days the system(s) was run for the reporting period
    - Total volume of water pumped from the withdrawal trench and introduced into the Area 3 infiltration trenches

- Operation details of the treatment system(s)
- A description of breakdowns and/or repairs along with an explanation for any significant downtime
- A description of the resolution of performance problems
- A summary of the EC (i.e., groundwater containment) performance monitoring
- Comments, conclusions, and recommendations based on data evaluation

The PRRs will be submitted, in electronic format, to the NYSDEC Central Office, NYSDEC Region 7 Office, and NYSDOH.

5.4 CORRECTIVE MEASURES PLAN

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an IC or EC, a corrective measures plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the corrective measures plan until it is approved by the NYSDEC.

6.0 REFERENCES

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