

**Fifth Five-Year Review Report
Ludlow Sand & Gravel Superfund Site
Oneida County, New York**



Prepared by

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

Approved by:

A handwritten signature in black ink, appearing to read "P. Evangelista", is written over a horizontal dashed line.

**Pat Evangelista, Acting Director
Superfund and Emergency Management Division**

Date

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LIST OF ABBREVIATIONS & ACRONYMS

ARP	Approved Remedial Plan
BHHRA	Baseline Human Health Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
EPA	United States Environmental Protection Agency
FYR	Five-Year Review
ICs	Institutional Controls
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NGP	North Gravel pit
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation
O&M	Operation, Maintenance and Monitoring Manual
OU	Operable units
PCBs	Polychlorinated biphenyls
PFAS	Polyfluoroalkyl
PPB	Parts per billion
PPM	Parts per million
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
ROD	Record of Decision
RI/FS	Remedial Investigation/Feasibility Study
SPM	Site Management Plan
VI	Vapor Intrusion
TAGM	Technical and administrative Guidance Memorandum
UU/UE	Unlimited Use and Unrestricted Exposure
VOCs	Volatile Organic Compounds

I. INTRODUCTION

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

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

This is the fifth FYR for the Ludlow Sand & Gravel Superfund Site (Site). The triggering action for this statutory review is the signing date of the previous FYR Report, September 23, 2014. The FYR has been prepared since hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of two operable units (OUs) which will be addressed in this FYR. The OU1 remedy addressed containment of the landfill, as well as polychlorinated biphenyl (PCB)-contaminated soils located above the water table in North Gravel Pit (NGP). OU2 addressed residual PCB contaminated soils remaining below the water table in the NGP and groundwater.

The Ludlow Sand & Gravel Superfund Site FYR was led by Isabel Fredricks, EPA Remedial Project Manager. Participants included Kathlyn Flynn, EPA hydrologist; Marian Olsen, EPA human health risk assessor, and Chuck Nace EPA ecological risk assessor. The potentially responsible party (PRP) for the Site, was notified of the initiation of the FYR. The review began on 12/1/2018.

Site Background

The Site is located in the Town of Paris, Oneida County, New York, approximately six miles south of Utica. The Ludlow Sand & Gravel property encompasses approximately 130 acres with landfill activities confined to approximately 18 acres. The landfill area is fenced on the western boundary along Holman City Road. The south and east sides of the landfill are bounded by a New York State designated wetland and an unnamed stream, while to the north, the landfill is bounded by a gravel pit which is also part of the Site (see Appendix A). The wetland is considered by EPA to be an area currently in use as an environmental resource.

The landfill is in a groundwater recharge zone to the principal aquifer along Sauquoit Creek. The Creek serves as a major discharge point for groundwater flowing from uplands.

Water supplies in the area are mainly used for domestic and agricultural purposes with two municipally-owned public water supplies within two miles of the Site. The Sauquoit Valley Water District is a spring source located approximately one-mile upgradient of the Site's groundwater flow patterns. The Village of Clayville's water system is located about three-quarters of a mile northwest of the landfill. The only individual water supply wells within 1,000 feet of the landfill are three homeowner wells along Mohawk Street which are located upgradient to groundwater flow around the landfill. Eight additional homeowner wells exist between 1,000 and 3,000 feet from the landfill.

Single family homes are located along Holman City Road. The owner continues operating the gravel pit and some consideration is being given to potential reuse or redevelopment scenarios for the Site within restrictions described in the Institutional Controls (ICs).

The landfill began receiving municipal refuse from surrounding communities in the 1960s. The landfill also received bulk liquid, including septage, waste oils, coolants, and sludges containing metals. The bulk liquids were disposed of at the landfill by surface application. The NGP was also periodically used for the disposal of bulk waste oils. Drummed liquid wastes were reportedly not disposed of in the landfill. Drummed liquids were bulked using a vacuum truck and were applied to the landfill in a manner similar to the bulk liquids previously described. The landfill continued to accept waste until it was shut down by court order in 1988.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Ludlow Sand & Gravel		
EPA ID: NYD013468939		
Region: 2	State: NY	City/County: Town of Paris/Oneida County
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	Has the Site achieved construction completion? Yes	
REVIEW STATUS		
Lead agency: EPA <i>[If "Other Federal Agency", enter Agency name]:</i>		
Author name (Federal or State Project Manager): Isabel Fredricks		
Author affiliation: EPA		
Review period: 9/23/2014 - 5/14/2019		
Date of Site inspection: 5/14/2019		
Type of review: Statutory		
Review number: 5		
Triggering action date: 9/23/2014		
Due date (five years after triggering action date): 9/23/2019		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

Special Metals Corporation of Utica, New York, a PRP, agreed to perform a Remedial Investigation/Feasibility Study (RI/FS) which was submitted in 1986. Subsequently, Mr. Ludlow, another PRP, engaged a contractor to perform additional investigations to supplement the initial investigation and prepare a closure plan. In addition, at the request of New York State Department of Environmental Conservation (NYSDEC), EPA tasked a contractor to perform a supplemental RI/FS to further evaluate the cost of the alternatives.

Based upon the results of these investigations, the 1988 Record of Decision (ROD) for OU1 identified the lifetime risks from dermal exposure to PCBs in soil was 5×10^{-5} for the worst-case scenario and the cancer risks from ingestion of soils was 9×10^{-6} . The risks to the child from the ingestion, dermal contact, and inhalation of PCBs in groundwater was 1×10^{-6} for the most probable case and 6×10^{-5} for the worse case. It should also be noted that in 1987, a Federal District Court Judge in the District Court of Binghamton ordered the landfill to be closed pursuant to federal and state regulations.

In 1994, the PRPs proposed a work plan for a supplemental RI/FS to address OU2. As some removal of contaminated material had occurred as part of the implementation of the OU1 remedy, the PRPs believed that sufficient work was done to address the contamination at the NGP and that any further remedial action was unnecessary. The EPA and NYSDEC disagreed with the PRPs and the dispute was taken to court. Subsequently, the work plan was approved for implementation under a Consent Judgment, by order of the court, dated August 3, 1996. The purpose of the supplemental RI was to characterize the extent of groundwater contamination further and to define the nature and extent of residual contamination at the NGP. The supplemental RI was conducted between November 1996 and January 1998.

OU2 receptors were evaluated for exposure to PCBs, the contaminant of concern. Receptors included the on-Site worker who may be exposed to surface soil and through ingestion of groundwater, the maintenance worker who may be exposed to surface soil, the adolescent trespasser who may be exposed to either surface or shallow soils, and the construction worker who may be exposed to soils deeper than 2 feet during future construction at the Site. The cancer risk to the reasonable maximum exposure individual is evaluated by comparison of the risks to the acceptable risk range of 10^{-4} to 10^{-6} or one in ten thousand to one in a million. The risk range was exceeded for the current/future on-Site worker exposed to surface soil (7.4×10^{-4}) and to the on-Site worker exposed to shallow soil core samples (5.4×10^{-4}). Risks to the following receptors were within the risk range: adolescent trespasser exposed to shallow soils (7.8×10^{-5}), and the future construction worker (5.2×10^{-5}).

The evaluation of noncancer for human health hazards for all scenarios evaluated exceeded EPA's Goal of Protection of Hazard Quotient (HQ) of 1. The following HQs were calculated: an HQ of 52 for the industrial on-Site worker; an HQ of 37 for the on-Site worker exposed to shallow soils; an HQ of 16 for the adolescent trespasser exposed to surface soil; an HQ of 11 for the adolescent trespasser exposed to shallow soil; and HQ of 92 for the construction worker.

Evaluation of cancer risks from ingestion of groundwater on-Site indicates a risk to a worker of 2.1×10^{-7} that is below the risk range, based on exposure to Aroclor 1242, a commercial mixture of PCBs. The HQ for the worker was less than 1. These results indicate that exposure do not pose an unacceptable cancer risk or noncancer hazard to the worker.

Aroclor 1254 in surface soil, shallow core samples, and subsurface soil is the main cancer risk and non-cancer health hazard driver for the industrial/commercial worker, the trespasser (for noncancer only), and construction worker (for non-cancer only).

An ecological risk assessment was not performed for either OU1 or OU2. However, the OU1 ROD stated that, PCBs would remain in sediments where they would be bioaccumulated within benthic organisms as well as transient organisms inhabiting the areas surrounding the landfill and the wetlands. Biota sampling conducted by the NYSDEC Division of Fish and Wildlife has indicated the presence of PCBs in the biota in the area. Additional studies were performed to adequately characterize the extent of PCB contaminants in the local biota. Because the leachate areas east, southeast and south of the landfill are flooded with surface and/or groundwater, degradation of these water bodies could occur. This would result in an adverse impact to aquatic life, vegetation and wildlife that may use these areas as a water source.

Response Actions

Remedy Selection

Remedial Action Objectives (RAOs) were developed for the Site as a result of data collected during the remedial investigation to aid in the development and screening of remedial alternatives. They are: (1) minimize the potential for PCBs to migrate from soils into groundwater; and (2) eliminate any direct contact, ingestion, or inhalation threat associated with contaminated soil. The RAO for the NGP portion of the Site (OU2) was to remediate the PCB-contaminated soils above 10 ppm.

Based upon the results of the RI/FS, the OU1 ROD issued on September 30, 1988, called for the following remedial measures:

- Consolidate approximately 10,000 cubic yards of contaminated soil and sediment located adjacent to the landfill and dispose of it in the landfill and then place either a clay or synthetic cover over it to prevent rain water from coming into contact with the buried materials;
- Collect leachate from seepage areas;
- Dewater the landfill, if necessary, by using either a passive drain system or groundwater extraction wells;
- Implement upgradient groundwater controls to lower the water table to prevent groundwater from coming into contact with the waste material;
- Treat the contaminated leachate and groundwater at an on-Site facility, or if the volume of water were small, transport the water and leachate to an approved disposal facility;
- Install a perimeter fence around the Site, including the wetlands;
- Recommend that ICs be established in the form of deed restrictions on future uses of the Site; and
- Monitor the groundwater, private wells, and surface water to ensure that remediation of the landfill is effective.

In addition, the ROD called for implementation of a soil/sediment sampling program to fully define the volume and extent of contaminated soils to be consolidated under the cap. New York State and the PRPs entered into a Consent Judgment in the Northern District of New York for the implementation of an Approved Remedial Plan (ARP). The ARP addressed the elements of the 1988 ROD. The ARP also included elements that were to be addressed as part of OU2, including the excavation and consolidation

of contaminated sediments from the wetlands and PCB-contaminated soil from the NGP into the landfill. It also included a supplemental groundwater study that was completed by the PRPs in January 1990.

Many soil and groundwater samples were collected at the Site to characterize the nature and extent of contamination as part of the supplemental RI. These and other data indicated that PCBs were the principal contaminants which exceeded soil cleanup values. These PCB concentrations remained at depth in the NGP because of the limitations of the excavation equipment which was used when the NGP was excavated as part of the OU1 remedial activities. In addition, low levels of volatile organic compounds (VOCs) and inorganic compounds (metals) were also detected in soil and groundwater samples on a sporadic and limited basis. During the supplemental RI quarterly groundwater sampling was performed at five wells around the perimeter of the NGP from September 1997 until March 1999 for a total of seven sampling events. Monitoring well MW11-R had detectable concentrations of PCBs (0.13 parts per billion (ppb) and 0.24 ppb) in the unfiltered samples during two of the seven sampling events (September 1997 and June 1998). All other wells sampled, and all filtered samples did not demonstrate detectable concentrations. This indicated that PCB contamination is not migrating in groundwater and is confined to the pit area. Based upon these data, it was determined that no further remedial action was necessary for the groundwater, with the assumption that the residual PCB contamination remaining below the water table in the NGP would be addressed as part of the OU2 remedy.

The remedy for OU2, specified in a ROD issued on March 31, 2003, primarily addressed residual PCB contamination at depth in the NGP and specifically called for:

- Solidifying soil at depth with PCB concentrations above 10 parts per million (ppm);
- Implementing a pre-design delineation sampling program to determine the area to be treated;
- Implementing soil bench-scale testing to determine the grout characteristics;
- Backfilling the NGP to its original elevation, covering the area with clean soil to raise the surface elevation to its original grade, and applying a vegetative cover;
- Limiting Site access and issuing a deed restriction to prohibit groundwater usage and limiting the land use to nonresidential purposes;
- Installing at least two downgradient deep groundwater monitoring wells to ensure that PCB migration in the groundwater is not occurring; and
- Implementing a groundwater monitoring program.

Status of Implementation

The remedial action (RA) for OU1 was conducted by the PRPs pursuant to the Consent Judgment with the State. During the remedial design, the soil contamination in the wetlands areas and NGP were delineated. The remedial design report was approved by the NYSDEC in June 1990.

RA activities for OU1 started in 1990 and were performed under the oversight of the NYSDEC. Sediment from the wetlands was excavated to the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) No. 94-HWR-4046 surface soil guidance value of 1 ppm for PCBs and consolidated into the landfill prior to the cap completion. Approximately 40 cubic yards of sediment with PCB concentrations greater than 500 ppm were disposed of off-Site at an approved disposal facility. Approximately 60,000 cubic yards of soil were excavated from the NGP, of which approximately 40,000 cubic yards were found to be contaminated with PCBs and were consolidated into the landfill prior to completion of the cap. The other 20,000 cubic yards of material had nondetectable levels of PCBs and were placed on the bank of the NGP. The total amount of soil that was excavated from the NGP was greater than anticipated and the

excavation using conventional excavation equipment became difficult when groundwater was encountered. Topsoil and seeding were placed over the entire capped area which was enclosed within a chain link fence. A leachate collection system, a leachate treatment system, gas collection/lateral drainage layer and gas venting systems were also installed. Monitoring wells were installed downgradient from the landfill. Construction was completed in 1992.

A report documenting the cleanup efforts, *Construction Document Report*, was submitted by the PRPs and approved by the NYSDEC in May 1995.

The United States Army Corps of Engineers prepared the remedial design plans and specifications for OU2 through an interagency agreement with the EPA. The 2003 ROD identified pressure grouting as the method to be used to solidify the PCB-impacted soils in the NGP. The EPA performed a Value Engineering Assessment between the proposed pressure grouting technology and soil mixing technology. In-situ soil mixing, sometimes referred to as in-situ solidification/stabilization, was identified as having the potential to complete the project at a lower cost and in a shorter time frame. As a result, the EPA decided to use this technology to address the NGP soils containing PCB concentrations above 10 ppm in the NGP. The EPA Region 2 removal program staff directed and oversaw construction activities.

Following on-Site mobilization in June 2007, construction activities were conducted in two phases. Phase I of the remedial action included in-situ soil mixing of PCB-contaminated soils and installation of groundwater monitoring wells. Phase II included backfilling the pit with clean fill to its original elevation, seeding the area to provide a vegetative cover, and installing culverts, swales, and a retention basin for storm water runoff.

On September 25, 2007, a final inspection was conducted by EPA and NYSDEC for OU2. The Site was deleted from the NPL on December 2, 2013.

Institutional Control Implementation

Institutional controls are in place to ensure that the future use of the site does not change, that the remedy components are not damaged and that groundwater is not used for potable purposes. The cap is in good condition and prevents direct contact by human and ecological receptors.

IC Summary Table

Table 1: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Groundwater and Soils	Yes	Yes	Entire Site	Restrict installation of groundwater wells and groundwater use; employ Site management plan for excavation below demarcation layer	Environmental Protective Easement and Declaration of Restrictive Covenants, August 2013

Systems Operations/Operation & Maintenance

The long-term monitoring program for the Site commenced in 2000. This program consists of the following activities:

- Monthly inspections are performed to visually assess and document the condition of the landfill perimeter fence and access road, leachate management system building, gas collection system, monitoring wells and manholes, and overall integrity of the cover;
- Water level measurements are obtained from designated monitoring wells at the landfill to assess seasonal water level fluctuations and evaluate groundwater flow direction;
- Groundwater samples are collected from 17 monitoring wells, three residential wells and one public supply well during the monitoring events and analyzed for PCBs and VOCs;
- Surface water is sampled annually from the culvert where the ponded wetland discharges beneath Holman City Road to monitor PCBs;
- Annual methane monitoring at the landfill gas vents, manholes and monitoring wells is conducted; and
- Leachate collected from the landfill is pumped through the on-Site leachate treatment facility prior to discharge in accordance with the operation and maintenance (O&M) Manual. Operation of the leachate collection and treatment system was discontinued in 2008 after it was determined that there was minimal potential for the capped landfill to impact the downgradient water supply wells and groundwater.

No operation or maintenance for the stabilized soils is necessary for OU2.

Five wells installed during the OU2 remediation were sampled to establish a baseline. The monitoring of these wells has been incorporated into the OU1 long-term monitoring program for the Site.

Monitoring and maintenance continues to be performed by MACTEC Engineering and Consulting, P.C., under contract with NYSDEC.

The Site management plan (SMP) activities conducted by MACTEC Engineering and Consulting, P.C. was revised (Revision 1) during the three-year period (January 2015-December 2017) and was approved by the NYSDEC in June 2016. The long-term monitoring activities described in the SMP includes groundwater elevation monitoring, monitoring well inventory and repair, groundwater sampling and analysis, private and public water supply monitoring, and leachate sampling and analysis. The SMP requires inspections of the landfill access system, landfill cover system and landfill seep, storm water collection and drainage system, and landfill gas vents. From January 2008 to May 2016, monitoring locations were sampled at 15-month intervals. In 2016, the SMP revision altered the long-term monitoring event frequency to five-year intervals. The next long-term monitoring event is scheduled for 2021.

The following is a summary of the SMP activities conducted at the Site between January 2015 and December 2018:

Groundwater Elevation Monitoring: During the groundwater monitoring events from 2015 through 2017, water level measurements were obtained from shallow and deep monitoring wells at the landfill to assess seasonal water level fluctuations and evaluate groundwater flow direction.

Monitoring Well Inventory and Repair: During the February 2015 long-term monitoring well

inventory and subsequent June 2015 inspection, thirteen monitoring wells and two manholes were observed to need repairs. These repairs were completed concurrently with the June 2015 Site inspection.

Groundwater Quality Monitoring: Samples for laboratory analysis were collected from monitoring wells in February 2015 and 2016. They were analyzed for VOCs, PCBs, phenolics and metals to ensure detection of potential threats to human health. While PCBs are the primary contaminant of concern at the Site, VOCs, phenolics, and metals are present within the landfill, but only have been sporadically and infrequently detected in groundwater.

Surface Water Monitoring: Surface water samples were collected in February 2015 and May 2016 events from the wetland outfall culvert located at the southern end of the OU1 landfill.

Landfill Gas Monitoring: Methane monitoring at the landfill gas vents, manholes and monitoring wells is conducted on an annual basis.

Leachate System Monitoring: Leachate collected from the landfill had been pumped through the on-Site leachate treatment facility prior to discharge in accordance with the O&M Manual. Sampling and analysis of the parameters outlined in the O&M Manual is conducted on a semi-annual basis for PCBs and once every 15 months for the remaining monitoring parameters (VOCs, metals and phenolics). An evaluation of leachate and groundwater data conducted in 2007 concluded that operation of the treatment system was not necessary. As a result, the leachate collection system was shut down in June 2008. In February 2015 and May 2016, water samples were collected from pump station #1 and a manhole at the southern edge of the landfill and analyzed for PCBs, VOCs, target compound list (metals), and total phenolics.

Residential Water Supply

Samples were collected for both LTM events from two downgradient residential wells and were analyzed for PCBs, VOCs, TCL metals, and total phenolics.

OU2 North Gravel Pit

Groundwater samples were collected from the three monitoring wells and analyzed for PCBs.

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.

Per- and Polyfluoroalkyl Substances (PFAS) and 1,4-Dioxane Groundwater Sampling

Groundwater sampling for 1,4-dioxane and PFAS was conducted at the request of NYSDEC to evaluate the presence/absence of PFAS and 1,4-dioxane at the Site. To evaluate downgradient conditions, three monitoring wells were selected at OU1 and one at OU2. In addition, one upgradient monitoring well was sampled.

1,4-dioxane was detected at concentrations exceeding the November 2018 Regional Screening Level (RSL) of 0.46 ppb (USEPA 2019) at three of the five sample locations: 18 ppb, 23 ppb and 5.1 ppb. These wells are along the downgradient fence line of OU1.

PFAS were detected in samples collected from each well, however, none of the samples had combined concentrations above the USEPA Office of Water Lifetime Health Advisory Level of 70 parts per trillion for both PFOA and PFOS.

The State of New York is in the process of finalizing MCLs for 1,4-dioxane, PFOA and PFOS. EPA will continue to work with NYSDEC to determine whether further sampling at this site is necessary.

III. PROGRESS SINCE THE LAST REVIEW

Table 1: Protectiveness Determinations/Statements from the 2014 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Protective	The remedy for the site protects human health and the environment.
2	Protective	The remedy for the site protects human health and the environment.
Sitewide	Protective	The remedies for the site protects human health and the environment.

There were no issues and recommendations identified in the last FYR.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

On October 1, 2018, EPA Region 2 posted a notice on its website indicating that it would be reviewing Site cleanups and remedies at 42 Superfund Sites in New York and New Jersey, including the Ludlow Sand & Gravel Site. The announcement can be found at the following web address: <https://www.epa.gov/aboutepa/fiscal-year-2019-five-year-reviews>.

In addition, to this notification, a notice of the commencement of the FYR was sent to local public officials. The notice was provided to the town of Paris and the village of Clayville by email on April 8, 2019, with a request that the notice be posted in municipal offices and on the respective town and village webpages. The purpose of the public notice was to inform the community that the EPA would be conducting a FYR to ensure that the remedy implemented at the Site remains protective of public health and is functioning as designed. In addition, the notice included contact information, including addresses and telephone numbers, for questions related to the FYR process or the Site.

Once the FYR is completed, the results will be made available on EPA's Ludlow Sand and Gravel Site webpage (www.epa.gov/superfund/ludlow-sand-and-gravel) and at the Site repositories, which are the Utica Public library, 303 Genesee street, Utica, New York 13501; NYSDEC Region 7 Office, State Office Building, 207 Genesee Street, Utica, New York 13501; and the USEPA Region 2, Superfund Records Center, 290 Broadway, 18th Floor, New York, NY 10007.

Data Review

The 2015 and 2016 results show the groundwater flow directions in the shallow and deep aquifers were generally similar to previous Site conditions. Groundwater in both shallow and deep aquifers flow west-southwest, while the groundwater in the deeper aquifer has a more southerly flow component southwest of the landfill.

No phenols or PCBs were detected in the OU1 groundwater samples in this period. VOCs were detected at concentrations less than New York State Class GA Water Quality Standards. Six metals were detected at concentrations exceeding the standards or guidance values; antimony, iron, magnesium, manganese, selenium, sodium and thallium. These results are consistent with historically observed results.

No other contaminants were detected above New York State Class GA Water Quality Standards. No PCBs were detected in either event at the OU2 monitoring wells. At the residential wells, no PCBs, VOCs or phenols were detected in either event. Metal concentrations were typically less than the GA standard or guidance values. No PCBs were detected in surface water samples.

Results have demonstrated that the landfill gas venting system is operating well. PCBs and phenols were not detected in samples collected from the former leachate system.

Site Inspection

The inspection of the Site was conducted on 5/14/2019. In attendance were Robert Strang, NYSDEC, Matthew Hoskins, D&B Engineers and Architects, P.C., Jean Firth, Wood PLC and Isabel Fredricks, EPA. The purpose of the inspection was to assess the integrity of the remedy.

During the Site inspection, there were no problems or deviations observed with respect to the ongoing operation and maintenance activities.

V. TECHNICAL ASSESSMENT

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

Question A Summary:

PCBs have not been detected in groundwater downgradient of the landfill or the NGP, Therefore, it is concluded that the stabilization and capping activities have effectively immobilized all PCB contaminants in soils. Groundwater monitoring will continue to verify that the contaminant activities are effective. Institutional controls are in place to ensure that the future use of the site does not change, that the remedy components are not damaged and that groundwater is not used for potable purposes. The cap is in good condition and prevents direct contact by human and ecological receptors.

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

Human Health Risk Assessment

Summary. Overall, the remedy remains protective and potential exposure pathways considered in the baseline human health risk assessment (BHHRA) from exposures to soils and groundwater remain valid.

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy remain valid. There are no changes in the toxicity or exposure assumptions that will change the overall conclusions of the BHHRA.

Exposure Assumptions There have been no changes in the physical conditions of the Site, or land use that would affect the exposure assumptions or the protectiveness of the remedy for human health. The property zoning is not expected to change in the next five years. The remedy components, landfill capping; groundwater containment; and solidification of PCB-contaminated soil located below the water table, are designed to prevent exposure to contaminants in soil and groundwater. These actions are protective of human health. The updates to the Standard Default Exposure Assumptions in 2014 do not change the overall conclusions of the BHHRA.

Soil: The exposure assumptions used to estimate the potential cancer risks and non-cancer health hazards in the BHHRA supporting the OU1 ROD and the OU2 RODs for human health followed EPA's Risk Assessment Guidance for Superfund available at the time the BHHRA was developed. The processes that were used in the human health risk assessments are still valid. In addition, given that soils have been capped, the human exposure pathways were interrupted, and exposures are not anticipated.

Groundwater: The evaluation of the groundwater focused on direct ingestion of groundwater as a potable water source and the possibility of vapor intrusion if buildings were to be constructed over the groundwater plume. The evaluation of the direct contact pathway showed that all nearby residents are using well water. Sampling conducted for the OU1 Periodic Review Report did not reveal PCBs or phenols above their respective New York State Class GA Water Quality Standards. The non-detect concentrations at the method detection limit of 0.009 ug/l are below the federal New York State Class GA Water Quality Standards for phenols, and the current maximum contaminant level for PCBs of 0.5 ug/l. No VOCs were detected above standards. As in previous years, PCBs and VOCs were not detected in the samples collected from the residential wells sampled or the Clayville supply well.

PCBs were not detected in the OU2 NGP groundwater samples collected from wells MW-10, MW-A and MW-AS.

Vapor Intrusion (VI): The previous FYR soil VI evaluation found that trichloroethylene and tetrachloroethylene were not detected in groundwater and VI was not a concern. Groundwater monitoring over the past five years shows no detections of VOCs including trichloroethylene or tetrachloroethylene. Therefore, this exposure is screened out as a pathway of concern.

Toxicity values. The main Site contaminant of concern was PCBs. At the current time, the IRIS program is re-evaluating the non-cancer toxicity of PCBs and any potential changes in the toxicity values will need to be evaluated in the next FYR. The remedy for OU1 was a source control remedy for soils, sediments, leachate seeps and groundwater in contact with wastes. The remedial actions have interrupted potential exposures to PCBs. The remediation goal of 10 ppm for PCBs in soil identified in the 2003 ROD is consistent with values for industrial properties identified under the Toxic Substances Control Act. The industrial remediation goal of 10 ppm includes the currently available toxicity and this value is also protective. The cancer risk and non-cancer health hazards for worker exposures at a concentration of 10 ppm are approximately 1×10^{-5} and below the concentration of 15 ppm associated with the non-cancer goal of protection of an HQ = 1.

The assessment of human health risks indicates the stabilization and capping activities have immobilized all PCB contaminants in soils. Groundwater monitoring will continue to verify that the contaminant activities are effective. There are no changes in the physical conditions of the Site, or land use that would affect exposure or the protectiveness of the remedy. The remedy is protective for human health.

Ecological Risk Assessment

The previous FYR indicated that the “Given that the contaminated soils have been capped, and the leachate discharges has been controlled, the potential for exposure to ecological receptors has been eliminated”. Base on the information contained in the monitoring reports for sediment and surface water (i.e., results non-detect for Site-related contaminants) and the photographs included in the monitoring report, the conclusion from the previous FYR that the ecological exposure pathways have been eliminated is still valid. Therefore, since the remedial actions, have resulted in interrupting the exposure pathways for ecological receptors, the remedial action objectives used at the time of the remedy are still valid.

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

No additional information has come to light.

VI. ISSUES/RECOMMENDATIONS

There are no issues/recommendations at the Site.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)		
<i>Operable Unit:</i> OU1	<i>Protectiveness Determination:</i> Protective	<i>Planned Addendum Completion Date:</i> Click here to enter a date
<i>Protectiveness Statement:</i> The remedy is protective of human health and the environment.		

Sitewide Protectiveness Statement	
<i>Protectiveness Determination:</i> Protective	<i>Planned Addendum Completion Date:</i> Click here to enter a date
<i>Protectiveness Statement:</i> The implemented remedy for the Site is protective of human health and the environment.	

Protectiveness Statement(s)		
<i>Operable Unit:</i> OU2	<i>Protectiveness Determination:</i> Protective	<i>Planned Addendum Completion Date:</i> Click here to enter a date
<i>Protectiveness Statement:</i> The remedy is protective of human health and the environment.		

Sitewide Protectiveness Statement	
<i>Protectiveness Determination:</i> Protective	<i>Planned Addendum Completion Date:</i> Click here to enter a date
<i>Protectiveness Statement:</i> The implemented remedy for the Site is protective of human health and the environment.	

VIII. NEXT REVIEW

The next FYR for the Ludlow Sand & Gravel Site is required five years from the completion date of this review.

REFERENCE LIST

Table 1: Chronology of Site Events	
Event	Date(s)
Pre-NPL responses	1982
Final NPL listing	1983
Remedial Investigation/Feasibility Study completed	1988
Record of Decision – OU1 (landfill capping, leachate collection and treatment, groundwater controls)	1988
Consent Judgment for the performance of the OU1 Remedial Design and Remedial Action	1989
OU1 Remedial Design performed by the PRP	1990
OU-1 Remedial Action performed by the PRP	1990-1996
First Five-Year Review conducted by EPA	1999
Record Decision – OU2 (gravel pit, solidification of PCBs)	2003
Second Five-Year Review conducted by EPA	2004
OU2 Remedial Design performed by EPA	2006
OU2 Remedial Action performed by PRP	2007
Third Five-Year review conducted by EPA	2009
Deletion from NPL	2013
Forth Five-Year review conducted by EPA	2014

Table 2: Documents, Data and Information Reviewed in Completing the Five-Year Review	
Document Title, Author	Date
Record of Decision	1988-2003
First Five-year Review	7/1/1999
Second Five-Year Review	7/1/2004
Third Five-year Review	7/1/2009
Forth Five-year review	9/23/ 2014
Periodic Review Report	January 2018

APPENDIX A - SITE MAP



