FOURTH FIVE-YEAR REVIEW REPORT
HOOKER (102nd STREET) SUPERFUND SITE
NIAGARA COUNTY, NEW YORK

Prepared by

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

September 2016

Approved by: **Date:**

Walter E. Mugdan, Director
Emergency and Remedial Response Division

September 26, 2016

Table of Contents

Executive Summary

This is the fourth five-year review for the Hooker (102nd Street) Superfund Site located in Niagara Falls, Niagara County, New York. The purpose of this five-year review is to review information to determine if the remedy is and will continue to be protective of human health and the environment. The triggering action for this statutory five-year review is the previous five year review dated September 19, 2011.

The selected remedy has been fully implemented. Institutional controls to protect the landfill remedy and to prevent the installation of potable water wells in the vicinity of the landfill were implemented. This site has ongoing operation, maintenance and monitoring activities as part of the selected remedy. Based upon the results of the five-year review, it has been concluded that the selected remedy has been functioning as designed.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Hooker (102nd Street) Landfill		
EPA ID: 980506810		
Region: 2	**State:** NY	**City/County: Niagara Falls, Niagara County**

SITE STATUS	
NPL Status: Final	
Multiple OUs? No	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA ***[If "Other Federal Agency", enter Agency name]*:** Click here to enter text.
Author name (Federal or State Project Manager): Gloria M. Sosa
Author affiliation: EPA RPM
Review period: 9/19/2011 - 9/18/2016
Date of site inspection: 5/2/2016
Type of review: Statutory
Review number: 4
Triggering action date: 9/18/2011
Due date *(five years after triggering action date)*: 9/18/2016

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
N/A

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): *OU1*	**Issue Category:** Monitoring			
	Issue: Monitoring wells PCM-03, 04, and 05 continue to exceed NYSDEC Class GA Groundwater Criteria.			
	Recommendation: Sample surface water and sediment in the embayment area outside the slurry wall			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	7/15/2017

OU(s): *1*	**Issue Category: Operations and Maintenance**			
	Issue: Monitoring well PZ-08 has been 'dry' for six consecutive quarters			
	Recommendation: • monitoring well PZ-08 well should be tested and possibly redeveloped or replaced.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	No	PRP	EPA/State	7/15/2017

Protectiveness Statement(s)		
Operable Unit: OU1	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter a date.
Protectiveness Statement: The remedy at the Hooker (102nd Street) Landfill site currently protects human health and the environment as there is no human exposure to contaminated ground water or landfill residuals, and engineered and institutional controls continue to be operated, monitored and maintained. However, in order for the remedy to be protective in the long-term, additional sampling to assess elevated levels of containments outside the slurry wall will be conducted to ensure long-term protectiveness.		

Sitewide Protectiveness Statement	
Protectiveness Determination: Protective	*Addendum Due Date (if applicable):* Click here to enter a date.
Protectiveness Statement: The remedy at the Hooker (102nd Street) Landfill site currently protects human health and the environment as there is no human exposure to contaminated ground water or landfill residuals, and engineered and institutional controls continue to be operated, monitored and maintained. However, in order for the remedy to be protective in the long-term, additional sampling to assess elevated levels of containments outside the slurry wall will be conducted to ensure long-term protectiveness.	

Introduction

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

This is the fourth FYR for the Hooker (102nd Street) Landfill Superfund site, located in Niagara County, New York. This FYR was conducted by the Environmental Protection Agency (EPA) Remedial Project Manager (RPM) Gloria M. Sosa. The review was conducted pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 U.S.C. §9601 *et seq.* and 40 CFR 300.430(f)(4)(ii), and in accordance with the *Comprehensive Five-Year Review Guidance*, OSWER Directive 9355.7-03B-P (June 2001). This report will become part of the site file.

The triggering action for this statutory review is the previous FYR, dated September 19, 2011. A FYR is required at this site due to the fact that hazardous substances, pollutants or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. The site consists of one operable unit, which is addressed in this FYR.

Site Chronology

See Table 1 for the site chronology.

Background

Site Location

The site is located on Buffalo Avenue in Niagara Falls, New York (see Figure 1). The site borders on the Niagara River and lies less than one-quarter mile directly south of the Love Canal Superfund site, separated from the Love Canal site by the LaSalle Expressway and Buffalo and Frontier Avenues. A portion of the filled area of the site is an extension of the original Love Canal excavation.

Land and Resource Use

The site consists of approximately 22.1 acres; 15.6 acres are owned by Occidental Chemical Corporation (OCC), formerly the Hooker Chemicals & Plastics Corporation, and 6.5 acres are owned by the Olin Corporation (Olin). Hereafter, OCC and Olin will collectively be referred to as the "Companies." The site has restricted access and has not been put to reuse.

The site is bounded to the south by a shallow embayment of the river. A stone-faced bulkhead, constructed in the early 1970s to minimize soil erosion to the river, runs along the length of the shoreline at the site. The embayment lies at the upstream end of the Little Niagara River which flows around the north shore of Cayuga Island before discharging into the river approximately 1.5 miles downstream from the site. To the west of the site is Griffon Park, which was formerly used as a landfill for municipal waste by the City of Niagara Falls. Griffon Park is owned by the City of Niagara Falls and is utilized for passive recreational activities and a boat ramp along the Little Niagara River. There is limited residential development to the west of Griffon Park. Across

the Little Niagara River is Cayuga Island, which is a residential community. The property to the east of the site is zoned residential and currently has two waterfront residences, but is otherwise an unimproved densely brushed field. A well-maintained perimeter fence restricts site access. Authorized vehicular traffic access is provided from Buffalo Avenue by locked fence gates.

History of Contamination

The larger portion of the landfill operated from 1943 to 1971. During that time, approximately 23,500 tons of mixed organic solvents, organic and inorganic phosphates, and related chemicals were deposited at the landfill. Brine sludge, fly ash, electrochemical cell parts and related equipment and 300 tons of hexachlorocyclohexane process cake, including lindane, were also deposited at the site. A landfill operated on the smaller portion of the site property from 1948 to about 1970, during which time 66,000 tons of mixed organic and inorganic chemicals were disposed. In addition, about 20,000 tons of mercury brine and brine sludge, more than 1,300 tons of mixture of hazardous chemicals, 16 tons of mixed concrete boiler ash, fly ash, and other residual materials were disposed at the site.

Initial Response

In December 1970, the Buffalo District of the U.S. Army Corps of Engineers (COE) inspected the site and notified the Companies that their disposal practices were in violation of the Rivers and Harbors Act of 1899 (RHA). As a result, any further landfilling at the site by the Companies stopped.

In 1972, the site was capped, a fence was erected on three sides, and a bulkhead along the Niagara River was installed.

On December 20, 1979, a complaint pursuant to the Resource Conservation and Recovery Act (RCRA), the Clean Water Act (CWA), and the RHA was filed by the United States of America, on behalf of the Administrator of the EPA, against the Companies seeking injunctive relief to remediate imminent and substantial endangerment to the public health and welfare, and civil penalties. On November 18, 1980, a complaint pursuant to the New York State Conservation Law and the state's common law of public nuisance was filed by New York State (NYS) against OCC and Olin in the U.S. District Court for the Western District of New York, seeking injunctive relief and civil penalties. The two complaints were consolidated. The site was added to the National Priorities List (NPL) in September 1983. In 1984, the Companies prepared a work plan for conducting the Remedial Investigation (RI) and Feasibility Study (FS) at the site and after receiving EPA approval, the Companies commenced to investigate landfill residues, off-site fill, shallow ground water, liquid waste, off-site soil, river sediments, and storm drains. The RI/FS was completed in 1990.

Basis for Taking Action

Contaminants found within the survey area during the RI/FS monitoring period included heavy metals (such as mercury), chlorobenzene compounds, chlorinated phenols, hexachlorocyclohexanes, polychlorinated biphenyls (PCBs), and polychlorinated dioxins and dibenzofurans. Ground water samples taken from the bedrock aquifer beneath the site did not contain site contaminants. Based on these findings, and considering the highly impermeable nature of the clay/till layer separating the alluvium from the bedrock, shallow (overburden) ground water does not appear to flow vertically from the site into the bedrock aquifer. Rather, the

overburden ground water discharges laterally into the embayment and across the site's eastern and western boundaries. The principal pathway for migration of contaminants off-site was via ground water discharge from the fill and alluvium zones of the landfill into the embayment. Sediment monitoring conducted in the River showed contamination limited to an area within 300 feet from the shore.

Off-site investigations also indicated surface soils north of Buffalo Avenue and surface soils around the property perimeter contained site contaminants including dioxin above the 1 part per billion (ppb) action level. As a result, as an interim measure, several inches of gravel were placed over the contaminated areas to preclude possible exposure at these locations.

The risk assessment concluded that the risks were present at the site for fish consumption and direct contact with contaminated surface soils. In addition, potential ecological risks were identified for sensitive species exposure to site contaminants.

Remedial Actions

Remedy Selection

On September 26, 1990, EPA issued a Record of Decision (ROD) identifying the selected remedy for the site. The remedial objective of the selected remedy is to contain the source area and to prevent further migration of contaminants to the extent possible.

The major components of the selected remedy consist of the following:

Landfill Residuals

- A synthetic-lined cap, constructed in accordance with federal and state standards, will be installed over the landfill and perimeter soils.
- All "off-site" soils above cleanup thresholds will be consolidated beneath the cap.
- A slurry wall, completely surrounding the site's perimeter, will be constructed and keyed into the underlying clay/till geologic formation. The precise location of the slurry wall will be established through the use of geotechnical borings which will determine the extent of the non-aqueous phase liquid (NAPL) plume. The NAPL plume is to be contained by the slurry wall.
- Ground water will be recovered using an interception drain installed at the seasonal low water table in the fill materials. Recovered ground water will be treated. Although the recovery of ground water does include a treatment component, the primary function of ground water recovery in general, is to create and maintain an inward gradient across the slurry wall.
- NAPL beneath the site will be recovered using dedicated extraction wells, and will be incinerated at an off-site facility.

Niagara River Sediments

- The two areas of river sediments which contain elevated concentrations of contaminants ("hot spots") will be dredged, and these highly contaminated sediments will be incinerated at an off-site facility.
- The remaining sediments will be dredged out to the "clean line" with respect to site-related contamination.
- These remaining sediments, after dewatering, will then be consolidated on the landfill.

- Any NAPL found within the remaining sediments will be extracted, and will be incinerated at an off-site facility.
- The primary focus of this remediation plan is to contain the NAPL plume with the slurry wall. In the event the slurry wall's initial positioning places it across the "hot spot" area(s), practicality may dictate that the wall be extended outward to enclose these "hot spots." In such case, these highly contaminated sediments, rather than being dredged and incinerated, would be left in place, that is, contained by the slurry wall, covered with fill, and finally covered with the cap. The remaining sediments beyond the slurry wall would still be dredged and consolidated beneath the cap.

Storm Sewer

- The existing storm sewer will be cleaned, and a high density polyethylene plastic slip liner will be installed within the sewer. The annular space between the original pipe and the slip liner will then be pressure-grouted.
- Any NAPL found in the soils and/or sediments taken from the existing sewer will be extracted, and will be incinerated at an off-site facility.

Monitoring

- Post-remedial monitoring shall be performed to determine the effectiveness of the remedial alternatives which have been selected.

Restriction of Access

- A 6-foot high chain-link fence will be installed around the perimeter of the cap in order to restrict access to the site.

Institutional Controls

- Institutional controls in the form of deed restrictions, or similar restrictions, on future uses of the landfill, will be established.

On September 30, 1993, EPA issued an Explanation of Significant Differences (ESD) to document a change in the remedial action for the then-existing storm sewer. The ESD documented the requirement to construct a new storm sewer that would be re-routed around the eastern perimeter of the landfill, and the then existing storm sewer would be plugged and abandoned.

On June 9, 1995, EPA issued a ROD Amendment to document a change in the treatment of excavated sediments from the River. The remedial action, as identified in the 1990 ROD required dredging the River sediments to the "clean line" with respect to site related contamination. As a result of the ROD Amendment, these sediments, after dewatering, would not be incinerated, but instead would be consolidated in the landfill. Any NAPL found within these sediments would be extracted and incinerated at an off-site facility, consistent with the 1990 ROD.

<u>Remedy Implementation</u>

On May 24, 1991, EPA issued Special Notice letters under Section 122(e) of CERCLA to the Companies offering the opportunity to perform the Remedial Design/Remedial Action (RD/RA) as set forth in the ROD for the site. On July 16, 1991, the Companies responded to EPA's Special Notice and Demand Letter with a "good faith offer" of their willingness to perform the RD/RA. However, subsequent negotiations were not successful.

In the absence of an agreement, EPA, pursuant to Section 106(a) of CERCLA, issued a Unilateral Administrative Order (UAO) to the Companies on September 30, 1991 to conduct the RD/RA at the site.

Remedial design activities pursuant to the UAO began in October 1991. The Intermediate Engineering Report (IER), the equivalent of the Remedial Design Report, was approved by the EPA in 1993. However, federal and state natural resource trustees subsequently raised certain concerns related to the IER. As a result, EPA issued a ROD Amendment in June 1995. The ROD Amendment eliminated the requirement to incinerate excavated sediments from the embayment and called for a realignment of the slurry wall so as to avoid the destruction of three acres of irreplaceable wetlands and aquatic habitat. The ROD Amendment further specified that excavated sediments would be consolidated under the landfill cap.

Landfill Residual Remediation

In April 1996, the remedial action began at the site. Construction activities including excavation, consolidation and isolation of perimeter and off-site soils under the landfill cap were completed in August 1996. Table 4 identifies the site-specific soil cleanup criteria.

The circumferential slurry wall construction began in August 1996, and was completed in May 1997. As noted above, a straight line slurry wall alignment, outlined in the IER, would have destroyed approximately three acres of wetlands and aquatic habitat in the embayment area. Therefore, a modified alignment was constructed to preserve wetland and aquatic habitat and the shoreline was entirely dredged. The wall was keyed into the underlying clay/till formation to hydraulically contain the aqueous phase liquid (APL)/NAPL plume within the site.

An interception drain was installed within the landfill at the seasonal low water table to recover leachate and create inward gradients across the slurry wall. Four individual APL wet wells are set at target elevations (561.9 feet) and shut down when elevations in the wells reach target level. A force main system for pumping APL leachate from the landfill to the Love Canal Treatment Facility (LCTF) became operational in March 1999. NAPL is recovered at the landfill and its presence is monitored by eight dedicated extraction wells.

Preparation of hydraulic monitoring at the site consisted of the installation and subsequent measurement of ground water levels in pairs of monitoring wells and piezometers to determine ground water elevations. This included the installation of ten piezometers (PZ-01 through PZ-10) inside the slurry wall and ten monitoring wells (PCM-01 through PCM-10) outside the slurry wall. Ground water quality is monitored through sampling of the overburden monitoring wells (PCM-01 through PCM-10) and three bedrock monitoring wells (PCBM-01 through PCBM-03). Overburden material is made up of fill (0 to 18 feet) and alluvium layer (up to 32 feet), which are hydraulically connected and underlain by a clay layer, which acts as an aquitard. Ground water flows towards the River.

Installation of the capping system began in November 1997. The capping system consists of a combination of geosynthetic and natural soil materials to minimize infiltration of precipitation into the landfill, as well as to isolate the landfill contents.

Access to the site is restricted by the installation of a six-foot high chain link fence that encircles the site along the property line and along the bulkhead. Additionally, institutional controls in the form of deed restrictions were implemented to ensure that future land use at the site is limited so

as to preclude certain types of access to the landfill, prevent any construction or other activity that could interfere with the integrity of the cap or other engineering controls in place at the site, and to restrict ground water use at the site from human consumption.

Sediment Remediation

Beginning in July 1996, a cofferdam was built around the portion of the embayment which contained contaminated sediments. After the embayment area was dewatered, contaminated sediments above the site-specific action levels were removed to a maximum excavation depth of two feet and placed on top of the landfill prior to finalization of the cap installation. Clean fill was backfilled into the excavated embayment. This work was completed in November 1996.

Storm Sewer Remedy

Abandonment and relocation of the 42-inch 100th Street storm sewer that traversed the site was completed in September 1996.

Site Completion

A Preliminary Close-Out Report, which summarizes remedial actions for landfill residuals, perimeter soils, shallow ground water, NAPL, and River sediments, was signed by the EPA on September 2, 1999 and a settling Consent Decree was lodged with the court on July 19, 1999 and was entered by the court on October 1, 1999. By means of a letter dated March 13, 2002, EPA accepted the Companies' Certification of Completion of the remedial action, and transferred the enforcement lead for oversight of the continuing operation and maintenance of the site to the New York State Department of Environmental Conservation (NYSDEC). The site was deleted from the NPL on August 5, 2004.

<u>Operation, Maintenance, and Long-Term Monitoring</u>

An Operation and Maintenance (O&M) Plan has been developed and is being implemented. The O&M plan includes routine inspections of the capped area; mowing landfill vegetation to prevent woody growth; quarterly ground water level measurements; semiannual ground water quality monitoring; quarterly NAPL presence monitoring; APL collection and discharge; and maintenance of access restrictions.

All APL leachate collected from the individual wells at the site has been, and continues to be transferred to the nearby LCTF, where the leachate is treated and discharged. The LCTF is permitted to discharge to the Niagara Falls municipal sewerage system for final treatment at the Niagara Falls Publicly Owned Treatment Works. Wet wells are set at target elevations (561.9 feet) and shut down when elevations in the wells reach target level, in order to maintain the inward differential (gradient) of one to two feet.

NAPL is recovered at the landfill and its presence is monitored by eight dedicated extraction wells on a quarterly basis. If more than three gallons of NAPL is present in a recovery well, NAPL is removed and stored on-site before being transferred to the Clean Harbors facility in Argonite, Utah, for incineration.

In accordance with the O&M Plan, ground water level measurements are monitored within the piezometers and monitoring wells quarterly. There are ten monitoring wells (PCM-01 through

PCM-10) outside the slurry wall and three bedrock monitoring wells (identified as PCBM wells) positioned on the southern, northern, and eastern sides of the site. These bedrock wells are monitored in the same manner as the overburden wells for water level and water quality monitoring.

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

Progress Since Last Five-Year Review

Protectiveness statement(s) from third FYR:

The remedy at the Hooker (102nd Street) Landfill site currently protects human health and the environment as there is no human exposure to contaminated ground water or landfill residuals, and engineered and institutional controls continue to be operated, monitored and maintained. However, in order for the remedy to be protective in the long-term, additional sampling to assess elevated levels of containments outside the slurry wall will be conducted to ensure long-term protectiveness.

Recommendations/ Follow-up Actions from third FYR

- Inward gradients were not consistently maintained for all quarters between 2006 and 2010 at well pair PCM-07R/PZ-07. Recommend that piezometers are tested to ensure they are not clogged and are in hydraulic communication.

- Evaluate source of ground water contamination outside of slurry wall on southwest side of site. Sample surface water and sediment to evaluate residual contamination.

In 2011, NYSDEC requested an investigation of the contamination outside the slurry wall. It is understood by the agencies that residual material remained outside the slurry wall. However, it was expected that the residual contamination would decrease in time. The results of long-term monitoring at the site do not show a reduction in monitoring wells PCM-03, 04, and 05, which continue to exceed NYSDEC Class GA Groundwater Criteria.

OCC conducted a hydraulic evaluation of overburden monitoring well and piezometer hydraulic conditions in 2011 and 2012. All overburden monitoring wells and piezometers were tested to determine if the wells were in hydraulic communication with the geologic media in which the wells are screened.

In April 2012, OCC conducted hydraulic response testing of the monitoring wells and piezometers. OCC concluded that current site water levels inside the slurry wall in this area have been reduced through pumping to the extent that the installed screen depth of PZ-09 is no longer within the current water table. OCC proposed to reinstall PZ-09 and PCM-09, as well as PZ-06 and PCM-09.

OCC installed soil borings for the proposed replacement wells for PZ-06 and PZ-09 in October 2012. The overburden was found to be dry 2 feet into the confining layer for PZ-06 and 8 feet into the confining layer for PZ-09. OCC concluded that the wells were installed appropriately to monitor the groundwater at or above the confining layer, and that a deeper well would not

provide groundwater data from within the landfill. Since a well installed below the confining layer would not be useful in monitoring hydraulic conditions at the site, replacement wells for PZ-06 and PCM-06 were not installed. However, PZ-09 had been abandoned prior to the installation of the PZ-09R soil boring. Therefore, PZ-09R was installed in November 2012 to a depth of 14 feet bgs, approximately 2 feet into the confining layer with a 5-foot screen. Development of the well was attempted on December 21, 2012; however, the well was found to be dry and, therefore, development did not occur.

Glenn Springs Holdings, Inc (GSHI), representing OCC, responded to NYSDEC on July 23, 2013, stating that GSHI acknowledges that the concentrations of contaminants outside the slurry wall had remained relatively stable over time. In order to evaluate these chemical concentrations, GSHI reviewed the conditions at the site before and after the implementation of the remedy and concluded the following:

1. The elevated concentrations observed historically and currently in these wells are likely the result of a combination of impacted groundwater remaining outside of the slurry wall following its installation and potentially impacted sediments remaining below the 2- to 3-foot removal depth.
2. There is no gradient through the alluvium between the slurry wall and shoreline for groundwater to discharge to the River.
3. The current hydraulic data indicate that the groundwater in the alluvium between the slurry wall and shoreline is essentially stagnant.
4. Conditions at PCM-03, -04, and -05 are anaerobic, which are conducive to reductive dechlorination.
5. An assessment of the potential for natural attenuation indicates that if natural attenuation is occurring through reductive dechlorination, a decrease in chlorobenzene concentration will not be observed until all the residual chlorobenzenes have desorbed from the impacted sediments.

GSHI further stated that a combination of the conclusions listed above is reason why the elevated concentrations outside the slurry wall have not decreased. GSHI believes that remedy remains protective and that additional investigation was not warranted.

In April 2016, EPA requested that OCC/GSHI conduct sampling of sediment and surface-water to address the FYR recommendations. OCC/GSHI has agreed to conduct sampling of sediment and surface-water in three locations associated with the locations of Monitoring wells PCM-03, 04, and 05, respectively. GSHI will prepare a workplan for the sampling which will be reviewed by EPA and NYSDEC. Once the workplan is approved, GSHI will conduct the work

Five-Year Review Process

Administrative Components

The FYR team included Gloria M. Sosa (EPA-RPM), Edward Modica (EPA-Hydrologist), Julie McPherson (EPA-Human Health Risk Assessor), Mindy Penzak (EPA-Ecological Risk Assessor) and Michael Basile (EPA-Community Involvement Coordinator). This is a PRP-lead site.

Community Involvement

On November 19, 2015, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at 32 Superfund sites and four federal facilities in New York and New Jersey, including the Hooker (102nd Street) site. The announcement can be found at the following web address: http://www2.epa.gov/sites/production/files/2015-11/documents/fy_16_fyr_public_website_summary.pdf.

EPA has notified the local community that it will be conducting a FYR of the site. Once the FYR is completed, the results will be posted electronically online at http://www.niagarafallsusa.org and will also be made available for public viewing at the US EPA Region 2 Western New York Public Information Office, 186 Exchange Place, Buffalo, New York. The telephone number of the local site repository is 716.551.4410.

In addition, efforts will be made to reach out to local public officials to inform them of the results of the FYR.

Document Review

The documents, data and information which were reviewed in completing this FYR are summarized in Table 3.

Data Review

The Companies, through their contractor, CRA under direct supervision of GSHI, an affiliate of OCC, operate and maintain the facilities.

APL Collection and Discharge

Since the completion of the force main system and initiation of the leachate pumping operations, the system has shown integrity in that the four wet wells have been recharging properly, the leachate level within the landfill has decreased, and the reduced level has been maintained. During the present operations, enough leachate has been and will be removed from the landfill so as to maintain the inward differential (gradient) of one to two feet. The force main system is pumping sufficient APL leachate from the landfill to the treatment facility as to maintain an inward gradient across the slurry wall.

For the period between 2011 and 2015, a yearly average of 253,099 gallons of APL were removed and conveyed to the LCTF. This quantity of APL represents a steadily decreasing yearly average from 309,099 gallons reported for 2011 to 199,893 gallons reported for 2015. A total of approximately 9.4 million gallons of APL has been removed from the site since pumping was initiated in March 1999.

NAPL Presence Monitoring

NAPL is recovered at the landfill and its presence is monitored at eight dedicated extraction wells on a quarterly basis. Performance data show that the NAPL recovery is functioning properly. For the period between 2011 and 2015, the total quantity of NAPL removed was 4,487 gallons. This quantity is somewhat more than half the quantity of NAPL recovered during the previous five-year period (of 8,000 gallons); the decrease likely reflects decreasing availability of recoverable and mobile NAPL from the landfill subsurface. The majority of NAPL was

pumped from NR-2. NAPL is transported to a Clean Harbors facility, most recently the Aragonite Utah facility, for incineration.

Landfill Cap/Consolidated Soils & Sediment

Based on site inspections, the landfill cap is in good repair. There appears to be no significant subsidence or breach on the cover. The perimeter fence is intact and restricts access as intended.

Hydraulic Monitoring

According to performance data for the last five years, water level monitoring at ten well pairs along the landfill perimeter show that hydraulic capture has been generally maintained around the landfill. Water levels are measured quarterly. Water level measurements for the well pair PCM-07R/PZ-07 have shown that inward gradients were not consistently maintained for quarters between 2011 and 2015. This appears to be related to fourth quarter measurements (usually in December) when water levels increase compared to levels in late summer. Also, well PZ-9 was dry for all or for two quarters of 2011 and 2012, and wells PZ-6 and PZ-8 were dry for all or most quarters of years 2011 to 2015 so that it could not be confirmed that inward gradients were maintained across the slurry wall where these wells are located along the northern side of the site. Nevertheless, piezometric contour maps of the landfill show that there is a north to south groundwater gradient toward the APL collection trench (in the southern part of the landfill) indicating that groundwater flows away from the northern wall. Also, water quality data collected in wells PCM-06, PCM-07 and PCM-09 located on the outside of the slurry wall along its northern section, show no contamination.

Ground Water Quality Monitoring

The water quality monitoring program had called for semiannual collection of groundwater samples from ten monitoring wells screened in the overburden (PCM wells) and three monitoring wells screened in the bedrock (PCBM wells). As of 2012, collection has shifted to an annual frequency. Between 2011 and 2015, the data indicate that there were no exceedances above the maximum contaminant level (MCL) in most perimeter wells in the overburden. However, overburden wells PCM-03, PCM-04 and PCM-05 (along the southern section of the wall) have exceedances of benzene (up to 64 ppb), chlorobenzene (up to 4,600 ppb), 1,2-dichlorobenzene (up to 250 ppb), 1,4-dichlorobenzene (up to 450 ppb), phenol (up to 18 ppb), and related SVOC compounds. There were also exceedances of pesticides reported in these wells for the same period, beta-benzene hexachloride (BHC) (up to 0.093 ppb), and delta-BHC (up to 1.8 ppb). The NYSDEC Water Quality Regulation (WQR) for beta- and delta-BHC is 0.04 ppb for both constituents.

The chemical constituents observed, their concentration ranges, and the locations where observed are consistent with the site's historical water-quality data. It should be noted that these overburden (screened less than 30 feet deep) wells are screened along the south/southeast side of the landfill, on the outside of the slurry wall near the shoreline. Since inward gradients have been consistently maintained across the section of the slurry wall over the same period, it does not appear that this contamination is due to contaminated water seeping from the landfill, but rather, is due to residual contamination from soils located on the outside of the wall. Consistent with the inward gradient seen in well pairs PZ-03/PCM-03, PZ-04/PCM-04 and PZ-05/PCM-05, any dissolved phase is not moving towards the River.

Residual contamination in subsurface soil may still persist in the soil matrix where the wells are screened, affecting water quality in the saturated zone outside of the slurry wall near the

embayment area. This contamination is not unexpected because the slurry wall was constructed close to the edge of the steep embankment and could not enclose all of the contaminated soil. Although inward gradients across the wall should limit the migration of contaminated water to the zone just outside the wall and direct it into the landfill, interstitial pore water affected by the contaminated soil may migrate into the surface water in the embayment area and affect ambient surface water quality. Consequently, the ambient quality of surface water in the embayment area should be monitored to confirm water quality.

Site Inspection

The inspection of the site was conducted on May 2, 2016. In attendance were: Gloria M. Sosa, EPA; Brian Sadowski, NYSDEC Region 9; Joseph Branch, GSHI; and, John Pentilchuck, GHD (consultant to GSHI). The purpose of the inspection was to assess the protectiveness of the remedy. The site condition was excellent.

Interviews

No interviews were conducted for this FYR.

Institutional Controls Verification

Institutional controls, in the form of deed restrictions, were implemented at the site to preclude the extraction of ground water other than as required for the implementation of O&M activities for the remedy. Additionally, institutional controls were implemented to prevent any construction or other activity that could interfere with the integrity of the cap or other engineering controls in place at the site.

Technical Assessment

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

All components of the remedy are functioning as intended by the decision documents. The remedy objective for the site as described in the 1990 ROD is hydraulic containment of APL/NAPL within the landfill. As specified in the 1990 ROD, the remedy required the installation of a slurry wall around the landfill perimeter, recovery and treatment of APL leachate, separate recovery of NAPL and off-site incineration, and the installation of a landfill cap with consolidation of contaminated soils beneath and installation of a perimeter fence. The 1995 ROD Amendment eliminated the requirement to incinerate contaminated sediments excavated from the embayment area and allowed for these sediments to be placed beneath the landfill cap. The remedy also called for remedial monitoring, and institutional controls. Based on performance data for the past five years, the remedy is functioning according to design.

<u>APL Collection and Discharge</u>

In 1997, a slurry wall was installed around the perimeter of the landfill and keyed into the underlying clay/till formation to hydraulically contain the APL/NAPL plume within the landfill. An interception drain was also installed within the landfill at the seasonal low water table to recover leachate and create inward gradients across the slurry wall. Since the startup of the pumping operation in 1999, inward gradients have generally been maintained. Individual APL pumps in wet wells are set to target elevations (typically 561.4 feet) and shut down when elevations in the wells drop to 0.2 feet below the set point. For the past five years, a yearly

average of 253,099 gallons of APL were removed and conveyed to the LCTF. Based on recent performance data, the ground water APL collection system appears to be functioning according to design.

NAPL Recovery

As part of the remedy, NAPL is recovered at the landfill and its presence is monitored at eight wells on a quarterly basis. Performance data show that the NAPL recovery system is functioning properly. For the period between 2011 and 2015, the total quantity of NAPL removed was 4,487 gallons. Recovered NAPL is transported to a Clean Harbors facility in Aragonite, Utah, for incineration.

Landfill Cap/Consolidated Soils and Sediment

Cap installation and soil/sediment excavation activities were completed on the site by 1997. The cap consists of a geosynthetic layer and natural soil material to reduce infiltration and migration of the APL/NAPL plume. Sediment activities met the cleanup objectives chosen in the 1990 ROD. There has not been a breach of the cap and it remains in good condition. The perimeter fence is intact and restricts access as intended.

Hydraulic Monitoring

For the past five years, quarterly water level monitoring at the well pairs along the landfill perimeter indicate that hydraulic capture has been generally maintained around the landfill. Water level measurements for the well pair PCM-07R/PZ-07 have shown that inward gradients were not consistently maintained for quarters between 2011 and 2015. Also, wells PZ-6, PZ-8 and, to a lesser degree, PZ-09 were dry for all or most quarters between 2011 and 2015. Therefore, it could not be confirmed that inward gradients were maintained across the slurry wall where these wells are located along the northern side of the site. However, piezometric contour maps of the landfill show that there is a north to south ground water gradient toward the APL collection trench (in the southern part of the landfill) indicating that groundwater flows away from the northern wall. As indicated in section VII, it has been recommended that all piezometers, particularly those that are frequently found to be ‘dry’, continue to be tested to ensure they are not clogged and are in hydraulic communication.

Ground Water Quality Monitoring

Semiannual ground water quality samples from wells screened in the overburden and wells screened in the bedrock between 2011 and 2015 indicate that there were no exceedances above their respective criteria at most perimeter wells. However, wells PCM-03, PCM-04, and PCM-05 have historically shown exceedances of benzene, chlorobenzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, phenol, and related compounds. These wells are screened along the south/southeast side of the landfill, on the outside of the slurry wall near the shoreline, which had originally been targeted for removal prior to 1995 ROD amendment. Since inward gradients have been consistently maintained across the section of the slurry wall over the same period, it does not appear that this contamination is due to contaminated water seeping from the landfill, but rather, is due to residual contamination from soils that were on the outside of the wall.

Federal and state natural resource trustees expressed that remediation of the site-related chemicals in the embayment area would have resulted in the loss of an irreplaceable habitat along the Niagara River. Following an assessment conducted by the natural resource trustees, a modified alignment was constructed to preserve wetland and aquatic habitat. Monitoring wells PCM-03, PCM-04 and PCM-05 are all located outside of the slurry wall, along the steep

embankment of the River. Consistent with the inward gradient seen in well pairs PZ-03/PCM-03, PZ-04/PCM-04 and PZ-05/PCM-05, any dissolved phase is not moving towards the River. As indicated in section VII, ambient quality of surface water and sediments should be sampled in the embayment area as a follow up action to this FYR.

Institutional Controls

Institutional controls, in the form of deed restrictions, were implemented at the site to preclude the extraction of ground water other than as required for the implementation of O&M activities for the remedy. Additionally, institutional controls were implemented to prevent any construction or other activity that could interfere with the integrity of the cap or other engineering controls in place at the site.

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

The majority of the exposure pathways and the receptor populations identified in the 1990 Baseline Human Health Risk Assessment are still valid. Although some exposure assumptions have changed and several exposure pathways were not evaluated, it is not expected to effect the remedy.

The toxicity values for several COPCs have changed since the remedial investigation (RI). In order to account for changes in toxicity values since the RI, the maximum detected concentrations of COPCs detected in the on-site monitoring wells during the 2011-2015 sampling period were compared to their respective residential groundwater Remedial Screening Levels and MCLs (National Primary Drinking Water Standards) and New York Department of Conservation Water Quality Regulations. The MCL is the highest level of contaminant that is allowed in drinking water. MCLs are promulgated standards that apply to public water systems and are intended to protect human health by limiting the levels of contaminants in drinking water. The PRGs are a human health risk based value that is equivalent to a cancer risk of $1x10^{-6}$ or a hazard index (HI) of 1.

EPA's dioxin reassessment has been developed and undergone review for many years, with the participation of scientific experts in EPA and other federal agencies, as well as scientific experts in the private sector and academia. The Agency followed current guidelines and incorporated the latest data and physiological/biochemical research into the reassessment. On February 17, 2012, EPA released the final human health non-cancer dioxin reassessment, publishing an oral non-cancer toxicity value, or reference dose (RfD), of $7x10^{-10}$ mg/kg-day for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) in EPA's Integrated Risk Information System (IRIS). The dioxin cancer reassessment will follow thereafter. The dioxin RfD was approved for immediate use at Superfund sites to ensure protection of human health. This change in the dioxin RfD did not necessitate any changes in the remedial action at the site.

Several site related constituents have consistently been detected in the wells downgradient of the site (PCM-03, PCM-04 and PCM-05) above their respective criteria. Since an inward pressure gradient has been maintained in this area, the concentrations of the constituents detected in the downgradient wells does not suggest that the site related contamination is breaching the slurry wall, but rather the contamination exists outside the slurry wall and is potentially impacting surface water quality and the sediments. It is acknowledged by GSHI in a response letter dated July 2013, that the slurry wall design is different than the original remedy location and that

impacted material would remain outside of the slurry wall in order to maintain the natural fish and wildlife habitats along the River adjacent to the site.

The ROD does not define specific RAOs but does include what is expected once the remedies are implemented at the site. The following language is included: “The selected remedy of consolidation, capping and containment will effectively eliminate each of these pathways leading to human exposure. The “ingestion of fish” pathway will be eliminated since no contaminants can leach from the landfill area due to the existence of the slurry wall keyed into the confining clay/till layer, the capping of the site and the maintenance of an inward gradient across the slurry wall. In a similar manner, the pathways involving swimming in the river and drinking water from the river will be eliminated since the entry of contaminants into the river will be eliminated. Exposure to and dust from contaminated off site soils will be avoided since all off site soils which have contamination levels above those levels deemed actionable, will be removed from their present location and consolidated beneath the cap. After the implementation of the remedy, the overall risk associated with the site will be reduced to 10^{-6} for carcinogens and the HI for non-carcinogens will be less than 1.” The “RAOs” continue to be valid for the site.

Soil vapor intrusion was not previously evaluated during the RI as a potential future exposure pathway based on the conservative (health protective) assumption that buildings are located above the maximum detected concentration of the contaminants of concern in the groundwater. This exposure pathway was qualitatively addressed in the previous FYR. The health based screening criteria provided in the Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (USEPA, 2002) was used to initially evaluate this exposure pathway. This guidance provides calculations of concentrations in groundwater associated with indoor air concentrations at acceptable levels of cancer risk and non-cancer hazard. This review compared the maximum detected concentrations of the chemicals of potential concern with the vapor intrusion screening criteria. Several constituents (site-related) have exceeded their respective risk based criteria (1x10-6) and the upper bound of the risk range ($1x10^{-4}$). This does not indicate that a vapor intrusion problem would occur if a building were to be erected over the site. This merely indicates that further investigation would be necessary, which includes site specific considerations such as the type of building, the location of the building to the maximum detected concentration, and the subsurface characteristics of the site. Currently, there are no buildings on the site; therefore, the exposure pathway is incomplete at this time.

The soil remedy was reviewed to address the protectiveness of the remedy presented in the 1990 ROD. As stated earlier, the soil and the sediment in the outlying embayment areas were excavated and placed in the landfill. The maximum depth of excavation in the embayment area was two feet. The cleanup goals for some contaminants identified in the ROD (Table 12) are below their respective New York State Department of Conservation Technical and Administrative Guidance Memorandum (TAGMs) #4046, which are considered TBCs.

Perimeter soils identified during the RI to contain TCDD above 1 ppb were excavated and backfilled as part of the remedy. Although the cleanup goal for dioxin has changed, the cleanup level of 1 ppb for this area is still protective because the excavated areas are covered with several inches of gravel and topsoil, thereby preventing exposure to the soils beneath the excavated area. The perimeter soils maintain a vegetative cover, which is periodically inspected by the PRP to confirm the integrity of the cover and ensure protectiveness.

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

As indicated previously, concentrations of site related contaminants have been detected in wells downgradient of the site. Since the excavation of contaminated sediment in the embayment area was conducted to a maximum depth of two feet, it is likely that residual contamination exists in this area and may be discharging into the Niagara River. It is recommended that surface water and sediment samples be collected downgradient from the monitoring wells (PCM-03, PCM-04 and PCM-05) to determine if site related contaminants are discharging into the Niagara River at concentrations exceeding their respective ARARs (NYSDEC Ambient Water Quality Standards and the Clean Water Act Ambient Water Criteria). It is also recommended that surface water and sediment samples be collected and analyzed for full TCL/TAL as part of the ongoing O&M at the site.

Technical Assessment Summary

Based upon the results of the FYR, it has been concluded that the selected remedy has been functioning as designed. Institutional controls to protect the landfill remedy and to prevent the installation of potable water wells in the vicinity of the landfill have been implemented. The inward gradient across the slurry wall, with only one nonmaterial exception at the piezometer location along Buffalo Avenue, has been maintained since the initial installation of the remedy. The steady-state leachate pumping operations indicate that the integrity of the slurry wall has been maintained since the initial installation of the remedy.

Issues, Recommendations and Follow-Up Actions

- Monitor surface water and sediment in the embayment area outside the slurry wall.

Since analytical results from monitoring wells PCM-03, 04, and 05 continue to exceed NYSDEC Class GA Groundwater Criteria, EPA recommends that surface water and sediment should be sampled in appropriate locations.

- Maintain perimeter wells that frequently go ‘dry’:

Well pairs that are installed adjacent to the slurry wall of the landfill are used to measure groundwater gradients across the wall. Commonly, seasonal water levels may drop to a level that is below the screen of a well and, thus, a hydraulic head determination cannot be made for the well. However, persistent ‘dry’ readings in a given well can also indicate that the well is no longer in hydraulic communication with the aquifer, is not yielding, and is in need of replacement or redevelopment. The Annual Review Reports assume that a ‘dry’ reading is an indication of a lower water level compared to the level in the coupled well. However, EPA does not concur and believes that this assumption can lead to incorrect gradient evaluation. Wells that are frequently observed to be dry need to be tested. PZ-08, for example, has been ‘dry’ for six consecutive quarters, irrespective of seasonal water level variation. The well needs to be tested and possibly redeveloped or replaced.

OU(s): *1*	Issue Category: Monitoring			
	Issue: Monitoring wels PCM-03, 04, and 05 continue to exceed NYSDEC Class GA Groundwater Criteria			
	Recommendation: • Sample surface water and sediment in the embayment area outside the slurry wall.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	No	PRP	EPA/State	7/15/2017

OU(s): *1*	Issue Category: Operations and Maintenance			
	Issue: Monitoring well PZ-08 has been 'dry' for six consecutive quarters			
	Recommendation: • monitoring well PZ-08 well should be tested and possibly redeveloped or replaced.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	No	PRP	EPA/State	7/15/2017

Protectiveness Statement

Protectiveness Statement(s)		
Operable Unit: OU1	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter a date.
Protectiveness Statement: The remedy at the Hooker (102nd Street) Landfill site currently protects human health and the environment as there is no human exposure to contaminated ground water or landfill residuals, and engineered and institutional controls continue to be operated, monitored and maintained. However, in order for the remedy to be protective in the long-term, additional sampling to assess elevated levels of containments outside the slurry wall will be conducted to ensure long-term protectiveness.		

Sitewide Protectiveness Statement	
Protectiveness Determination: Protective	*Addendum Due Date (if applicable):* Click here to enter a date.
Protectiveness Statement: The remedy at the Hooker (102nd Street) Landfill site currently protects human health and the environment as there is no human exposure to contaminated ground water or landfill residuals, and engineered and institutional controls continue to be operated, monitored and maintained. However, in order for the remedy to be protective in the long-term, additional sampling to assess elevated levels of containments outside the slurry wall will be conducted to ensure long-term protectiveness.	

Next Review

The next FYR report for the Hooker (102nd Street) Superfund Site is required five years from the completion date of this review.

Attachments

Figure 1.1: Site Location
Figure 1.2: Site Plan
Figure 1.3: Google Earth Site Aerial View
Table 1: Chronology of Site Events
Table 2: Documents, Data and Information Reviewed in Completing the Five-Year Review

SOURCE: USGS QUADRANGLE MAP;
TONAWANDA WEST, NEW YORK, 1980

figure 1.1

SITE LOCATION
2015 PERIODIC REVIEW REPORT
102ND STREET LANDFILL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York

GHD

01431-D23101(092)GN-WA001 JAN 14, 2016

Figure 1.1: Site Location

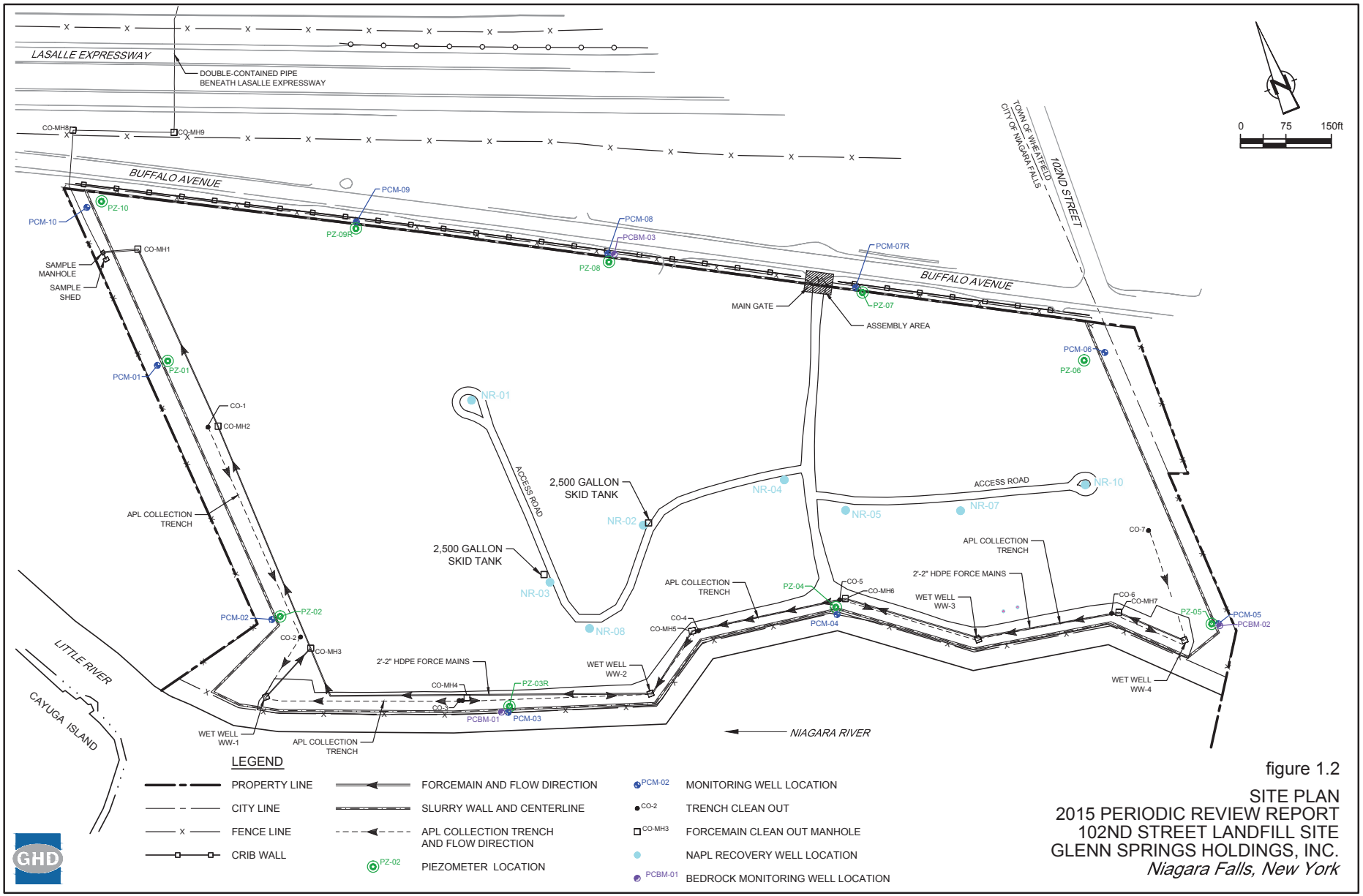

figure 1.2

SITE PLAN
2015 PERIODIC REVIEW REPORT
102ND STREET LANDFILL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York

01431-D23101(092)GN-WA002 FEB 26/2016

Figure 1.2: Site Plan

Figure 1.3: Google Earth Site Aerial View

Tables

Table 1: Chronology of Site Events	
Event	**Date(s)**
The Companies deposited 159,000 tons of hazardous wastes at the site	1945 to 1970:
EPA sued the Companies.	1979
RI Work Plan negotiations and pre-remedial investigations	1982 to 1984
Site listed on the National Priorities List	Sept 1983
Work Plan for RI approved	June 1984
Site Operations Plan for RI approved	Dec 1984
RI field work began	1985
RI Final Report and FS Final Report approved	July 1990
ROD signed by EPA	Sept 1990
EPA issued Special Notice letters for the Remedial Design and Remedial Action	Sept 1991
UAO for Start of Remedial Design and Remedial Action	Sept 1991
ESD issued	Sept 1993
ROD Amendment issued	June 1995
Construction of the Remedy was started	April 1996
Construction of the Remedy was completed	Mar 1999
First Five-Year Review Report issued by EPA	Aug 2001
NYSDEC assumed oversight responsibilities of PRP O&M activities	Mar 2002
Site deleted from the National Priorities List	Aug 2004
Second Five-Year Review issued by EPA	Sept 2006
Third Five-Year Review issued by EPA	Sept 2011

Table 2: Documents, Data and Information Reviewed in Completing the Five-Year Review	
Document Title	**Date**
Remedial Investigation, Final Report	July 1990
Record of Decision for the 102nd Street Landfill Superfund Site	September 1990
Explanation of Significant Differences	September 1993
Ecological Resource Impacts and Mitigation Site Study	October 1994
Record of Decision Amendment,	June 1995
Consent Decree	April 1999
Final Close-out Report,	September 1999
Annual Report	2011
Annual Report	2012
Annual Report	2013
Annual Report	2014
Annual Report	2015
Operation, Maintenance & Monitoring Manual 102nd Street Landfill	Oct 2015
EPA Guidance for conducting Five-Year Reviews	June 2001