THIRD FIVE-YEAR REVIEW REPORT
NIAGARA COUNTY REFUSE SUPERFUND SITE
TOWN OF WHEATFIELD
NIAGARA COUNTY, NEW YORK

Prepared by

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

Approved by:

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September 4, 2014

Date

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EXECUTIVE SUMMARY

This is the third five-year review for the Niagara County Refuse Superfund Site, located in the Town of Wheatfield, Niagara County, New York. The main components of the selected remedy for the Site included 1) construction of a New York State Part 360 Standard Landfill Cap; 2) construction of a leachate collection system; 3) implementation of deed and access restrictions; and 4) implementation of long-term air and water quality monitoring.

Based upon a review of monitoring data, a Site inspection, and other Site information, the U.S. Environmental Protection Agency (EPA) concludes that the remedy for the Niagara County Refuse Superfund Site has been fully implemented consistent with the Site's decision documents and is protective of human health and the environment.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Niagara County Refuse		
EPA ID: NYD000514257		
Region: 2	**State:** NY	**City/County:** Town of Wheatfield/Niagara

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

REVIEW STATUS
Lead agency: EPA **If "Other Federal Agency" was selected above, enter Agency name:** Click here to enter text.
Author name (Federal or State Project Manager): Michael Negrelli
Author affiliation: EPA
Review period: 11/06/2008 – 07/31/2014
Date of site inspection: 07/11/2013
Type of review: Statutory
Review number: 3
Triggering action date: 11/05/2008
Due date *(five years after triggering action date)*: 11/05/2013

Issues/Recommendations

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 01	**Issue Category: Monitoring**			
	Issue: Modifications to the monitoring plan are warranted to ensure that there is a complete representation of groundwater chemistry in each of the four sampled wells for annual monitoring purposes and groundwater quality evaluation.			
	Recommendation: Resample well NCR-5S as soon as conditions allow such that there is a complete representation of groundwater chemistry in each of the four sampled wells for annual monitoring purposes; evaluate 2014 samples for total and dissolved metals; include arsenic in the monitoring plan contaminant list; and use data to develop groundwater isocontour maps for all contaminants.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	PRP	EPA	December 2014

Protectiveness Statement(s)

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
01	Protective	
Protectiveness Statement: The remedy is protective of human health and the environment.		

Sitewide Protectiveness Statement (if applicable)

For sites that have achieved construction completion, enter a sitewide protectiveness determination and statement.	
Protectiveness Determination: Protective	*Addendum Due Date (if applicable):*
Protectiveness Statement: The implemented remedy for the Site protects human health and the environment.	

INTRODUCTION

This five-year review was conducted pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act, 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). The purpose of a five-year review is to ensure that implemented remedies are protective of human health and the environment and that they function as intended by the decision documents. This document will become part of the Site file.

This is the third five-year review for the Niagara County Refuse Site. Following the initiation of construction of the Site remedy on October 19, 1998, the first five-year review was completed in 2003 and the report was issued by EPA on November 5, 2003. Because contaminants remain on Site, a statutory review is required every five years successively. In accordance with the Section 1.3.3 of the five-year review guidance, subsequent five-year reviews are triggered by the signature date of the previous five-year review report. The trigger for this five-year review is the date of the previous five-year review report, which is November 5, 2008.

The Site is addressed under one operable unit (OU).

SITE CHRONOLOGY

The chronology of Site events is shown in Table 1.

BACKGROUND

Site Location and Physical Descriptions

The Niagara County Refuse Site is a former municipal landfill, comprised of approximately 65 acres, located along the eastern border of the Town of Wheatfield, New York and the western border of the City of North Tonawanda. The Site lies approximately 500 feet north of the Niagara River. To the west of the Site lies former farmland, currently undeveloped; to the north is wooded wetlands, a Niagara-Mohawk Power Corporation transmission line, and a right-of-way owned by the New York State Department of Transportation; to the east are woodlands and low-density housing (approximately 1,000 feet from the Site boundary); and to the south are access roads, railroad tracks, River Road, and the Niagara River.

Geology/Hydrogeology

Three overburden zones and one bedrock zone are present beneath the Site. The two uppermost overburden zones are characterized as a silt unit and clay/upper till unit. The silt unit is present across the Site outside the limits of the landfill cells, varying in thickness from one to eight feet, and exhibits a low hydraulic conductivity, which has minimized the potential for horizontal migration of contaminants from the landfill. The clay/upper till unit is present beneath the silt unit with an average

thickness of 30 feet; this unit is characterized as an aquitard due to low hydraulic conductivities measured in the unit and similarly, has minimized the potential for vertical migration of contaminants from the landfill.

The bedrock zone and the overlying overburden zone (lower till unit) are the primary water-bearing formations. The lower till unit is present beneath the clay/upper till unit with an average thickness of 15.7 feet. The bedrock unit beneath the lower till unit is a highly fractured water-bearing unit characterized as a usable aquifer by the New York State Department of Environmental Conservation (NYSDEC). As reported in the original Site investigation, the groundwater in these two aquifers generally flows in a south/southwesterly direction towards the Niagara River beneath the southern half of the Site and in a north/northwesterly direction towards Black Creek beneath the northern half of the Site.

Surface water runoff is channeled through a network of drainage swales, primarily to a municipal storm water sewer system which discharges to the Niagara River, although some surface water runoff flows to the wetlands at the north end of the Site.

Land and Resource Use

Since the completion of the remedial action, Niagara County has given some consideration to potential reuse or redevelopment scenarios for the Site within the restrictions of the institutional controls that have been put in place at the Site (discussed in Section VI, below). Although there has not been any formal planning in this regard at this time, the long grasses maintained as cap cover and the revitalized wetland area at the north end of the Site have attracted various wildlife species, particularly native and migrating birds. There has been some preliminary discussion about setting up blinds for bird watching. Regardless of any formally planned reuse or redevelopment, the long grasses of the cap and the wetlands along the north end of the Site serve a useful environmental purpose.

History of Contamination

During the landfill's operational period (1968-1976), the Niagara County Refuse Disposal District (NCRDD) accepted municipal refuse and industrial wastes, which are commingled throughout the landfill. More than 100 waste generators or transporters are thought to have used the Site. Disposed materials included heat-treatment salts, plating-tank sludge, tetrachloroethylene, polyvinyl chloride skins and emulsions, thiazole polymer blends, polyvinyl alcohol, phenolic resins, and brine sludge containing mercury. The Site was capped with 20 inches of dirt and clay at the time that it was closed by the NCRDD in 1976. Illegal dumping of rubbish and hard fill, as well as the erosion of the clay cap, had been concerns at the Site subsequent to its closure. The Town of Wheatfield acquired ownership of the Site from the NCRDD in June 1977.

Initial Response

Beginning in 1980, the Site became the focus of several investigations by EPA, NYSDEC, and the United States Geological Survey. The investigations were comprised of limited sampling of on-site soils, groundwater, drainage swale surface water and sediments, as well as some off-site soil, surface

water, and sediment sampling. Volatile organic compounds (VOCs) (primarily methylene chloride), semi-volatile organic compounds (SVOCs) (primarily phenolic compounds, phthalates, and polycyclic aromatic hydrocarbons (PAHs)), pesticides, and metals were detected at varying concentrations on Site. Based on the results of these investigations, the Site was placed on the National Priorities List (NPL) in September 1983. In 1987, EPA initiated a Remedial Investigation/Feasibility Study (RI/FS) for the Site to determine the nature and extent of Site contamination and to evaluate alternatives for the mitigation of any risks associated with the contamination. Under EPA oversight, the performance of the RI/FS was taken over by a group of fourteen potentially responsible parties (PRPs) in 1989. The investigation was concluded in 1991 and the RI/FS Report became final upon issuance of the Record of Decision (ROD) in 1993.

Basis for Taking Action

Based on the results of the RI report, which measured the levels of VOCs, SVOCs, pesticides, and metals in various Site media, EPA determined that although contamination was present in the landfill, the low permeability clays beneath and around the Site had prevented the vertical and horizontal migration of contaminants. An analysis of the groundwater around the Site perimeter showed little or no impact from the landfill. Additionally, residents nearby the Site receive municipal water. However, EPA performed a risk assessment for the Site based on the data collected during the RI, and the risk assessment determined that uncontrolled leachate outbreaks, caused by the infiltration of rainwater through the landfill and subsequent seeping out from the sides of the landfill cells, would continue to degrade the quality of perimeter Site groundwater, resulting in a potential future risk from groundwater ingestion. This formed the basis for the decision to cap the landfill and to continue monitoring the groundwater around the perimeter of the Site after the remedial action was completed.

EPA's baseline risk assessment addressed the potential risks to human health by identifying several potential exposure pathways by which the public may be exposed to contaminant releases at the Site under current and future land-use conditions. The greatest carcinogenic risk attributable to the Site was the potential future risk associated with the ingestion of Site perimeter groundwater by area residents. This generated a risk of $2x10^{-4}$, which is at the upper bound of EPA's acceptable risk range. This risk was primarily attributable to the metal arsenic, although the levels detected in Site groundwater wells were below the EPA and New York State Department of Health (NYSDOH) maximum contaminant level (MCL).

Ecological risks attributable to the Site were also considered and evaluated in the ecological risk assessment. The ecological risk assessment established that surface water and sediment concentrations of metals (primarily aluminum, lead, and zinc) and pesticides (primarily 4,4-DDT) may result in adverse acute and/or chronic effects in aquatic organisms within the drainage swales and streams present on the Site or in close proximity. Additionally, stressed vegetation had been observed in the northern wetland area which may be attributable to the Site.

Enforcement Activities

The performance of the RI/FS by the group of fourteen PRPs was accomplished through an Administrative Order on Consent (AOC), issued by EPA on March 30, 1989. EPA published its ROD for the Site in September 1993 which identified the remedial actions that needed to be undertaken to

mitigate risks to human health and the environment as a result of Site contamination. These actions are summarized below. An agreement was reached with twelve PRPs to perform the actions identified in the ROD and was memorialized in a Consent Decree for remedial design/remedial action (RD/RA) entered by the court on February 3, 1995. EPA also issued a unilateral administrative order on July 18, 1995 requiring a recalcitrant PRP to coordinate and cooperate with the PRP group in performing the RD/RA. In addition, EPA entered into an AOC on September 23, 1994 with eleven PRPs which were determined to be minor volume contributors of waste to the Site, resulting in a cash settlement of $793,866.

REMEDIAL ACTIONS

Remedy Selection

Based on the findings of the RI/FS, EPA signed a ROD for the Site on September 24, 1993, selecting the following remedy:

- Construction of a New York State Part 360 Standard Landfill Cap.
- Construction of a clay perimeter barrier wall.
- Construction of a gas venting system beneath the cap.
- Construction of a leachate collection system.
- Removal of the field tile drains located to the west of the landfill.
- Performance of an ecological assessment of the adjacent wetlands.
- Implementation of deed and access restrictions.
- Implementation of a long-term operation & maintenance program for the cap, and gas venting and leachate collection systems.
- Implementation of long-term air and water quality monitoring.

The remedy also calls for an evaluation of Site conditions at least once every five years, beginning from the start of construction, to determine if the selected remedy is operating as intended and remains protective of human health and the environment.

The remedy selected in the ROD meets the remedial action objectives (RAOs) for the Site. The RAOs, as noted in the ROD, are:

- Preventing direct contact with landfill contents.
- Controlling surface water runoff and erosion.
- Collecting and treating landfill leachate.
- Controlling landfill gas.
- Preventing the infiltration of contaminants into groundwater.
- Remediating contaminated wetland areas, if necessary.

Remedy Implementation

EPA negotiated a Consent Decree with the PRP group to develop a remedial design to meet the requirements of the ROD and to implement the design through a remedial action. The Consent Decree

became effective on February 3, 1995. Pre-design activities commenced shortly thereafter, culminating in the Final Design Report which was approved by EPA in 1997. The design was prepared by Conestoga - Rovers & Associates under contract with the PRP group. The completed design included the use of modern geotextiles for the cap in place of a traditional clay barrier layer and sand drainage layer. The cap liner was tied directly into native clay material outside the leachate collection system, eliminating the need for a clay barrier wall. A call for bids for remedial construction was issued and a contract was awarded to Haseley Construction Company, Inc., for remedial construction in June 1998.

In October 1998, EPA approved the Remedial Action Work Plan for Site construction. An ecological assessment of the adjacent wetlands was performed prior to the start of construction and a wetland mitigation plan, calling for limited wetland replanting at the Site and wetland creation off Site at the nearby Gratwick Park site, was approved in October 1998. The remedial contractor began mobilization at the Site on October 19, 1998.

On-site construction commenced in November 1998 under the direction of Niagara County with EPA providing oversight of the construction activities through an interagency agreement with the U.S. Army Corps of Engineers. The Site was surveyed, cleared and grubbed, a security fence was erected, and erosion and sediment control measures were put in place. Installation of the leachate collection system and its tie-in to the City of North Tonawanda sanitary sewer by forcemain was completed over the winter months. Early spring was devoted to grading the Site and filling the central swales of the landfill with clean fill. Placement of the first layer of the cap (gas vent stone), began in May 1999 and the leachate collection system became operational during the summer of 1999, eliminating any potential pathway for leachate to migrate off Site. The tile drains on the west side of the landfill were removed during the summer. An unusually dry season, along with contractor efficiency, allowed for relatively uninterrupted construction activity throughout the summer and fall. The key trench was constructed concurrently with the multi-layered cap as the two were tied in to complete a uniform seal around the landfill. By November 1999, the cap had been placed over the entire Site and seeding had been completed.

The construction contractor returned to the Site in May 2000 to assess the remaining work to be done. The wetland plantings and some tree perimeter plantings were completed at that time. It was determined that cleaning the drainage swales of accumulated silt and debris, some erosion repair work to the cap surface, and some spot reseeding were the only activities remaining to be completed. This work was completed during the summer months and in September 2000, EPA conducted a final inspection with NYSDEC and the PRPs. In December 2000, EPA issued its approval of the Remedial Action Report, signifying that the remedial action had been completed in accordance with the ROD and Remedial Design, and the project entered the operation, maintenance, and monitoring phase.

Institutional Controls Implementation

Institutional controls (ICs) have been put in place at the Site. The ROD included a component for ICs to be designed to prevent direct contact with the subsurface waste material in the landfill by limiting future Site use. The Consent Decree required that the settling defendants develop and implement a plan for ICs. In accordance with the Consent Decree and the plan, on January 30, 2001,

the owner PRPs recorded the Consent Decree in the Land Records of Niagara County as Index Number 107616.

The owners of the property included within the Site are the County of Niagara and the Town of Wheatfield. Each owner filed a set of deed restrictions in the land records. The restrictive covenants provide notice that hazardous substances are buried on the property; that the use of the property is restricted in perpetuity in that future Site use must not breach the integrity of the cap, cover, liners or any other components of the containment system; must not disturb or disrupt the function of the Site's monitoring systems; nor otherwise increase the potential hazard to human health or the environment posed by the Site. Additional restrictions prohibit the installation of wells on the property and prohibit the erection of any permanent structure or building without the prior approval of EPA and Niagara County.

The restrictive covenants placed on the real property at the Site by Niagara County and the Town of Wheatfield were filed with the land records on March 19, 2001 and March 23, 2001, respectively. These items complete the ICs requirement of the ROD.

Operation, Maintenance and Monitoring

The Operation, Maintenance and Monitoring Manual was approved by EPA on December 29, 2000. It should be noted that air monitoring is not an included activity in the approved manual in that during the development of the manual, an evaluation of the air around the gas vents was performed and indicated that the gas generation rate in the landfill is very low, primarily due to the age and composition of the wastes. In addition, lateral subsurface gas migration is prevented by the perimeter barrier system. The operation and maintenance (O&M) activities outlined in the manual are being performed by Parsons (formerly Parsons Engineering Science, Incorporated) under contract to Niagara County. O&M activities were initiated in January 2001. The Site is inspected monthly and monitoring data are collected on a pre-set schedule. A summary of O&M data collection activities since the last five-year review, and the corresponding report containing the results, is provided in Table 2, attached.

Additionally, maintenance is performed on the cap on both a scheduled and as-needed basis. For example, pumps are routinely inspected and pressure-washed, repairs are made to the perimeter fence when needed, weeds and tall grass are trimmed around wells and manhole covers, and the grass cover of the cap is cut once yearly in the late summer. The leachate collection system is monitored both from a control building and a visual inspection of the wet wells and the gas vents are regularly inspected for integrity. The wetland replacement area of the Site, representing 0.17 acres, is routinely monitored for habitat health and vegetation data is recorded and provided in the annual monitoring report.

The O&M monitoring results indicate that the remedial system, as designed and constructed pursuant to the 1993 ROD, is performing satisfactorily. Based on the sampling results obtained during the first two years of O&M, and in accordance with the O&M Manual, quarterly groundwater sampling was replaced with semi-annual sampling in 2003 and surface water sampling was discontinued. Semi-annual groundwater sampling continued for three years and, based on the uniform monitoring results obtained during this period and in accordance with the O&M Manual, sampling frequency became

annual in 2006. A revised Industrial Wastewater Discharge Permit was issued by the City of North Tonawanda for the treatment of Site leachate in February 2007 (and since renewed in 2010 and 2013). Based on previous years sampling data, the revised permit reduced the analytical parameter list and established a semi-annual effluent sampling frequency. Additionally, the wetland replacement area of the Site, inspected monthly, is determined to be a productive and diverse wetland community.

PROGRESS SINCE LAST FIVE-YEAR REVIEW

The previous five-year review was completed on November 5, 2008, pursuant to OSWER Directive 9355.7-03B-P. That review, conducted after the remedial action had been completed and operation, maintenance, and monitoring activities had commenced, and the Site subsequently delisted from the NPL, determined that the remedial action as designed and constructed pursuant to the 1993 ROD was performing satisfactorily and that the remedy implemented was protective of human health and the environment.

Aside from the continuation of operation, maintenance, and monitoring activities, the 2008 five-year review recommended that, since the 2007 groundwater monitoring event was postponed by three months due to the well network being dry, the monitoring plan should be modified if necessary. However, since drought conditions have not been as severe as in 2007, no modifications were made to the monitoring plan. Based on the monitoring activities and data collection since the last five-year review, there has been no change in Site conditions.

However, as documented in Table 3C and Table 3E, attached, well NCR-5S was dry during the sample collection date in 2010 and 2012. Modifications to the monitoring plan are warranted to ensure that there is a complete representation of groundwater chemistry in each of the four sampled wells for annual monitoring purposes and groundwater quality evaluation. Accordingly, the following steps are recommended: groundwater samples should be collected in the first half of the year when water levels are generally higher (possibly April or May, pending adequate water level in the well) and changing collection of the groundwater samples from the pumps that are currently in the wells to using a dedicated disposable high density polyethylene (HDPE) bailer. Due to the low purge volume required, the bailer would also be used to purge the well. The pumps currently used are designed for deeper wells with a greater well column. Additionally, it would be advisable that groundwater samples collected in 2014 include analysis for total and dissolved metals. After the 2014 annual groundwater sampling, any trends in the concentrations of inorganic analytes would again be evaluated. Note that the wells are designed to monitor the shallow overburden groundwater and with the recommended changes, a greater water column will be available when sampled in the spring. Changing the time of year that groundwater samples are collected and changing the sampling method will likely solve the issue of inadequate water column during sampling. Future annual sampling events would be completed during the first half of the year, pending adequate water levels.

Additionally, while arsenic has not historically been identified in excess of state or federal criteria, it should periodically be added to the parameter list since arsenic was a primary risk driver (see risk assessment discussion above). It is recommended that arsenic levels in the 2014 groundwater sampling event be compared to the NYSDEC ambient water quality standard (AWQS) [25 ug/L] and USEPA maximum contaminant level (MCL) [10 ug/L]. Based on the analytical results, arsenic could be considered for future groundwater sampling events.

Finally, in order to better evaluate the RAO of preventing the infiltration of contaminants into groundwater, it is recommended that plume maps (isoconcentration maps) be created following each groundwater sampling event for the contaminants of concern (COCs) that are related to the Site. Additionally, groundwater contour maps should be provided to determine groundwater flow direction to be evaluated in conjunction with the isoconcentration maps. Current hydraulic conditions need to be assessed since the dry wells may indicate hydrogeological changes over time. Implementation of these recommendations will ensure a more robust data set for the next five-year review.

FIVE-YEAR REVIEW PROCESS

Five-Year Review Team

The five-year review team included Michael Negrelli (EPA-RPM), Sharissa Singh (EPA-Hydrologist), Julie McPherson (EPA-Human Health Risk Assessor), Mindy Pensak (EPA-Ecological Risk Assessor) and Michael Basile (EPA-Community Involvement Coordinator). This is a PRP lead Site. EPA, in reviewing Site records and reports, and in consultation with NYSDEC and the PRP O&M contractor, has provided the information necessary for this review.

Community Notification and Involvement

EPA has notified the local community that it is conducting a five-year review of the Site. Upon completion, the Five-Year Review Report is made available in the local Site repository as well as at EPA's Western New York Public Information Office in Buffalo. Additionally, when completed, the Report will be posted on-line electronically for public availability. Local elected officials are also provided with a copy of the completed report.

Document Review

Table 2, attached, provides a list of all documents that were reviewed to prepare this Five-Year Review Report.

Monitoring and Data Review

As discussed in the Operation and Maintenance section above, the Site is inspected monthly and monitoring data are collected according to a pre-set schedule, the results of which are contained in the quarterly, semi-annual, and annual monitoring reports. The sampling program was developed to ensure that the perimeter collection system and the perimeter barrier system of the landfill cap effectively prevent the migration of contaminants from the Site. Additionally, effluent from the leachate conveyance system is sampled for compliance with the City of North Tonawanda Industrial Wastewater Discharge Permit and water levels are measured within the landfill to ensure that the operation of the perimeter collection system keeps water levels within the landfill reduced. The monthly inspections of the landfill include visual inspections of the perimeter collection system, off-site forcemain, wetlands, perimeter fence, drainage ditches, swale outlets, culverts, gas vents, monitoring wells, and the cap surface.

Effluent sampling has consistently demonstrated compliance with the requirements of the City of North Tonawanda Industrial Wastewater Discharge Permit, which was most recently renewed in 2013. In accordance with the permit, effluent sampling is conducted on a semi-annual basis. Water level measurements, conducted monthly, generally vary between one and two feet per year, indicating that the operation of the perimeter collection system keeps water levels within the landfill reduced. Two annual surface water sampling events were completed in 2001 and 2002 in accordance with the O&M Manual for the Site, with results consistent with the groundwater monitoring results. Sampling of surface water has been discontinued. Monthly inspections of the landfill occasionally show a need for minor erosion repair of the cap or repair to components of the leachate collection system. Inspections of the wetland creation area of the Site have shown that the wetlands are well established, exhibiting substantial growth and propagation.

Site perimeter groundwater is sampled from four monitoring wells located at the north, south, east, and west boundaries of the landfill. The data collected from these monitoring wells are used in determining the effectiveness of the remedy in preventing landfill leachate from migrating from the landfill and degrading the quality of Site perimeter groundwater. Since the last five-year review, the groundwater monitoring program data show that no VOCs or SVOCs have been detected in the groundwater in the immediate vicinity of the landfill. A few inorganic constituents, particularly aluminum, iron, magnesium, and sodium, have been detected above drinking water standards, generally by no more than one order of magnitude. Most notably, the results have remained largely uniform throughout the evaluation period and reflect regional background conditions. The results of the groundwater monitoring from 2008-2012 can be found in Table 3.

As discussed under "Progress Since the Last Five-Year Review," above, based on the monitoring activities and data collection since the last five-year review, there has been no change in Site conditions. However, as documented in Table 3C and Table 3E, attached, well NCR-5S was dry during the sample collection date in 2010 and 2012. Dry conditions also prevailed in 2007. Modifications to the monitoring plan are warranted to ensure that there is a complete representation of groundwater chemistry in each of the four sampled wells for annual monitoring purposes and groundwater quality evaluation. Accordingly, certain recommendations are made in this report (discussed above under "Progress Since the Last Five-Year Review" and summarized below under "Recommendations and Follow-up Actions") to ensure a more robust data set for the next five-year review.

Site Inspection and Interviews

An EPA team consisting of Damian Duda, RPM, Sharissa Singh, Hydrogeologist, and Michael Basile, Community Involvement Coordinator, conducted a Site inspection on July 11, 2013. During the Site inspection, the team did not observe any problems or deviations from the on-going operation and maintenance activities being implemented at the Site.

No specific interviews were conducted for this review. However, prior to conducting the Site inspection, a discussion was held with the PRP's O&M contractor to ensure that no problems or issues had arisen since the preparation of the most recent monitoring report. Contact was also made with NYSDEC officials prior to the Site inspection. A NYSDEC representative joined the EPA team for

the Site inspection on July 11, 2013 and found the Site to be in good condition and the remedy elements to be operational and effective as designed.

TECHNICAL ASSESSMENT

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

The Site is a former municipal landfill. The greatest carcinogenic risk attributable to the Site is associated with the potential ingestion of contaminated groundwater. The remedial actions included capping of the landfill, construction of a gas venting system and leachate collection system, implementation of institutional controls, and long term monitoring of air and water quality.

The remedial actions were initiated in 1998 and completed in 2000. O&M activities commenced in 2001 and included monthly inspections and water level measurements, routine cap maintenance, and media monitoring. Air monitoring was discontinued based on an evaluation of the air around the gas vents that determined that the gas generation rate in the landfill is very low and that subsurface gas migration is prevented by the perimeter barrier system. Surface water sampling was discontinued after two years in accordance with the O&M Plan based on favorable sampling results. Initially groundwater was sampled quarterly, then semi-annually after two years, and annually after five years. Groundwater analytical data indicate that results have been generally uniform over time and visual inspection of the wetland community on the northern border of the Site indicate that it is thriving.

Institutional controls have been in place since 2001 and the restrictive covenants provide notice that hazardous substances are buried on the property; that the use of the property is restricted in perpetuity in that future Site use must not breach the integrity of the cap, cover, liners or any other components of the containment system; must not disturb or disrupt the function of the Site's monitoring systems; nor otherwise increase the potential hazard to human health or the environment posed by the Site. Additional restrictions prohibit the installation of wells on the property and prohibit the erection of any permanent structure or building without the prior approval of EPA and Niagara County. Additionally, nearby residences are provided with potable water from the municipal water supply, peremptorily preventing risk exposure to using groundwater as potable water.

The landfill cap, fence, drainage system, and monitoring wells are intact and in good repair. Operation and maintenance of the remedy has been performed on a regular basis since January 2001 and is on-going.

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

Some chemical specific toxicity values have changed since the Site was originally assessed. In order to account for changes in toxicity values since the baseline human health risk assessment was performed, the maximum detected concentrations of the contaminants of concern identified during the 2008 through 2013 sampling period were compared to calculated risk-based screening levels and National Primary Drinking Water Standard MCLs. 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.

Risk-based human health screening levels are equivalent to a cancer risk of 1 x 10^{-6} or a hazard index of 0.1. The results indicate that the concentrations of some inorganics exceed their respective criteria in some wells that are used to monitor the groundwater quality outside the boundaries of the landfill. Specifically, the inorganic elements aluminum, copper, iron, magnesium, and sodium have been detected above drinking water standards in some of the monitoring wells, however generally by no more than one order of magnitude. Most notably, the results have remained generally uniform throughout the evaluation period, indicating that the landfill constituents are not impacting the surrounding groundwater and the elevated concentrations reflect background conditions. As such, the RAO of preventing the infiltration of contaminants into groundwater continues to be achieved.

As noted in both the 2003 and 2008 Five-Year Review Reports, based on the absence of buildings on Site or in near proximity to the Site, it was determined that vapor intrusion was not an issue. Over the past five years, no new buildings have been constructed and vapor intrusion is not an issue for the Site. Additionally, the last sampling event to include VOC analysis (2005) detected concentrations of several contaminants, but at levels below MCLs. Therefore, vapor intrusion is not currently a concern for this Site.

The ecological risk assessment established that surface water and sediment concentrations of metals and pesticides may result in adverse acute and/or chronic effects in aquatic organisms within the drainage swales and streams present on the Site or in close proximity. Additionally, stressed vegetation had been observed in the northern wetland area which may be attributable to the Site. To account for lost ecological habitat associated with the remedial construction, a wetland mitigation plan was developed and executed which included limited wetland replanting at the Site and wetland creation off-site at nearby Gratwick Park. The ecological risk exposure pathways were closed with the construction of the landfill cap.

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

No other information has come to light that would call into question the protectiveness of the remedy.

RECOMMENDATIONS AND FOLLOW-UP ACTIONS

The Site has ongoing operation, maintenance, and monitoring activities. As anticipated by the decision documents, these activities are subject to routine modification and adjustment. Although there has been no change in Site conditions or the protectiveness of the remedy since the last five-year review, it is recommended that the monitoring plan be modified to ensure that there is a complete representation of groundwater chemistry in each of the four sampled wells for annual monitoring purposes and groundwater quality evaluation (well NCR-5S was dry during the sample collection date in 2010 and 2012). Accordingly, the following steps are recommended:

- Groundwater samples should be collected in the first half of the year when water levels are generally higher (e.g., April or May), and be changed to collection by a dedicated disposable HDPE bailer. Due to the low volume required for purgingthe wells, the bailer could also be used to purge the well.

- Groundwater samples collected in 2014 would include analysis for total and dissolved metals. After the 2014 annual groundwater sampling, any trends in the concentrations of inorganic analytes would again be evaluated. Note that the wells are designed to monitor the shallow overburden groundwater and with the recommended changes, a greater water column will be available when sampled in the spring. Changing the time of year that groundwater samples are collected and changing the sampling method will likely solve the issue of inadequate water column during sampling.
- Arsenic should be added to the groundwater parameter list since arsenic was a primary risk driver (see risk assessment discussion above). It is recommended that arsenic levels in the 2014 groundwater sampling event be compared to the NYSDEC AWQS (25 ug/L) and USEPA MCL (10 ug/L). Based on the analytical results, arsenic could be considered for future groundwater sampling events.
- In order to better evaluate the RAO of preventing the infiltration of contaminants into groundwater, it is recommended that plume maps (isoconcentration maps) be created following each groundwater sampling event for the COCs that are related to the Site. Additionally, groundwater contour maps should be provided to determine groundwater flow direction to be evaluated in conjunction with the isoconcentration maps. Current hydraulic conditions need to be assessed since the dry wells may indicate hydrogeological changes over time.

Implementation of these recommendations will ensure a more robust data set for the next five-year review.

PROTECTIVENESS STATEMENT

The remedies implemented at this Site are protective of human health and the environment.

NEXT FIVE-YEAR REVIEW

The next five-year review will be completed within five years of the signature date of this five-year review.

Table 1: Chronology of Site Events	
Event	**Date**
Initial Investigations by EPA, NYSDEC, and U.S. Geological Survey	1980
Site Placed on National Priorities List (NPL)	09/08/83
EPA Initiates Remedial Investigation/Feasibility Study (RI/FS)	09/23/87
Administrative Order on Consent with Potentially Responsible Parties (PRPs) for RI/FS	03/30/89
RI/FS Completed	09/24/93
Record of Decision (ROD) Issued by EPA	09/24/93
Consent Decree between EPA and PRPs for Remedial Design/Remedial Action (RD/RA) Entered with Court	02/03/95
RD Completed/RA Started	09/30/97
Construction Started	10/19/98
Preliminary Close-Out Report Issued	06/30/00
RA Completed	12/29/00
Operation and Maintenance (O&M) Started	12/29/00
First Five-Year Review Report Completed	11/05/03
Deletion from NPL	07/30/04
Second Five-Year Review Report Completed	11/05/08

Table 2: Summary of O&M Activities/Reports	
Report	**Data**
2008 Annual Monitoring Report (February 2009)	One groundwater sampling event (December 2008); two effluent sampling events (March and September 2008); 12 monthly inspections (January 2008 - Dec 2008); 12 water level measurements (January 2008 – December 2008)
2009 Annual Monitoring Report (February 2010)	One groundwater sampling event (December 2009); two effluent sampling events (March and September 2009); 12 monthly inspections (January 2009 - Dec 2009); 12 water level measurements (January 2009 – December 2009)
2010 Annual Monitoring Report (February 2011)	One groundwater sampling event (December 2010); two effluent sampling events (March and September 2010); 12 monthly inspections (January 2010 - Dec 2010); 12 water level measurements (January 2010 – December 2010)
2011 Annual Monitoring Report (February 2012)	One groundwater sampling event (December 2011); two effluent sampling events (March and September 2011); 12 monthly inspections (January 2011 - Dec 2011); 12 water level measurements (January 2011 – December 2011)
2012 Annual Monitoring Report (February 2013)	One groundwater sampling event (November 2012); two effluent sampling events (March and September 2012); 12 monthly inspections (January 2012 - Dec 2012); 12 water level measurements (January 2012 – December 2012)
2013 Quarterly Data Summary Report (April 2013)	One effluent sampling event (March 2013); three monthly inspections and water level measurements (January – March 2013)
2013 Semi-Annual Data Summary Report (July 2013)	One effluent sampling events (March 2013); three monthly inspections & water level measurements (April – June 2013)

Table 3A: Detected Analytes in Groundwater Samples, Niagara County Refuse Site, December 5, 2008

ANALYTE	NYSDEC AWQS*	NYSDOH MCL	USEPA MCL	UNITS	MW NCR-3S	MW NCR-4S	MW NCR-5S	MW NCR-13S
METALS:								
Aluminum	100	-	-	ug/L	**543**	**782**	**2430**	**902**
Barium	1000	2000	2000	ug/L	59.9	76.8	113	84.9
Cadmium	5	5	5	ug/L	ND	ND	ND	ND UJ
Calcium	-	-	-	ug/L	184000	154000	74700	207000
Chromium	50	100	100	ug/L	16.8	ND	15.8	5.8 J
Copper	5	-	-	ug/L	ND	**ND**	ND	**10 J**
Iron	300^	300^	-	ug/L	**1920**	**3190**	**1540**	**1660 J**
Magnesium	35000(g)	-	-	ug/L	**114000**	**49200**	**53700**	**77900**
Manganese	300^	300^	-	ug/L	64.5	215	23.8	76.6
Nickel	100	-	-	ug/L	14.2	ND	13	10 UJ
Potassium	-	-	-	ug/L	2720	9210	1270	3010
Sodium	20000	20000	20000	ug/L	15900	**31500**	**49300**	**22900**
Zinc	2000(g)	5000	-	ug/L	37.9	58.5	23.6	35.2 J

* NYSDEC Ambient Water Quality Standards
^ Sum of iron and manganese should not exceed value
(g) Guidance value
U Analyte not identified above analytical detection limit
J Estimated value
Bold indicates exceedance of one or more criteria

Table 3B: Detected Analytes in Groundwater Samples, Niagara County Refuse Site, December 4, 2009

ANALYTE	NYSDEC AWQS*	NYSDOH MCL	USEPA MCL	UNITS	MW NCR-3S	MW NCR-4S	MW NCR-5S	MW NCR-13S
METALS:								
Aluminum	100	-	-	ug/L	**2190 J**	**12300 J**	**6810 J**	**3750 J**
Barium	1000	2000	2000	ug/L	57.3	125	140	98
Beryllium	3(g)	4	4	ug/L	0.2 J	0.7 J	0.2 J	0.3 J
Cadmium	5	5	5	ug/L	0.4 J	0.9 J	ND	0.3 J
Calcium	-	-	-	ug/L	148000 J	185000 J	90600 J	211000 J
Chromium	50	100	100	ug/L	14.1	10.6	17.8	21.5
Cobalt	-	-	-	ug/L	1.2 J	2.6 J	1.6 J	1 J
Copper	5	-	-	ug/L	**11.9**	**19.3**	**15.5**	**9.9 J**
Iron	300^	300^	-	ug/L	**3550**	**56900**	**6130**	**5650**
Lead	25	25	15	ug/L	ND	**28.3**	6.7	ND
Magnesium	35000(g)	-	-	ug/L	**90400**	**61200**	**63500**	**73400**
Manganese	300^	300^	-	ug/L	48.4 J	**310 J**	99.7 J	22.5 J
Nickel	100	-	-	ug/L	25.3	11.8	13.8	11.4
Potassium	-	-	-	ug/L	3430	11500	2690	3820
Sodium	20000	20000	20000	ug/L	11500 J	**33400 J**	**26000 J**	**21800 J**
Vanadium	14	-	-	ug/L	4.6 J	7.1	11	9.1
Zinc	2000(g)	5000	-	ug/L	28.2	1340	56.3	30.2

* NYSDEC Ambient Water Quality Standards
^ Sum of iron and manganese should not exceed value
(g) Guidance value
U Analyte not identified above analytical detection limit
J Estimated value
Bold indicates exceedance of one or more criteria

Table 3C: Detected Analytes in Groundwater Samples, Niagara County Refuse Site, December 16, 2010

ANALYTE	NYSDEC AWQS*	NYSDOH MCL	USEPA MCL	UNITS	MW NCR-3S	MW NCR-4S	MW NCR-5S	MW NCR-13S
METALS:								
Aluminum	100	-	-	ug/L	**465**	**3810**	NS	**1170**
Barium	1000	2000	2000	ug/L	50.4	56.7	NS	53.9
Cadmium	5	5	5	ug/L	0.5 J	0.9 J	NS	1.1
Calcium	-	-	-	ug/L	146000	136000	NS	154000
Chromium	50	100	100	ug/L	6	3.2 J	NS	16.1
Cobalt	-	-	-	ug/L	4 U	0.6 J	NS	4 U
Copper	5	-	-	ug/L	**6 J**	**6.6 J**	NS	**12.4**
Iron	300^	300^	-	ug/L	**723**	**9960**	NS	**2030**
Lead	25	25	15	ug/L	3.7 J	6.7	NS	5 U
Magnesium	35000(g)	-	-	ug/L	**89400**	**47400**	NS	**59200**
Manganese	300^	300^	-	ug/L	25.9	22.9	NS	13.1
Nickel	100	-	-	ug/L	6.8 J	4.4 J	NS	8.2 J
Potassium	-	-	-	ug/L	2540	10500	NS	1770
Selenium	10	50	50	ug/L	15 U	9.4 J	NS	15 U
Sodium	20000	20000	20000	ug/L	11700 J	**33300 J**	NS	**23200 J**
Vanadium	14	-	-	ug/L	2.5 J	2.1 J	NS	3.7 J
Zinc	2000(g)	5000	-	ug/L	20.6	268	NS	47.3

* NYSDEC Ambient Water Quality Standards
^ Sum of iron and manganese should not exceed value
(g) Guidance value
U Analyte not identified above analytical detection limit
J Estimated value
Bold indicates exceedance of one or more criteria
NS indicates no sample due to no water present in the well on the sampling date

Table 3D: Detected Analytes in Groundwater Samples, Niagara County Refuse Site, December 9, 2011

ANALYTE	NYSDEC AWQS*	NYSDOH MCL	USEPA MCL	UNITS	MW NCR-3S	MW NCR-4S	MW NCR-5S	MW NCR-13S
METALS:								
Aluminum	100	-	-	ug/L	**580 J**	**6100 J**	**8900 J**	**380 J**
Barium	1000	2000	2000	ug/L	49	93	180	59
Calcium	-	-	-	ug/L	122000	142000	83800	164000
Chromium	50	100	100	ug/L	18	5.6	24	4.6 J
Copper	5	-	-	ug/L	**10**	**10**	**24**	1.5 U
Iron	300^	300^	-	ug/L	**5300**	**18200**	**8300**	**540 J**
Lead	25	25	15	ug/L	3 U	9.4	13	3 U
Magnesium	35000(g)	-	-	ug/L	**73400**	**44900**	**42700**	**49000**
Manganese	300^	300^	-	ug/L	200	150	220	4 J
Nickel	100	-	-	ug/L	26	1.3 U	21	1.3 U
Potassium	-	-	-	ug/L	2600	18500	3000	3100
Sodium	20000	20000	20000	ug/L	9100 J	**33100 J**	**32200 J**	12800 J
Vanadium	14	-	-	ug/L	1.1 U	1.1 U	**15**	1.1 U
Zinc	2000(g)	5000	-	ug/L	340	400	**88**	47 J

* NYSDEC Ambient Water Quality Standards
^ Sum of iron and manganese should not exceed value
(g) Guidance value
U Analyte not identified above analytical detection limit
J Estimated value
Bold indicates exceedance of one or more criteria

Table 3E: Detected Analytes in Groundwater Samples, Niagara County Refuse Site, November 8, 2012

ANALYTE	NYSDEC AWQS*	NYSDOH MCL	USEPA MCL	UNITS	MW NCR-3S	MW NCR-4S	MW NCR-5S	MW NCR-13S
METALS:								
Aluminum	100	-	-	ug/L	61 J	**400**	NS	**150 J**
Barium	1000	2000	2000	ug/L	51	61	NS	42
Beryllium	3(g)	4	4	ug/L	0.3 U	0.3 U	NS	0.3 U
Cadmium	5	5	5	ug/L	0.7 J	0.5 U	NS	0.6 J
Calcium	-	-	-	ug/L	135000	137000	NS	147000
Chromium	50	100	100	ug/L	3.5 J	2.1 J	NS	3.3 J
Copper	5	-	-	ug/L	**7 J**	2.5 J	NS	**5.3 J**
Iron	300^	300^	-	ug/L	**320**	**1400**	NS	**380**
Lead	25	25	15	ug/L	3.8 J	3 U	NS	3 U
Magnesium	35000(g)	-	-	ug/L	**79200**	**43600**	NS	**56900**
Manganese	300^	300^	-	ug/L	7	4.4	NS	3.7
Nickel	100	-	-	ug/L	6.8 J	1.6 J	NS	3.9 J
Potassium	-	-	-	ug/L	3500 J	23600 J	NS	2500 J
Sodium	20000	20000	20000	ug/L	9700	**37300**	NS	**20100**
Zinc	2000(g)	5000	-	ug/L	38	63	NS	30 J

* NYSDEC Ambient Water Quality Standards
^ Sum of iron and manganese should not exceed value
(g) Guidance value
U Analyte not identified above analytical detection limit
J Estimated value
Bold indicates exceedance of one or more criteria
NS indicates no sample due to no water present in the well on the sampling date

Figure 1, Site Map