FOURTH FIVE-YEAR REVIEW REPORT FOR OSBORNE LANDFILL SUPERFUND SITE MERCER COUNTY, PENNSYLVANIA

ORIGINAL

September 2015

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Date

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LIST OF ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
COC	Contaminant of Concern
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
FYR	Five-Year Review
GPRA	Government Performance and Results Act
HI	Hazard Index
IC	Institutional Control
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
µg/L	Microgram per Liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
OU	Operable Unit
O&M	Operation and Maintenance
PADEP	Pennsylvania Department of Environmental Protection
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
RI	Remedial Investigation
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RD	Remedial Design
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
TCE	Trichloroethene
THM	Trihalomethanes
UAO	Unilateral Administrative Order
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

The Osborne Landfill Superfund site (the Site), in Grove City, Mercer County, Pennsylvania, is an abandoned coal strip mine that was used as a landfill from the late 1950s to 1978. The landfill accepted various types of industrial wastes and fill material. Wastes disposed of at the Site contained polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), metals and several volatile organic compounds (VOCs). Site investigations identified contamination in the landfill, wetlands and groundwater near the Site.

To manage the cleanup, EPA issued two Records of Decision (RODs) (see Table 1). The first ROD, dated September 28, 1990, addressed the solid waste fill material, the on-site water table, and contamination in the Clarion Aquifer and mine voids.

A second ROD, dated December 30 1997, addressed wetlands, groundwater contamination, and groundwater monitoring. The wetland to the southwest showed little impact from the Site and no action was warranted. During design of the extraction system for the Clarion aquifer and mine voids, EPA determined remediation of the Clarion Aquifer, as required by the 1990 ROD, was no longer necessary and monitored natural attenuation was selected. Three years of groundwater monitoring of the Homewood, Connoquenessing and Burgoon Aquifers, was performed to confirm that contamination was not migrating from the Site.

The solid waste fill material remedy includes a leachate collection and treatment system, landfill cap and slurry wall, groundwater monitoring, and institutional controls. Performance standards for the solid waste fill material cleanup were met in 2004. The remedy for the groundwater in the Clarion formation and mine voids is monitored natural attenuation (MNA). If the remedy for the solid waste fill material did not meet performance standards, a contingency remedy was identified which required the complete excavation of the fill material and placement of the fill into a multilayer impermeable landfill. This remedy (OU3) was not implemented.

The solid waste fill material (OU1) remedy currently protects human health and the environment. Performance standards for the landfill leachate collection and treatment system have been met, the landfill cap and slurry wall is functioning as intended. Continued ground water monitoring verifies integrity of the remedy is being maintained and Institutional Controls (ICs) in place for OU1 include all necessary ICs for the entire Site. ICs prevent disturbance of the cap and require all property owners in the vicinity of the Site to connect to the public water system.

The wetland (OU2) currently protects human health and the environment. The 1997 ROD determined the southwest wetland were not impacted by Site contaminants.

The remedy for the Clarion Formation (OU4) currently protects human health and the environment because performance standards in the Clarion Aquifer have been met and analytical results indicate the performance standards have been achieved for all but two mine void wells and one residential well. Vapor intrusion was ruled out as a concern for the Site given the current conditions.

The remedy for groundwater in the Homewood, Connoquenessing and Burgoon Aquifers (OU5) is protectective because groundwater monitoring, completed in 2002, determined Site related contamination was not migrating to these aquifers.

Because the remedial actions at all OUs are protective, the site is protective of human health and the environment.

The triggering action for this five-year review (FYR) was the signing of the previous FYR on September 8, 2010. This FYR found the remedy protective and did not identify any issues or recommendations.

Government Performance and Results Act (GPRA) Measure Review

As part of this FYR, GPRA Measures have also been reviewed. The GPRA Measures and their status are provided as follows:

Environmental Indicators
Human Health: Current human exposures at the Site are under control.
Groundwater Migration: Contaminated groundwater migration is under control.

Sitewide Ready for Anticipated Use
The Site achieved the Sitewide Ready for Anticipated Use measure on September 27, 2010.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Osborne Landfill		
EPA ID: PAD980712673		
Region: 3	**State:** PA	**City/County:** Grove City/Mercer

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA **If "Other Federal Agency" selected above, enter Agency name:** Click here to enter text.
Author name: Nick Tymchenko, with additional support provided by Skeo Solutions
Author affiliation: EPA Region 3
Review period: September 2014 – September 2015
Date of site inspection: 10/21/2014
Type of review: Statutory
Review number: 4
Triggering action date: 09/08/2010
Due date *(five years after triggering action date)*: 09/08/2015

Issues/Recommendations
Issues and Recommendations Identified in the Five-Year Review:

None

FIVE-YEAR REVIEW SUMMARY FORM (CONTINUED)

Protectiveness Statements

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU1	Protective	Click here to enter date.

Protectiveness Statement:
The solid waste fill material remedy currently protects human health and the environment. Performance standards for the land fill leachate collection and treatment system have been met, the landfill cap and slurry wall is functioning as intended. Continued ground water monitoring verifies integrity of the remedy is being maintained and Institutional Controls (ICs) in place for OU1 include all necessary ICs for the entire Site. ICs prevent disturbance of the cap and requires all property owners in the vicinity of the Site to connect to the public water system.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU2	Protective	Click here to enter date.

Protectiveness Statement:
The wetland currently protects human health and the environment. The 1997 ROD determined the southwest wetland were not impacted by Site contaminants.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU4	Protective	Click here to enter date.

Protectiveness Statement:
The remedy for the Clarion Formation currently protects human health and the environment because performance standards in the Clarion Aquifer have been met and analytical results indicate the performance standards have been achieved for all but two mine void wells and one residential well. Vapor intrusion was ruled out as a concern for the Site given the current conditions.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU5	Protective	Click here to enter date.

Protectiveness Statement:
The remedy for groundwater in the Homewood, Connoquenessing and Burgoon Aquifers (OU5) is protectective because groundwater monitoring, completed in 2002, determined Site related contamination was not migrating to these aquifers.

FIVE-YEAR REVIEW SUMMARY FORM (CONTINUED)

Sitewide Protectiveness Statement	
Protectiveness Determination: Protective	*Addendum Due Date (if applicable):* Click here to enter date.
Protectiveness Statement: The remedy at the Site is protective of human health and the environment.	

Fourth Five-Year Review Report
for
Osborne Landfill Superfund Site

1.0 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 will continue to be protective of human health and the environment. FYR reports document FYR methods, findings and conclusions. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The United States Environmental Protection Agency prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Section 121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121 states:

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each 5 years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

EPA interpreted this requirement further in the NCP, 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which states:

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.

EPA Region 3, with contractor support from Skeo Solutions, conducted the FYR and prepared this report regarding the remedy implemented at the Osborne Landfill Superfund site (the Site) in Grove City, Mercer County, Pennsylvania. EPA conducted this FYR from September 2014 to June 2015. EPA is the lead agency for developing and implementing the remedy for the potentially responsible party (PRP)-financed cleanup at the Site. The Pennsylvania Department of Environmental Protection (PADEP), as the support agency representing the Commonwealth of Pennsylvania, has reviewed all supporting documentation and provided input to EPA during the FYR process.

This is the fourth FYR for the Site. The triggering action for this statutory review is the previous FYR. The FYR is required because hazardous substances, pollutants or contaminants remain at

the Site above levels that allow for unlimited use and unrestricted exposure. The Site was separated into five operable units (OUs) as defined in Table 1 below.

Table 1: Site OU Designations[1]

Original OU Designation (1990)		Remedy Decision Document	Remedy
OU1	Solid Waste Landfill	1990 Record of Decision (ROD); 1998 OU1 Explanation of Significant Differences (ESD); 2004 OU1 ESD	Cap, slurry wall groundwater pumping and treatment; institutional controls
OU2	Wetland Sediments	1997 ROD	No action
OU3	On-site Water Table (OU1 contingency remedy)	1990 ROD	Contingency remedy, not implemented
OU4	Clarion Aquifer	1990 ROD; 1997 ROD; 1998 OU2 ESD	Groundwater pumping and treatment in 1990 ROD modified to natural attenuation with monitoring in 1997 ROD
OU5	Homewood, Connoquenessing and Burgoon Aquifers	1997 ROD	Three years of monitoring (completed 2002)

2.0 Site Chronology

Table 2 lists the dates of important events for the Site.

Table 2: Chronology of Site Events

Event	Date
PADEP closed the site landfill for not having a permit to accept wastes	April 7, 1978
EPA began assessing site conditions	Early 1980s
Cameron International, formerly known as Cooper Industries, voluntarily installed a security fence around the Site and removed and disposed of 83 filled drums, 460 empty drums and 45 cubic yards of soil	1983
EPA listed the Site on the Superfund program's National Priorities List (NPL)	September 1, 1983
Cameron International conducted a remedial investigation (RI) under a Consent Order and Agreement with PADEP, but did not comply with all required conditions	September 23, 1983, to about June 1984
EPA took over and completed site investigations	October 22, 1987
EPA completed the Site's RI, Feasibility Study (FS) and Remedial Action reports	August 1989
EPA issued 1990 ROD for OU1, OU3 and OU4.	September 28, 1990
EPA issued a Unilateral Administrative Order (UAO) to Cameron International to perform the remedial design/remedial action (RD)/RA for the 1990 ROD	March 29, 1991

[1] Up until 2014, some site documents, including samplings plans and FYRs, incorrectly referenced the Site OUs (e.g., OU4 was incorrectly referred to as OU2 and the 1997 ROD was incorrectly referred to as the OU2 ROD). This FYR uses the corrected OU references.

Event	Date
EPA entered into an Administrative Order on Consent with Cameron International to conduct a focused RI, FS and remedial action for the 1997 ROD	October 9, 1992
Cameron International extended a public water line to residents near the Site	1994
on-site construction began for landfill cap	August 5, 1995
Cameron International began operating the leachate system	1996
construction completed	Summer 1997
EPA issued 1997 ROD to address all site groundwater and wetlands	December 30, 1997
EPA's first ESD modified the measurement of the inward hydraulic gradient and some institutional controls EPA's second ESD modified several groundwater monitoring well locations	August 24, 1998
EPA signed the Site's Preliminary Closeout Report	September 21, 1998
Cameron International began sampling for monitored natural attenuation (1997 ROD)	Spring 1999
EPA completed the Site's first FYR	July 28, 2000
Cameron International shut down the groundwater treatment system in accordance with an Extraction Well Rebound Test approved by EPA	February 2004
EPA's third ESD modified cleanup standards for the groundwater portion of the selected remedy	June 29, 2004
Cameron International completed rebound testing	September 2005
EPA completed the Site's second FYR	September 8, 2005
Cameron International submitted an optimization project plan	June 30, 2009
Cameron International revised the optimization project plan in accordance with EPA comments	September 2009
Cameron International submitted an optimization project plan memorandum to present preliminary activity results and proposed modifications	January 4, 2010
Cameron International initiated the optimization project plan	March 25, 2010
Cameron International drilled a new well in the Clarion Aquifer and sampled to assess vapor intrusion	April 2010
EPA completed the Site's third FYR	September 9, 2010
Cameron International completed the optimization project	February 1, 2012

3.0 Background

3.1 Physical Characteristics

The Site is located in Pine Township, Mercer County, Pennsylvania, less than 1 mile east of Grove City (Figure 1). It includes a 12-acre capped landfill which was a former strip mine open pit (Figure 2). Woodlands are north of the Site. Farmland is present to the east and southeast across the East Pine Street Extension. A large shallow pond is located just west of the Site; it is a federally protected wetland. There is another wetland south of the Site, on both sides of the East Pine Street Extension.

The area immediately around the Site is sparsely populated. Most of the residential homes near the Site are located along Enterprise Road, which is about a quarter-mile north of the Site, or to the east along Diamond Road.

The remedy divides the groundwater units into two separate groups. The Clarion Aquifer and mine void system will be treated as a single unit and the Homewood, Connequenessing and Burgoon Aquifers are treated as another separate unit.

The Clarion Formation is the uppermost continuous bedrock unit in the site area. It is characterized by interbedded sandstone, shale and coal units. The lowermost unit of the Clarion Formation is the Brookville Coal, which is generally several feet thick and is economically minable. The coal was strip mined at the Site and deep mined in adjacent areas. Overlying the Brookville Coal is a 20 to 50 foot thick series of sandstone and sandy shale, the Clarion Sandstone. The Clarion Sandstone is absent west of the Site and strip mining activities removed this layer from most of the Site in the vicinity of the cap.

The aquifers beneath the Site, exclusive of unconsolidated materials, are the lower sandstone and coal of the Clarion Formation, the Homewood Sandstone, the upper and lower Connoquenessing Sandstone, and the Burgoon Sandstone. The Clarion Aquifer is the uppermost aquifer. The Brookville Coal mine void and Clarion Sandstone belong to the same aquifer, as no substantial aquitard separates these two permeable units. Groundwater flow is believed to be to the east-northeast.

3.2 Land and Resource Use

From the late 1950s to 1978, a landfill operated in an abandoned coal strip mine on site. The property includes an abandoned strip mine, mine spoils and highwall areas. Contaminated spent foundry sand and other industrial wastes were disposed of at the Site. In 1978, the Commonwealth closed the landfill for accepting industrial wastes without a permit. There are no current or projected land uses for the Site. An environmental restriction does not allow the capped landfill to be used for residential, commercial or industrial purposes.

In the past, homes near the Site used private wells in the Clarion Aquifer or mine voids for potable and non-potable water supplies. In 1994, after sampling found high levels of contaminants in a residential well, Cameron International connected residents living within 150 feet of the water line to the system.

3.3 History of Contamination

Strip mining took place at the Site during the 1940s. After the mine was abandoned, the strip mine pit filled with groundwater. In the late 1950s, a landfill accepting industrial wastes and fill material began operating at the privately owned property. Wastes were disposed of in the pit and gradually displaced the water. Approximately 233,000 cubic yards of fill material was disposed of at the former landfill.

Materials disposed of at the Site included spent foundry sand, the primary waste, infilco sludge (settled sludge collected from hydroblast equipment), spent carbide (a byproduct consisting of a lime and water slurry), waste acids from plating and cleaning tanks, and spent Sunoco® spirits and solvents. Miscellaneous debris, including scrap steel, wood and metal chips, was taken to the

former disposal area. Solid waste and manufacturing refuse were present on the surface of the Site and within the fill material.

Wastes disposed of at the Site contained polychlorinated biphenyls (PCBs) (primarily Aroclor 1254), polynuclear aromatic hydrocarbons (PAHs), metals (including lead and chromium) and several volatile organic compounds (VOCs). Principal threats in the fill material included PCBs, PAHs, heavy metals and chlorinated hydrocarbons and VOCs in groundwater.

In April 1978, PADEP, formerly the Pennsylvania Department of Environmental Resources, cited the owner for operating a non-permitted landfill and ordered the landfill's closure. To cover the wastes, foundry sand disposal was allowed to continue for a short time.

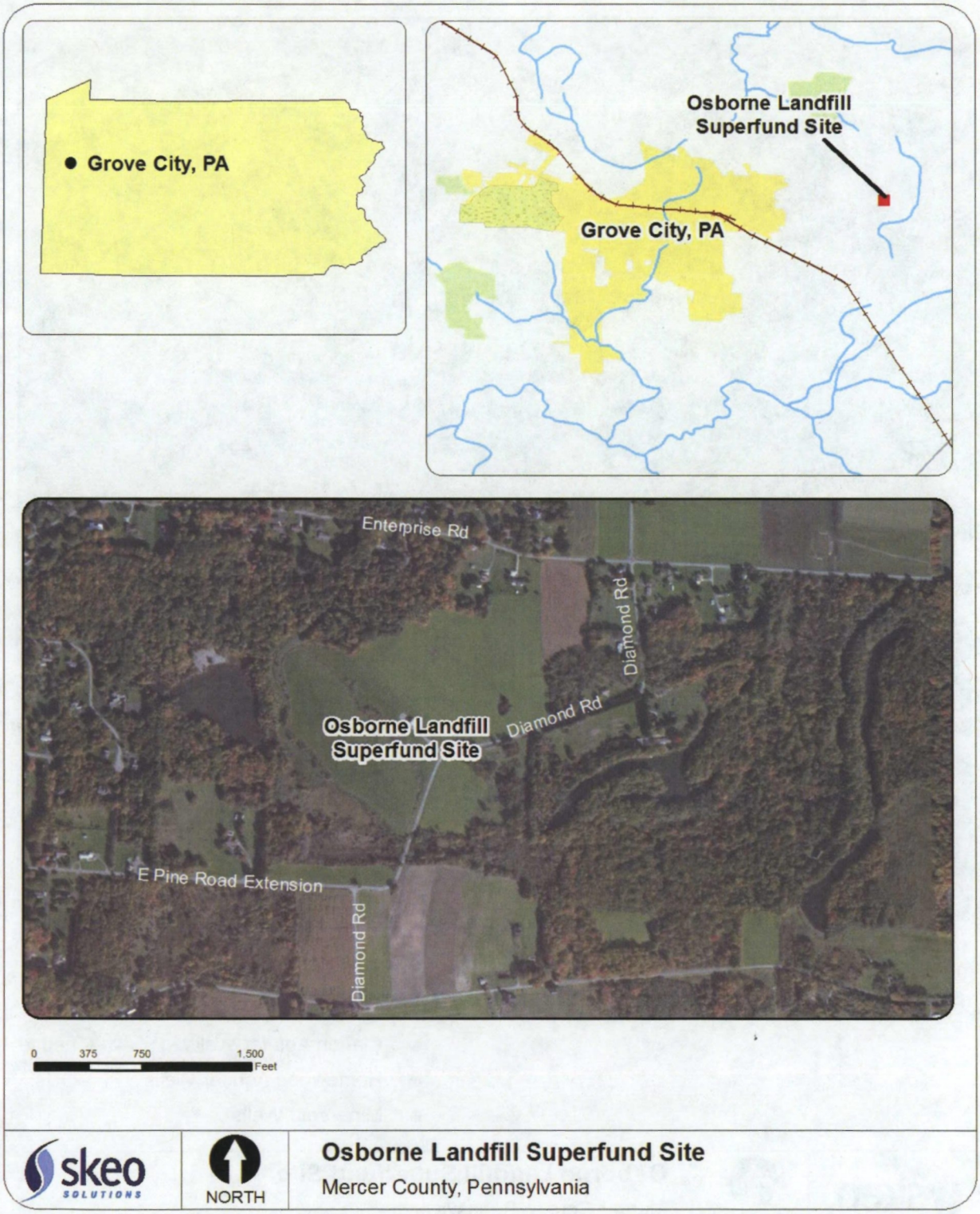
EPA identified Cooper Industries, now Cameron International, as a PRP for the Site. General Electric Corporation, also identified as a PRP, disposed of materials at the Site containing hazardous substances. General Electric Corporation contributed a cash settlement to reimburse EPA for past costs.

3.4 Initial Response

PADEP found high concentrations of oils and phenyls in the pond water during the non-permitted landfill's closure in 1978. In the early 1980s, EPA and PADEP investigations found over 600 drums. Hundreds of the drums were present on the surface of the Site; some drums were leaking. In a January 1983 letter, EPA notified Cameron International and other PRPs to take immediate actions at the Site. Cameron International fenced the Site and posted warnings to restrict access. A total of 603 drums were found on Site and removed. There were 460 empty and crushed drums, 83 drums containing liquids and 60 bulk solid drums. In September 1983, EPA finalized the Site's listing on the Superfund program's National Priorities List (NPL).

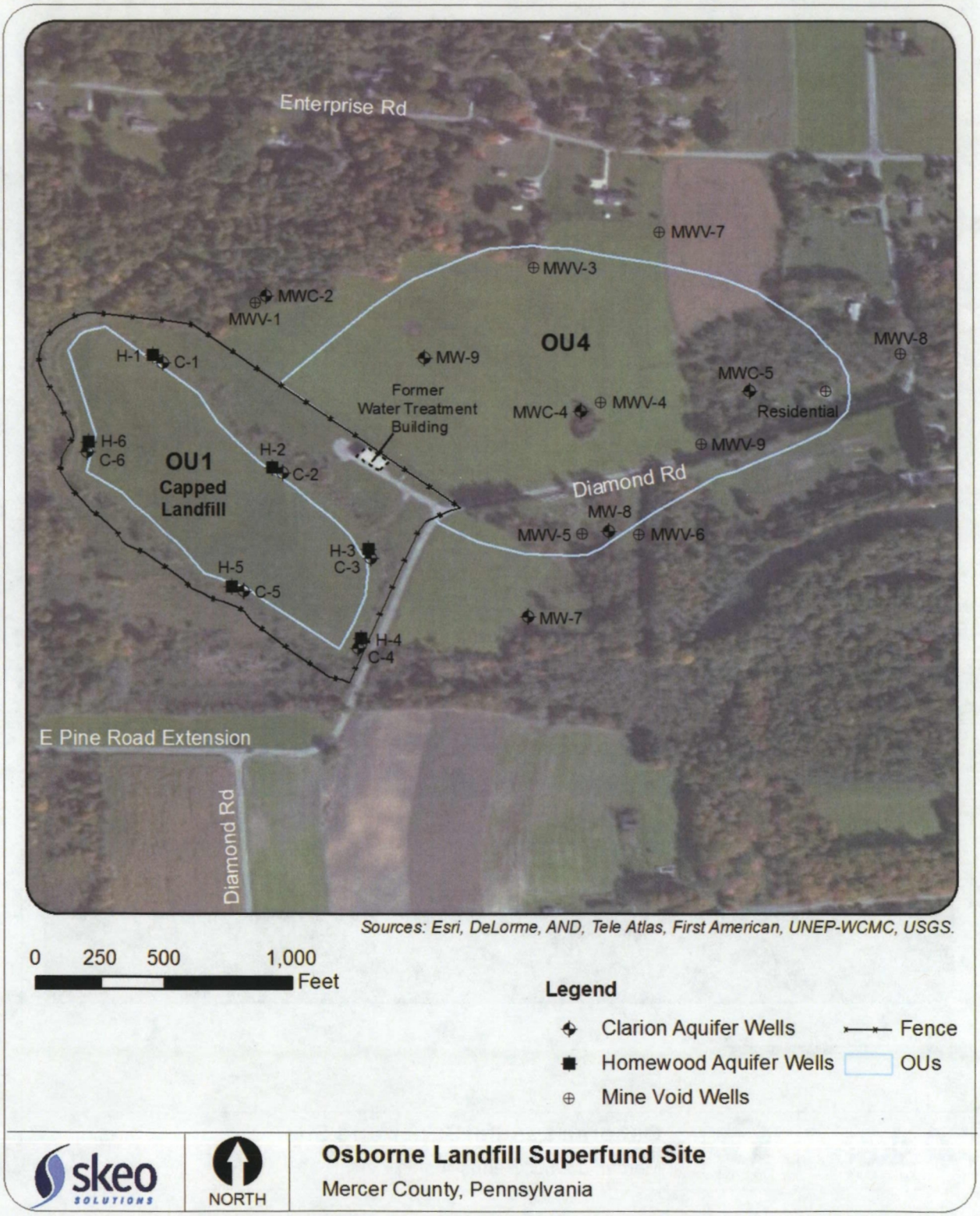
Cameron International entered into a Consent Order and Agreement with PADEP on September 23, 1983, to conduct a remedial investigation (RI) and feasibility study (FS) at the Site. In 1985, EPA also conducted an investigation of the disposal area to identify contaminants in the waste. At the request of the Commonwealth, EPA notified Cameron International, in a letter dated October 22, 1987, that EPA had assumed the lead at the Site and could conduct the RI/FS using Superfund monies. The RI/FS, completed by EPA from 1988 to 1989, assessed the nature and extent of contamination in all media.

Figure 1: Site Location Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

Figure 2: Detailed Site Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

3.5 Basis for Taking Action

The RI verified the presence of PCBs, PAHs, heavy metals and chlorinated hydrocarbons above EPA remedial action levels in the fill material at the Site. Vinyl chloride was also found in groundwater at concentrations greater than maximum contaminant levels (MCLs) allowed by the federal Safe Drinking Water Act.

The Site's Human Health Risk Assessment identified risks above EPA's acceptable risk range through exposure routes of direct contact with contaminated fill material and residential use of contaminated groundwater, including ingestion and showering.

4.0 Remedial Actions

In accordance with CERCLA and the NCP, the overriding goals for any remedial action are protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs). A number of remedial alternatives were considered for the Site, and final selection was made based on an evaluation of each alternative against nine evaluation criteria that are specified in Section 300.430(e)(9)(iii) of the NCP.

4.1 Remedy Selection

EPA issued two Records of Decision in 1990 and 1997 to select the remedy. EPA also issued two Explanation of Significant Differences (ESDs) one ESD in 1998 to modify the institutional controls and groundwater monitoring program and a second ESD in 2004 to clarify the cleanup goals for groundwater

<u>1990 Record of Decision (ROD)</u>

EPA selected the Site's primary and contingency remedies for solid waste fill material and the on-site water table and the primary remedy for the Clarion Aquifer in the September 1990 ROD. The 1990 ROD did not include remedial action objectives (RAOs) but did list the objectives of the primary and contingency remedies for each area:

- Solid waste fill material – OU1
    - Remove the threat to groundwater from leaching of the fill material.
    - Prevent dermal contact with PCB-contaminated foundry sand.
    - Eliminate overland transport of foundry sand to the wetland area.
- On-site water table – OU3
    - Eliminate a source of on-site water table contamination.
    - Eliminate potential migration of groundwater contamination.
- Clarion Aquifer – OU4
    - Reduce human health risks associated with future use of groundwater.

Major components of the remedy for the fill material included:

Primary Remedy – landfill cap, slurry wall, and groundwater treatment (OU1)

- Control system for the fill, including a clay cap, on-site drainage and erosion controls.
- A slurry wall around the perimeter of the fill area.
- Extraction wells, treatment of extracted water and injection into the on-site mine pool.
- Institutional controls and groundwater monitoring.
- Performance standards identified in the ROD included verification that a negative pressure be maintained within the fill area with respect to the adjacent aquifers and that any future subsidence will not impact the integrity of the slurry wall.

Contingency Remedy – waste removal and placement in RCRA landfill if OU1 Performance Standards were not met (OU3 not implemented)

- Resource Conservation and Recovery Act subtitle C landfill cap.
- Excavation of 233,000 cubic yards of fill and placement of the material in the on-site landfill.
- Regrading and revegetation of the site area.
- Institutional controls.

Major components of the remedy for the on-site water table included:

- No additional action as long as the slurry wall's implementation is effective.

Clarion Aquifer Remedy – originally groundwater treatment and revised to monitored natural attenuation (OU4)

Major components of the remedy for the Clarion Aquifer in the 1990 ROD included:

- Construction of extraction wells.
- Groundwater pumping and air stripping for volatile organic hydrocarbons.
- Injection of treated groundwater on site into the mine pool.
- Groundwater monitoring.

The Clarion Aquifer remedy was modified to monitored natural attenuation in the 1997 ROD.

<u>1997 ROD</u>

EPA selected the Site's remedy for all groundwater and wetland sediments in the December 1997 ROD. The 1997 ROD did not explicitly include RAOs; instead it stated that the remedy's primary objective was to reduce or eliminate potential risks to human health or the environment from exposure to contaminants associated with wetland sediments and all groundwater at the Site.

Major components of the 1997 ROD remedy included:

- No action for the southwest wetland sediments (OU2).
- Natural attenuation of the Clarion Formation with continued VOC groundwater monitoring (OU4). Periodic residential well sampling for VOCs.
- Semi-annual VOC monitoring of the Homewood, Connoquenessing and Burgoon Aquifers for three years to verify contamination was not migrating toward public water system wells (OU5).

Performance standards for monitored natural attenuation were set as MCLs and non-zero maximum contaminant level goals for vinyl chloride and OU1 VOCs.

1998 ESD

The August 1998 Explanation of Significant Differences (ESD):

- eliminated most of the institutional controls called for by the 1990 ROD and clarified the scope of the remaining institutional controls;
- clarified that the Commonwealth of Pennsylvania will enforce the prohibition on mineral removal near the Site;
- eliminated the requirement to maintain an inward gradient for Homewood Aquifer performance wells;
- revised compliance standards from the method detection limits to practical quantitation levels for OU1 groundwater and leachate; and
- updated the list of wells to be monitored. Two wells were abandoned because their location interfered with construction of the slurry wall and two new wells were installed to perform the same functions as the closed wells.

2004 ESD

The June 2004 ESD updated the performance standards for the groundwater from background levels to MCLs and Pennsylvania Land Recycling Program, Act 2, Chapter 250 Medium Specific Concentrations for Inorganic Regulated Substances in Groundwater (Table 3).

Table 3: 2004 ESD Cleanup Goals for Groundwater

Groundwater COC	Cleanup Goal (micrograms per liter, µg/L) (MCLs)
Arsenic	50[a]
Beryllium	4
Benzene	5
Benzo(a)pyrene	0.2
Chromium	100
Cis-1,2-dichloroethylene	70
Nickel	100
Lead	5
PCBs	0.5
Trichloroethene (TCE)	5
Vinyl Chloride	2

Notes:

a. ESD says "Until January 22, 2006, then scheduled to change to 10 µg/L."

4.2 Remedy Implementation

Slurry Wall Installation and Groundwater Pumping and Treatment

Remedial design and remedial action work was performed under a Unilateral Administrative Order (UAO) signed in March 1991. On-site construction began in August 1995 and was completed in July 1998. Contractors installed a slurry wall around the perimeter of the fill area

and bulkheaded mines, completely surrounding the strip pit and waste. The slurry was keyed into the clay layer and sandstone beneath the deep mine. A multilayered cap installed over the fill area tied into the slurry wall to reduce infiltration. Contractors built drainage channels around the cap to collect stormwater runoff, which is discharged to a stream adjacent to the landfill. Six well nests were installed to measure the pressure in the fill, the Clarion Formation, and the Homewood Formation. These wells are also sampled for contaminants.

Construction of the leachate treatment systems took place at the same time as installation of the slurry wall and cap. The leachate treatment system operated from 1996 until 2004 and treated the water table within the slurry wall. Treatment consisted of green sand filtration, permanganate addition and air stripping. Treated water was injected into a mine void in the Clarion aquifer. During operation, the extraction wells removed about 10 to 20 gallons of contaminated groundwater per minute. In 2003, the PRP prepared an extraction well rebound test and submitted a proposal to EPA to shut down the leachate treatment system. The system was shut down in February 2004; the rebound test followed. Samples from wells surrounding the Site demonstrated that the containment system is working and site-related contaminants are not migrating off site. Based on these findings, the leachate extraction and treatment system has remained turned off. Cap inspections and well sampling in OU1 is required to monitor the effectiveness of the remedy since waste remains in place.

The containment system is designed to prevent the migration of contamination into the aquifers that supply drinking water to area residents. A public water line serves residences near the Site. The water line, installed in 1994, extends along Enterprise Road (north of the Site) to Diamond Road (east of the Site) and south and west along Diamond Road. Pine Township Ordinance No 5 1982 Rules and Regulations Governing the Furnishing of Water Services requires all property owners to connect to the public water supply unless they are more than 150 feet from the service line. Only one contaminated residential well was identified during investigations; this residence is connected to the public water supply.

In June 1999, Cameron International purchased the 22 acres of site property containing the 12-acre landfill. The PRP has complied with institutional control requirements, which include prohibitions on the use or disturbance of groundwater until cleanup levels are achieved and prohibitions on new wells within the landfill property. A fence around the former landfill area restricts access and a deed restriction restricts the use of the property (no residential, commercial or industrial use; no use or activity that interferes with the effectiveness of the environmental response activities undertaken at the Site; no excavation activities). See section 6.3 for additional institutional control information. Cameron International also replaced several acres of wetlands damaged during cap installation.

Site Groundwater and the Wetlands Southwest of the Site

During the design phase for the 1990 ROD requirements, it became apparent that the Clarion Aquifer was fractured and a well placed in the aquifer would preferentially draw mine void water upward. As a result, each well would have a very limited lateral capture zone and numerous extraction wells would be needed to implement the remedy. It also was determined that an extraction well would likely draw contaminated mine water into the Clarion Formation, which is

used as a drinking water aquifer. Therefore, as documented in the 1997 ROD, EPA modified the remedy for the Clarion Formation (OU4) to monitored natural attenuation (see Section 6.4 for groundwater sampling results). The remedy for OU4 states monitoring will continue for five years after MCLs are reached.

Due to persistent low levels of vinyl chloride in a residential well, Cameron International proposed an optimization plan for the mine void wells. The plan included extraction and treatment of groundwater from the mine void north and east of the Site. Cameron International improved and restarted the treatment plant and installed an extraction system into this area from March 2010 to February 2012. During system operation, approximately 56.1 million gallons of water were extracted, treated and re-injected into the mine void. Vinyl chloride concentrations were reduced at all monitoring points, however, concentrations in MWV-5 continue to fluctuate above the MCL (Table 4). Subsequent to ceasing groundwater extraction, the vinyl chloride level at MWV-5 rebounded to 5.7 µg/L in December 2012. Historically, concentrations in this well fluctuate seasonally and since shutdown of the optimization project, vinyl chloride concentrations were below the 2.0 µg/L MCL in five out of the eight samples collected. Data is discussed in more detail in section 6.4, Data Review, of this report.

Table 4: Vinyl Chloride Concentrations before and after Optimization Study

Well	December 2009	June 2012
	Site Wells (µg/L)	
MWV-1	<0.5	<0.5
MWV-3	**3**	1
MWV-4	1.5	0.96
MWV-5	**3.6**	2.0
MWV-6	<0.5	<0.5
MWV-7	<0.5	<0.5
MWV-8	<0.5	<0.5
MWV-9	**3.5**	1.3
Res. Well A	**7.8**	**3.0**
C-2	**7.5**	**2.1**
H-2	**6.5**	<0.5

In 2002, three years of monitoring was completed in the Homewood, Connoquenessing and Burgoon Aquifers (OU5) that verified contamination was not migrating from the Site toward community wells.

4.3 Operation and Maintenance (O&M)

The February 2014 Groundwater Sampling Plan describes current groundwater sampling activities at the Site. The updated sampling plan requires annual sampling of monitoring wells C-1 through C-6 and H-1 through H-6, and semi-annual sampling of monitoring well C-2.

Annual sampling is required for monitoring wells MWV-1, MWV-3, MWV-4, MWV-5, MWV-6, MWV-7, MWV-8, MWV-9, MWC-2, MWC-4, MWC-5, MW-7, MW-8, MW-9 and the residential well (when accessible). MWV-5 and MWC-5 will be sampled semi-annually.

Current O&M costs are shown in Table 5. Costs include the optimization project in 2009-2013 with the majority of the work conducted in 2010 and 2011.

Table 5: Annual O&M Costs

Year	Total Cost (rounded to the nearest $1,000)
2009	$42,000
2010	$279,000
2011	$138,000
2012	$53,000
2013	$50,000
2014	$60,000

5.0 Progress Since the Last Five-Year Review

The protectiveness statements from the 2010 FYR for the Site stated:

OU1
Based on currently available data the remedies constructed for OU1 appear to be protective of human health and the environment. The constructed remedies for OU1 include landfill leachate collection system, the landfill cap and slurry wall, groundwater monitoring and the institutional controls and are functioning as intended. The remedies prevent contamination from leaving the Site, minimize migration of contaminants to groundwater and surface water and prevent direct contact with or ingestion of contaminants. ICs [institutional controls] in place for OU1 include all necessary ICs for the entire site.

OU4
Based on currently available data, the remedies in place for OU4 appear to be protective of human health and the environment. Natural attenuation with groundwater monitoring of VOCs was selected as the remedy. Additionally institutional controls in place as part of OU1 prevent the use of the contaminated groundwater as a drinking water supply. Recent analytical results indicate that performance standards have been achieved for all but three mine void wells and one residential well and an optimization plan has been approved by the EPA and implemented by the PRP to speed the natural attenuation of contaminants at the Site. A vapor intrusion investigation was conducted near the residence of concern and vapor intrusion was ruled out as a concern for the Site given the current conditions.

Overall Protectiveness
Based on currently available data the remedies constructed for the Site remain protective of human health and the environment in the short term and long term. The remedies are functioning as intended and no exposure pathways appear to exist.

The 2010 FYR included three issues and recommendations. This FYR summarizes each recommendation and its current status below (Table 6).

Table 6: Progress on Recommendations from the 2010 FYR

Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Simple modifications should be made to the drainage swale to facilitate moving the water from the site cap and swale to the mitigation wetland and specifically the area of the intended wetland that is not adequately saturated. Mowing of the area adjacent to the stream that runs along eastern/northeastern side of the Site (adjacent to the treatment building) should be modified to allow more of a buffer. Mowing should not be performed within ten feet of the top of the slope along this drainage feature.	Cameron International	9/2011	Inspections identified hydrology is sufficient to support wetland vegetation species. Considered and not performed.	11/11/14
Monitoring of VOCs in the groundwater in OU2 will continue five years after the performance standards are achieved. The PRP has implemented an optimization study to speed the natural attenuation of vinyl chloride in these wells. EPA will continue to evaluate the data and recommend any changes based on the optimization plan for OU2 groundwater. If the optimization plan is successful EPA will issue a decision document.	Cameron International/EPA	9/2015	Based on the progress of the optimization effort, this was considered and EPA did not issue a decision document.	2/27/13
These areas of settling should be monitored to determine whether there is active settling that could affect the cap. The soggy areas should be monitored over the coming months to determine if the problem is transient or represents a long-term issue that needs to be addressed.	Cameron International	Ongoing and as part of site O&M activities	Multiple site inspections did not identify cap settling. Completed. Problem appeared to be transient.	10/21/14

6.0 Five-Year Review Process

6.1 Administrative Components

EPA Region 3 initiated the FYR in September 2014 and scheduled its completion for September 2015. EPA remedial project manager (RPM) Nick Tymchenko led the EPA site review team,

which also included EPA site attorney Jefferie Garcia, EPA community involvement coordinator (CIC) Carrie Dietzel, EPA hydrogeologist Mindi Snoparsky, EPA toxicologist Jennifer Hubbard, and contractor support provided to EPA by Skeo Solutions. In September 2014, EPA held a scoping call with the review team to discuss the Site and items of interest as they related to the protectiveness of the remedy currently in place. The review schedule established consisted of the following activities:

- Community notification.
- Document review.
- Data collection and review.
- Site inspection.
- Local interviews.
- FYR Report development and review.

6.2 Community Involvement

In April 2015, EPA published a public notice in the *Allied News* newspaper announcing the commencement of the FYR process for the Site, providing contact information for Carrie Deitzel and inviting community participation. The press notice is available in Appendix B. No one contacted EPA as a result of the advertisement.

EPA will make the final FYR Report available to the public. EPA will place copies of the document in the designated site repository: Grove City Library, 125 West Main Street, Grove City, PA 16127.

6.3 Document Review

This FYR included a review of relevant, site-related documents, including the RODs, ESDs, annual reports and recent monitoring data. Appendix A presents a complete list of the documents reviewed.

ARARs Review

CERCLA Section 121(d)(1) requires that Superfund remedial actions attain "a degree of cleanup of hazardous substance, pollutants, and contaminants released into the environment and of control of further release at a minimum which assures protection of human health and the environment." The remedial action must achieve a level of cleanup that at least attains those requirements that are legally applicable or relevant and appropriate.

Groundwater ARARs
According to the 2004 ESD, cleanup goals for groundwater Contaminants of Concern (COCs) in the 1990 ROD were based on federal MCLs and state standards established under the Pennsylvania Land Recycling Program, Act 2, Chapter 250 Medium Specific Concentrations for Inorganic Regulated Substances in Groundwater. The 2004 ESD revised the performance standards to MCLs. Since then, the only change in ARARs is that arsenic is more stringent (Table 7), as anticipated in the ESD.

Table 7: ARAR Review for Groundwater COCs

COCs	2004 ESD ARARs (µg/L)	Current[a] ARARs (µg/L)	ARARs Change
Arsenic	50[b]	10	More stringent
Beryllium	4	4	None
Benzene	5	5	None
Benzo(a)pyrene	0.2	0.2	None
Chromium	100	100	None
Cis-1,2-dichloroethylene	70	70	None
Nickel	100	100[c]	None
Lead	5	5[c]	None
PCBs	0.5	0.5	None
TCE	5	5	None
Vinyl chloride	2	2	None

Notes:

a. National Primary Drinking Water Regulations: http://water.epa.gov/drink/contaminants/ (accessed 10/8/14).

b. The 2004 ESD identifies the arsenic ARAR as being scheduled to change to 10 µg/L in January 2006.

c. Pennsylvania Land Recycling Program, Act 2, Chapter 250 Medium Specific Concentrations for Inorganic Regulated Substances in Groundwater: http://www.pacode.com/secure/data/025/chapter250/chap250toc.html (accessed 10/8/14).

Institutional Control Review

On October 20, 2014, contractor staff conducted research at the Mercer County Public Records Office and found the deed information pertaining to the Site listed in Table 8.

Table 8: Deed Documents from Mercer County Public Records Office

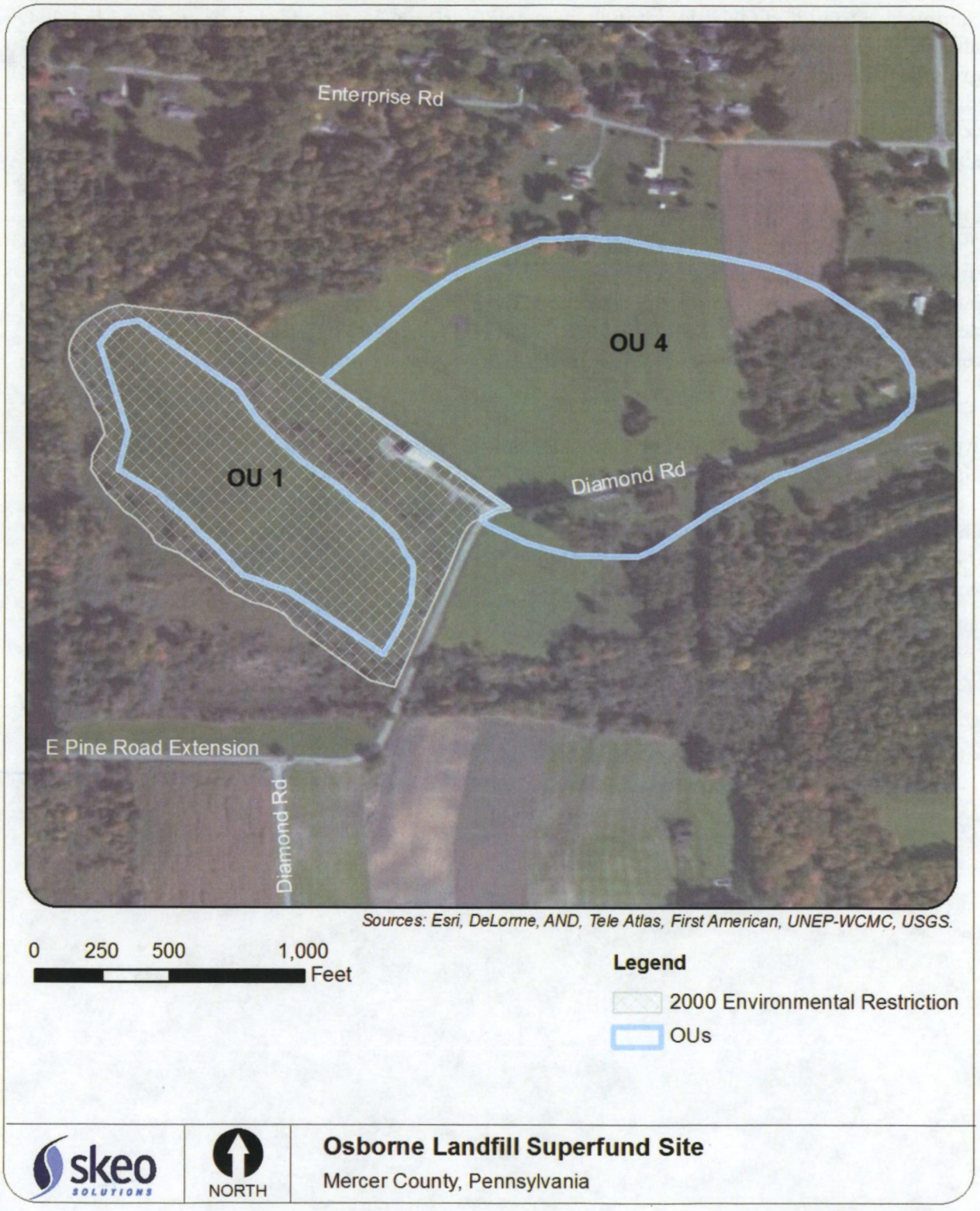
Date	Type of Document	Description	Instrument Number	Reel/Frame
3/21/2000	Environmental Restriction	Restrict the use of the approximately 12-acre former landfill area, including excavation (except installation of monitoring wells).	2000-00005450	322 / 1951

Table 9 lists the institutional controls associated with areas of interest at the Site. Figure 3 shows the location of institutional controls.

Table 9: Institutional Control (IC) Summary Table

Area of Interest – OU1 and OU4					
Media	**ICs Needed**	**ICs Called for in the Decision Documents**	**IC Objective**	**Instrument in Place**	**Notes**
Capped Landfill	Yes	Yes	Restrict use of capped former landfill area.	Environmental Restriction filed with Mercer County.	Restricts the use of property and excavation activities.
Ground water	Yes	Yes	Restrict use of water under cap; Restrict use of drinking water near Site; Restrict drilling within vicinity of Site.	Environmental Restriction filed with the County; The Pine Township Ordinance No 5 1982 Rules and Regulations Governing the Furnishing of Water Services; Commonwealth of Pennsylvania	Prohibitions on use or disturbance of groundwater until cleanup levels are achieved and prohibitions on new wells within property containing the landfill; requires all property owners to connect to public water supply unless they are more than 150 feet from service line; restricts mining or mineral removal within half mile of Site.

Figure 3: Institutional Control Base Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

6.4 Data Review

Sampling activities at OU1 do not include metals; performance standards were reached in 2004 and the groundwater pump-and-treat system was shut down with EPA's approval. Current groundwater monitoring shows that contaminants have reached MCLs in most wells, and the slurry wall has is preventing COCs from migrating into groundwater. Vinyl chloride is the only contaminant that remains above MCLs. Vinyl chloride concentrations from 2009 to 2014 are shown in Figure 5.

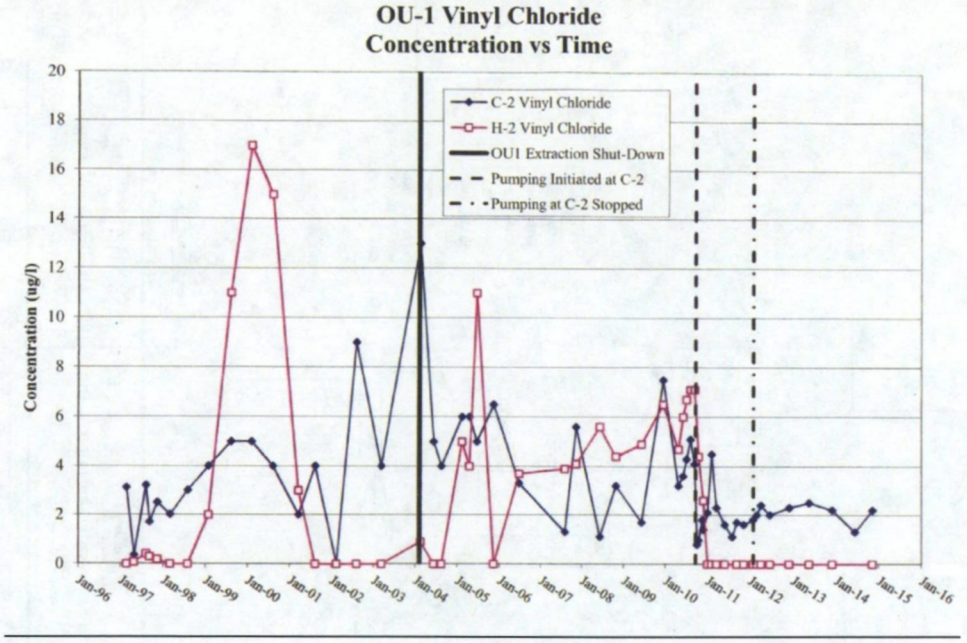
OU1 – Capped Landfill

Quarterly monitoring of the 12 C and H performance wells started in 1997, when the wells were installed. Monitoring was reduced to semi-annual after one year in accordance with the 1990 ROD. Concentrations of vinyl chloride above the 2 micrograms per liter (µg/L) MCL have been detected outside the slurry wall in wells C-2 and H-2 (Figures 4 and 5). During the 1992 remedial design investigation, residual bedrock impacts were documented as the source of these vinyl chloride exceedances.

Appendix F shows results from groundwater sampling in the C and H performance wells from November 2014. All values are below the 2 µg/L MCL except for C-2 (2.2 µg/L). Concentrations in this well over the last five years were the highest in December 2009 (7.5 µg/L) and declined to levels close to the MCL (1.9 µg/L) in November 2010. Since November 2010, the concentrations have fluctuated around the MCL. The most recent concentration of 2.2 µg/L was detected in November 2014.

Groundwater extraction from well C-2 was included in the optimization project's groundwater extraction scheme.

Figure 4: Vinyl Chloride in C-2 and H-2[2,3,4]

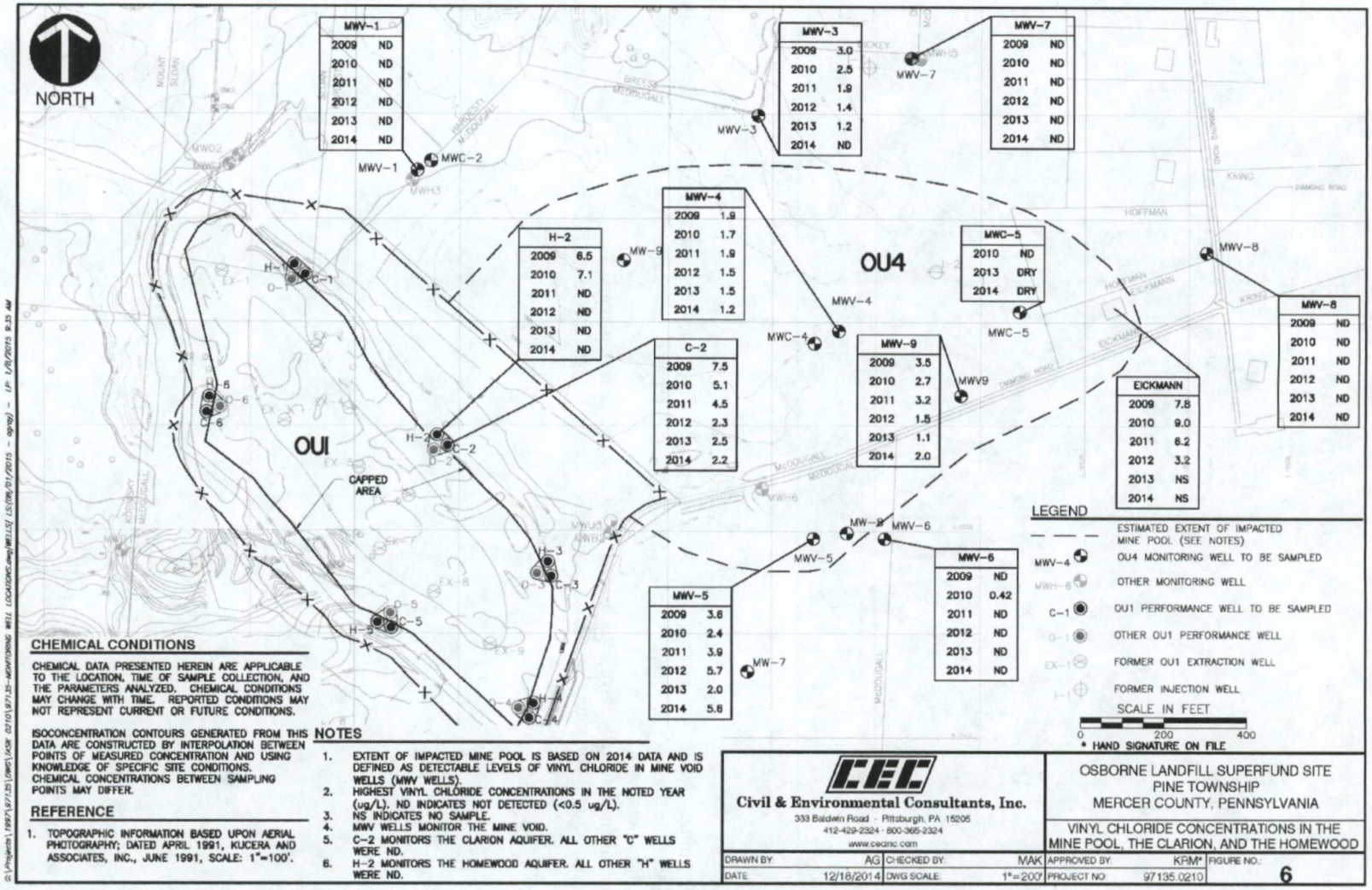


[2] From: 2014 Annual Groundwater Monitoring Report, Operable Unit 1 and Operable Unit 4, Osborne Landfill Superfund Site, Pine Township, Mercer County, Pennsylvania. Prepared for: Cameron by Civil & Environmental Consultants, Inc. January 8, 2015.

[3] Vinyl chloride was detected above MCLs only in C-2 and H-2 in recent years.

[4] Cameron International conducted an optimization project from March 2010 until February 2012 and extracted water from well C-2 during this time.

Figure 5: Vinyl Chloride Concentrations, 2009 to 2014[5]



[5] From: 2014 Annual Groundwater Monitoring Report, Operable Unit 1 and Operable Unit 4, Osborne Landfill Superfund Site, Pine Township, Mercer County, Pennsylvania. Prepared for: Cameron by Civil & Environmental Consultants, Inc. January 8, 2015.

OU4 and Residential Wells

Cameron International conducted an optimization project from March 2010 until February 2012 to extract groundwater from the mine void, treat the water at the on-site treatment plant, and re-inject the treated water into the mine void. The goal of the project was to accelerate the reduction of the vinyl chloride concentrations detected in the mine void wells.

Since the project's completion in February 2012, vinyl chloride concentrations above the MCL were detected at MWV-5 (5.7 µg/L in December 2012 and 5.6 µg/L in November 2014) and at the Residential Well A (2.5 µg/L in March 2015). Detectable concentrations of vinyl chloride below the MCL or non-detect occurred at MWV-3 (range 0.59-1.4 µg/L), MWV-4 (0.96-1.5 µg/L), MWV-6, MWV-7 and MWV-8 (non-detect), and MWV-9 (non-detect, 2.0 µg/L). Appendix F shows results from groundwater sampling in OU4 in November 2014 and residential sampling in November 2013.

Groundwater Sampling

The 1997 ROD called for residential well sampling five years after MCLs were reached, or residential well sampling could cease if residents were connected to the public water supply. Although residential well sampling ceased in 2013, Cameron International sampled residential wells beyond the 1997 ROD requirements.

The February 2014 Groundwater Sampling Plan describes current, reduced groundwater sampling activities at the Site. For OU1, the updated sampling plan requires annual sampling of monitoring wells C-1 through C-6 and H-1 through H-6, and semi-annual sampling of monitoring well C-2.

For OU4, annual sampling is required for monitoring wells MWV-1, MWV-3, MWV-4, MWV-5, MWV-6, MWV-7, MWV-8, MWV-9, MWC-2, MWC-4, MWC-5, MW-7, MW-8, MW-9 and at Residential Well A (when accessible). MWV-5 and MWC-5 will be sampled semi-annually.

6.5 Site Inspection

The site inspection took place on October 21, 2014. The site inspection checklist and photographs are in Appendix D and E, respectively. Site inspection participants met in the former water treatment building on site. The building is in good condition. Previous issues were discussed, including wetland mitigation, lack of water observed during the previous FYR, continued concentrations of vinyl chloride and the optimization study, and settling and sogginess observed on the cap. Site inspection participants included:

Carrie Deitzel, EPA CIC
Mary King, Civil & Environmental Consultants
Dan Maltese, Civil & Environmental Consultants
Ken Miller, Civil & Environmental Consultants
John Morettini, PADEP
Kathy Patnode, Fish and Wildlife Service
Mindi Snoparsky, EPA Region 3 Hydrologist

Nick Tymchenko, EPA RPM
Kirby Webster, Skeo Solutions
Richard Weinzierl, Cameron International
Johnny Zimmerman-Ward, Skeo Solutions

Participants observed the landfill cap, wells and the perimeter fence. All appeared to be in good working order. Gates on the perimeter fence were all locked. No evidence of vandalism was observed. Mowing occurs along the fence and nothing is growing up the fence. There are clear signs marking the Site. The road into the water treatment facility is well maintained. No areas of ponding were noted on the cap. There was a small section of the road that was retaining water, maintenance of the road can address this so that the water drains to the swale surrounding the cap.

Wetland mitigation areas adjacent to the western boundary of the Site were more closely observed. The size of the wetland mitigation area was difficult to identify due to the established growth. A more clear delineation of the size would allow for determination of the adequacy of the area's size. Participants discussed possible reasons for changes in water availability to the mitigation area. No changes have been made to the cap, although new construction above the Site could be redirecting runoff away from the area. There was also discussion of redirecting the drainage swale around the cap to the wetlands as a possible fix for the lack of water currently draining in the wetland mitigation area.

Vapor intrusion has not been evaluated for one property. Opportunities for gaining access to the property for sampling were discussed.

Skeo Solutions personnel visited the site repository at the Grove City Library and confirmed original documents from the Site are available at the repository.

6.6 Interviews

The FYR process included interviews with parties affected by the Site, including the current landowners and regulatory agencies involved in site activities or aware of the Site. The purpose was to document the perceived status of the Site and any perceived problems or successes with the phases of the remedy implemented to date. The interviews are summarized below. Appendix C provides the complete interviews.

Mary King: Ms. King is the project manager for Civil & Environmental Consultants, Inc., Cameron International's consultant. Ms. King believes that, overall, the remedies implemented at the Site have been successful. The remedies have eliminated or mitigated potential risks to human health and the environment. According to Ms. King, only very low levels of vinyl chloride are present at concentrations exceeding the MCL in the mine void system groundwater outside the limits of the landfill. Following the optimization project, both wells have exhibited downward trends in vinyl chloride concentrations, which suggest achievement of consistent concentrations of vinyl chloride below the MCL may occur in coming years. In addition, the modified remedies limited environmental disturbance and reduced remedial costs and monitoring costs.

John Morettini: Mr. Morettini is PADEP's site representative. PADEP considers the physical maintenance of the exterior plant, fence and site to be above standard, and the recordkeeping at the site to be exceptional. The extended water line, fencing and landfill cap are functioning as designed and eliminating exposure pathways. PADEP is unaware of any complaints or inquiries regarding the Site in the past five years, and unaware of any changes to state laws that might affect the protectiveness of the Site's remedy. The State requires a restriction on mining or mineral removal within a half-mile of the Site and will review each permit on a case-by-case basis.

Joe Holmes and George Elliot: Mr. Holmes and Mr. Elliot are Pine Township Supervisors. Both are somewhat aware of the Site, and not aware of any issues at the Site. They feel that the PRP representative is reliable and contacts them when site information needs to be shared. The only recent issue was a water line break that the fire department responded to and helped pump water out of the building. Neither Mr. Holmes nor Mr. Elliot are aware of any plans for the property, or aware of any activities at the Site that required notification in recent years.

7.0 Technical Assessment

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

The remedial action continues to function as designed. The slurry wall and cap system continue to contain contamination and performance standards for the leachate/ground water treatment system were met in 2004. Groundwater monitoring shows that contaminant concentrations are below MCLs in all but one well, and the slurry wall is containing the solid waste fill and preventing migration of COCs into groundwater.

Natural attenuation continues to reduce COC concentrations. The optimization study (2010-2012) reduced vinyl chloride concentrations, and only four wells have vinyl chloride concentrations at or above the MCL. Continued monitoring of groundwater will ensure that conditions remain the same. Groundwater will continue to be monitored while the landfill contamination remains in place to ensure protectiveness of human health and the environment. Opportunities for optimization have been explored and implemented. There are no early indicators of potential issues and access controls and institutional controls are in place to prevent exposure.

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

Other than arsenic, the groundwater cleanup standards identified in the 2004 ESD are still valid. Although the MCL has changed for arsenic, arsenic concentrations remain below the revised MCL of 10 µg/L based on rebound testing in 2005 and 2006. Sampling activities at OU1 do not include metals because performance standards were reached in 2004 and the groundwater pump-and-treat system was shut down with EPA approval. Toxicity factors have changed since the original risk assessment, as have risk assessment methods; details are shown in Appendix G. Site groundwater is not being consumed and there is no known completed direct exposure pathway.

There is the potential at the Site for vapor intrusion of VOCs into enclosed structures. One residential well has concentrations of vinyl chloride above the MCL. This condition was identified in the previous FYR, however, the owner of the residence denied entry into the residence for the air sampling. Alternatives for evaluating potential vapor intrusion at the residence was discussed and the conclusion was to demonstrate that the groundwater above the mine void was not impacted by vinyl chloride or other VOCs at concentrations above MCLs. The well (MWC-5) was installed in the Clarion formation near the resident's property line and the analytical results in 2010 indicated non-detectable concentrations of vinyl chloride. Since then, the well has been dry during attempts to resample.

The resident also did not allow Cameron International's representative access to the property in 2014 for well sampling but allowed the PRP to sample the unused residential well on March 23, 2015. The resident reiterated their objection for allowing access to the property or structures for sub-slab or indoor air sampling. The results of ground water sampling were 2.5 µg/L for vinyl chloride, continuing the downward trend with 3.2 µg/L and 3.0 µg/L measured in April and June of 2012.

7.3 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 could call into question the protectiveness of the remedy. EPA will re-evaluate the potential for VI if the owner of the residential well with vinyl chloride concentrations above the MCL provides access to Cameron International's representative to perform VI sampling of enclosed structures on the resident's property.

7.4 Technical Assessment Summary

The remedial action continues to function as designed. There are no early indicators of potential issues, and access controls and institutional controls are in place to prevent exposure, and as a result, there are no completed pathways that would result in exposure to human health and the environment. Although the MCL has changed for arsenic, arsenic concentrations remain below the current MCL of 10 µg/L based on testing in 2005 and 2006.

A screening-level vapor intrusion analysis indicates that this exposure pathway does not pose unacceptable risks. As shown in Table G-1, the hypothetical residential and industrial cancer risk associated with the historical maxima for the residential well and mine void wells is well within EPA's risk management range of 1×10^{-6} to 1×10^{-4} and the noncancer HIs are below 1.0 for vinyl chloride, which suggests that the vapor intrusion pathway may not pose a concern. While the screening indicates there is no unacceptable risk air sampling from the residence would provide data to more accurately evaluate vapor intrusion.

8.0 Issues

No issues were identified in this FYR.

9.0 Recommendations and Follow-up Actions

No issues were identified in this FYR that could affect current or future protectiveness. The following items, though not expected to affect protectiveness, warrant additional follow up:

- EPA will reevaluate the potential for vapor intrusion for the home with the residential well with vinyl chloride concentrations above the MCL if the property is sold and a future owner allows access for sampling.
- The perimeter of the cap needs to continue to be maintained to ensure that ponding of water does not interfere with the integrity of the cap.
- When cleanup levels have been attained, metals sampling should be conducted for final comparison with ROD standards and protective levels.
- EPA is requesting copies of the mitigation wetland inspections reports from 1995 to 2000 to confirm that the wetland had performed as designed during the five year monitoring period.

10.0 Protectiveness Statements

The solid waste fill material (OU1) remedy currently protects human health and the environment. Performance standards for the land fill leachate collection and treatment system have been met, the landfill cap and slurry wall is functioning as intended. Continued ground water monitoring verifies integrity of the remedy is being maintained and Institutional Controls (ICs) in place for OU1 include all necessary ICs for the entire Site. ICs prevent disturbance of the cap and require all property owners in the vicinity of the Site to connect to the public water system.

The wetland (OU2) currently protects human health and the environment. The 1997 ROD determined the southwest wetland were not impacted by Site contaminants.
The remedy for the Clarion Formation (OU4) currently protects human health and the environment because performance standards in the Clarion Aquifer have been met and analytical results indicate the performance standards have been achieved for all but two mine void wells and one residential well. Vapor intrusion was ruled out as a concern for the Site given the current conditions.

The remedy for groundwater in the Homewood, Connoquenessing and Burgoon Aquifers (OU5) is protectective because groundwater monitoring, completed in 2002, determined Site related contamination was not migrating to these aquifers.
Because the remedial actions at all OUs are protective, the site is protective of human health and the environment.

11.0 Next Review

The next FYR will be due within five years of the signature/approval date of this FYR.

Appendix A: List of Documents Reviewed

2009 Annual Groundwater Monitoring Report Operable Unit 1. Osborne Landfill Site, Pine Township, Mercer County, Pennsylvania. Prepared for Cameron by Civil & Environmental Consultants, Inc. February 16, 2010.

2009 Annual Groundwater Monitoring Report Operable Unit 4. Osborne Landfill Site, Pine Township, Mercer County, Pennsylvania. Prepared for Cameron by Civil & Environmental Consultants, Inc. February 16, 2010.

2010 Annual Groundwater Monitoring Report Operable Unit 1. Osborne Landfill Site, Pine Township, Mercer County, Pennsylvania. Prepared for Cameron by Civil & Environmental Consultants, Inc. February 9, 2011.

2010 Annual Groundwater Monitoring Report Operable Unit 4. Osborne Landfill Site, Pine Township, Mercer County, Pennsylvania. Prepared for Cameron by Civil & Environmental Consultants, Inc. February 9, 2011.

2011 Annual Groundwater Monitoring Report Operable Unit 1. Osborne Landfill Site, Pine Township, Mercer County, Pennsylvania. Prepared for Cameron by Civil & Environmental Consultants, Inc. March 2, 2012.

2011 Annual Groundwater Monitoring Report Operable Unit 2. Osborne Landfill Site, Pine Township, Mercer County, Pennsylvania. Prepared for Cameron by Civil & Environmental Consultants, Inc. March 2, 2012.

2012 Annual Groundwater Monitoring Report Operable Unit 1. Osborne Landfill Site, Pine Township, Mercer County, Pennsylvania. Prepared for Cameron by Civil & Environmental Consultants, Inc. April 5, 2013.

2012 Annual Groundwater Monitoring Report Operable Unit 2. Osborne Landfill Site, Pine Township, Mercer County, Pennsylvania. Prepared for Cameron by Civil & Environmental Consultants, Inc. April 5, 2013.

2013 Annual Groundwater Monitoring Report Operable Unit 1 and Operable Unit 4. Osborne Landfill Superfund Site, Pine Township, Mercer County, Pennsylvania. Prepared for Cameron by Civil & Environmental Consultants, Inc. February 17, 2014.

2014 Annual Groundwater Monitoring Report Operable Unit 1 and Operable Unit4, Osborne Landfill Superfund Site, Pine Township, Mercer County, Pennsylvania. Prepared for Cameron by Civil & Environmental Consultants, Inc. January 8, 2015.

Explanation of Significant Differences: Osborne Landfill OU1. U.S. Environmental Protection Agency Region 3. August 24, 1998.

Explanation of Significant Differences: Osborne Landfill OU2. U.S. Environmental Protection Agency Region 3. August 24, 1998.

Explanation of Significant Differences: Osborne Landfill OU1. U.S. Environmental Protection Agency Region 3. June 29, 2004.

Groundwater Sampling Plan Operable Unit 1 and Operable Unit 4. Osborne Landfill Superfund Site, Pine Township, Mercer County, Pennsylvania. Prepared for Cameron by Civil & Environmental Consultants, Inc. February 17, 2014.

Optimization Project Final Report. Osborne Landfill Superfund Site. Operable Unit 2, Grove City, Pennsylvania. Prepared for Cameron by Civil & Environmental Consultants, Inc. February 27, 2013.

Record of Decision: Osborne Landfill OU1. U.S. Environmental Protection Agency Region 3. September 28, 1990.

Record of Decision: Osborne Landfill OU2. US Environmental Protection Agency Region 3. December 30, 1997.

Third Five Year Review Report Osborne Landfill Superfund Site. Pine Township, Mercer County, Pennsylvania. U.S. Environmental Protection Agency Region 3. September 8, 2010.

Appendix B: Press Notice

EPA Reviews Cleanup Osborne Landfill

The U.S. Environmental Protection Agency (EPA) is conducting a third Five-Year Review of the Osborne Landfill Superfund Site located just east of Grove City, in Mercer County, PA. EPA inspects sites regularly to ensure that cleanups conducted remain fully protective of public health and the environment. Prior reviews have determined the cleanup remedy is protective. The results of this review will be available by August 2015.

To access results of the review (starting Aug 2015):
http://epa.gov/5yr

To learn detailed site and contact information:
http://go.usa.gov/3r3cB

To listen to a podcast about EPA Five-Year Reviews:
http://go.usa.gov/9rkW

To ask questions or provide site information: Contact:
Carrie Deitzel **Phone:** 215-814-5525
Email: deitzel.carrie@epa.gov

Appendix C: Interview Forms

Osborne Landfill Superfund Site — Five-Year Review Interview Form

Site Name:	**Osborne Landfill Superfund Site**	**EPA ID No.:**	**PAD980712673**
Subject Name:	**Mary King**	**Affiliation:**	**Civil & Environmental Consultants, Inc. Cameron International Consultant**

Interview Format (circle one): In Person Phone Email Other:

Interview Category: O&M Contractor

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   Overall, the remedies implemented at the Site have been a great success. The remedies, which were modified from those originally included in the site RODs, have been successful at eliminating or mitigating potential risks to human health and the environment. The landfill, which was the source of chemicals of concern at the Site, is encapsulated, which eliminates direct contact risks. The leachate extraction and treatment system that operated within the landfill reduced the levels of organic compounds of concern with respect to groundwater migration and ingestion to below MCLs. Currently, only very low levels of one compound, vinyl chloride, are present at concentrations exceeding the MCL in the mine void system groundwater outside the limits of the landfill. Because there are no users of the mine void water, there is no risk posed by the vinyl chloride.

   In addition, not only were the modified remedies effective, but they also limited environmental disturbance and contaminant release potentials to levels well below possible with the original remedies. Further, the modified remedies conservatively saved more than $20 million in remedial costs for Cameron International, and significant costs that regulatory agencies would have incurred to monitor the original remedies.

2. What is your assessment of the current performance of the remedy in place at the Site?

   Of the five Operable Units (OUs) assigned for the Site, four of the five OUs were addressed by the landfill encapsulation with leachate extraction and treatment remedial actions. Those include: OU1 – Solid Waste in Landfill; OU2 – Wetland Sediments; OU3 – On-site Water Table (Leachate); and OU5 – Homewood aquifer. The encapsulation system was demonstrated to be effective by the monitoring, and the leachate extraction was shutdown in 2004 with EPA's approval because the) performance standards for the system were achieved.

   The OU4 remedy is monitored natural attenuation. The Optimization Project conducted during the 2010-2012 period reduced, but did not eliminate the residual levels of vinyl chloride in the mine void. The number of wells with vinyl chloride concentrations in groundwater exceeding the 2 µg/l MCL has been reduced, and those exceedances are slight and only occur occasionally. As a

result, the OU4 groundwater is nearly achieving its performance standards (all compounds of concern below their MCLs).

3. What are the findings from the monitoring data? What are the key trends in contaminant levels that are being documented over time at the Site?

   Monitoring demonstrated that the performance standards for the leachate within the landfill were achieved. As a result, the extraction and treatment of leachate was ceased in 2004.

   Vinyl chloride concentrations in the groundwater beyond the encapsulated landfill have decreased through time. Following completion of the Optimization Project, vinyl chloride concentrations were detected above the MCL in the mine void only in two wells. Both wells have exhibited downward trends in vinyl chloride concentrations, which suggest achievement of consistent concentrations of vinyl chloride below the MCL may occur in coming years.

   In addition, the community's public water supply coupled with groundwater sampling results of the mine void demonstrate that remedial activities for OU4 over the past 10 years is protective of human health and ecological receptors; potential risk and exposure pathways have essentially been eliminated.

4. Is there a continuous on-site O&M presence? If so, please describe staff responsibilities and activities. Alternatively, please describe staff responsibilities and the frequency of site inspections and activities if there is not a continuous on-site O&M presence.

   There is not a continuous on-site O&M presence because there are no active remedial actions being performed. Cameron's representative, who lives within one mile of the site, performs periodic maintenance, such as mowing and rodent control as appropriate. During those activities, the representative performs an inspection of the entire Site. Additionally, the representative periodically performs site inspections after significant weather events to assess site conditions. If site features are in need of repair or maintenance, the representative arranges for those actions.

5. Have there been any significant changes in site O&M requirements, maintenance schedules or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

   Leachate recovery and treatment from the landfill was ceased with the approval of EPA in 2014, and the groundwater and treatment as part of the Optimization Project was ceased in 2012. O&M primarily consists of mowing and rodent control. The frequency of groundwater sampling was reduced in mid-2013 with the approval of EPA. There have been no adverse impacts associated with the cessation of the groundwater recovery and treatment actions, or due to the reduction in monitoring.

6. Have there been unexpected O&M difficulties or costs at the Site since start-up or in the last five years? If so, please provide details.

   There have been no unexpected O&M difficulties or costs.

7. Have there been opportunities to optimize O&M activities or sampling efforts? Please describe changes and any resulting or desired cost savings or improved efficiencies.

   The O&M consists primarily of mowing and rodent control. As a result, there have been no opportunities to optimize those basic activities.

   With respect to sampling, in 2013 CEC petitioned EPA to reduce the groundwater sampling based on the abundance of analytical data (20 years) and the documented effectiveness of the Optimization Project. A Groundwater Sampling Plan was submitted to EPA on September 27, 2013 to describe the revised monitoring requirements to reflect the approved reduction in sampling frequency and monitoring points. The Groundwater Sampling Plan was approved by EPA and was implemented in 2014.

8. Do you have any comments, suggestions or recommendations regarding O&M activities and schedules at the Site?

   No.

Osborne Landfill Superfund Site **Five-Year Review Interview Form**

Site Name: Osborne Landfill Superfund Site **EPA ID No.:** PAD980712673

Subject Name: John Morettini **Affiliation:** PADEP

Interview Format (circle one): In Person Phone Email Other:

Interview Category: State Agency

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   The Department considers the physical maintenance of the exterior of the plant, fence, and site to be above standard. The interior of the plant has always been clean and maintained in a professional manner. The Department has reviewed the site cleanup records, and visited the site on multiple occasions. The recordkeeping at the site has been exceptional, and copies of all required documents have been provided to the Department in a timely manner. The project has taken the minimal required land needed to provide the remedy, which has allowed greater use on the land by the public.

2. What is your assessment of the current performance of the remedy in place at the Site?

   With the plant currently not being operated, the Department can only evaluate the passive remedies in place. The extended water line, fencing, and landfill cap are functioning as designed and eliminating the exposure pathways.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

   The Department is unaware of any complaints or inquiries regarding Site related environmental issues or remedial activities from residents in the past five years.

4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

   The Department has only had communications with the EPA concerning Site related activities in the past five years.

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?

   The Department in unaware of any changes to State laws that might affect the protectiveness of the Site's remedy.

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?

According to the Institutional Controls, The State requires a restriction on mining or mineral removal within ½ mile of the site. The Institutional Control is in reference to the Department ARAR which prohibits removal of minerals providing structural support at the Site. This is to prevent subsidence on the Site which may disrupt the remedy in place. Due to the increase in gas drilling activities in the area, the Department's Oil and Gas Program has been notified to flag any potential wells being proposed within ½ mile of the Site so that the company may be notified of the landfill, and of their responsibility if their activities should disrupt the remedy. The topic of the ½ mile radius of the site must be further discussed to determine if it is a three dimensional calculation. An example of this discussion would be a gas well drilled to the Marcellus Shale could encounter natural gas at a depth greater than ½ mile below the site, so would the well be exempt from the Institutional Control? The Department shall review each permit on a case by case scenario.

7. Are you aware of any changes in projected land use(s) at the Site?

   The Department is unaware of any changes in projected land use at the Site.

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   The Department reviewed the prior proposal of reversing the plant flow with the intent of treating additional contaminated waters in the mine void. The concept and reengineering of the plant to perform this activity showed considerable insight.

Osborne Landfill Superfund Site **Five-Year Review Interview Form**

Site Name:	Osborne Landfill Superfund Site	**EPA ID No.:**	PAD980712673
Interviewer Name:	Carrie Deitzel	**Affiliation:**	US EPA R3 CIOB Community Involvement
Subject Name:	Joe Holmes George Elliot	**Affiliation:**	Pine Township Supervisors (Mr. Elliot chairs Board)

Contact Information:
724-967-2338
(direct for Mr. Holmes)
724-458-7229
(main # for Twp.)

Time: 11:00 a.m. **Date:** October 20, 2014

Interview Location: Pine Township Building; 545 Barkeyville Road; Grove City, PA

Interview Format (circle one): In Person **Phone** **Mail** **Other:**

Interview Category: **Local Government**

1. **Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?**

   Both interviewees were somewhat aware.

2. **Do you feel well-informed regarding current site-related O&M activities and remedial progress?**

   Both feel that the PRP representative is reliable and would/did contact them if/when information needed to be shared, such as when there was a water-line break at the Site.

   If not, what additional information would you like to receive in the future? N/A

3. **Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?**

   None that they are aware of, other than the water-line break, which the fire department did respond to, to help pump water out of the building.

4. **Are you aware of any changes to state laws or local regulations that might affect the protectiveness of the Site's remedy?**

   Not aware of any.

5. **Are you aware of any changes in projected land use(s) at the Site?**

   Neither interviewee was aware of any plans for the site property.

6. **Has EPA kept involved parties and surrounding neighbors informed of activities at the Site?**

   They are not aware of any activities that required notification nor do they know of any recent EPA outreach efforts.

7. **How can EPA best provide site-related information in the future?**

   Direct contact or email. Both men asked to be notified when the FYR Report is available online. Neither requested a hard copy of the report. In fact, they specifically said they don't need any more paper.

8. **Are you aware of any fracking activities in the area or do you anticipate them coming to the area?**

   They are aware of fracking in Allegheny and Butler Counties, and they are aware that several local residents have signed contracts for their mineral rights (including Mr. Elliott).

9. **Do you have any comments, suggestions or recommendations regarding the project?**

   None.

Appendix D: Site Inspection Checklist

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Osborne Landfill Superfund Site	**Date of Inspection: October 21, 2014**
Location and Region: Mercer County, Pennsylvania, Region 3	**EPA ID: PAD980712673**
Agency, Office or Company Leading the Five-Year Review: EPA	**Weather/Temperature: Light drizzle, in the 40's, Fahrenheit**

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other: _____
- ☒ Monitored natural attenuation
- ☒ Groundwater containment
- ☒ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** Mary King (Name) | Civil & Environmental Consultants, Inc. Project Manager (Title) | mm/dd/yyyy (Date)
   Interviewed ☐ at site ☐ at office ☒ by email Phone: _____
   Problems, suggestions ☐ Report attached: _____
2. **O&M Staff** _____ (Name) | _____ (Title) | mm/dd/yyyy (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____
   Problems/suggestions ☐ Report attached: _____

3. **Local Regulatory Authorities and Response Agencies** (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices). Fill in all that apply.

Agency PADEP
Contact John Morettini (Name) | Site Manager (Title) | Email (Date) | _____ (Phone No.)
Problems/suggestions ☐ Report attached: _____

Agency Pine Township
Contact Joe Holmes and George Elliot (Name) | Supervisors (Title) | 10/20/2014 (Date) | _____ (Phone No.)
Problems/suggestions ☐ Report attached: _____

Agency _____
Contact _____ (Name) | _____ (Title) | _____ (Date) | _____ (Phone No.)
Problems/suggestions ☐ Report attached: _____

Agency _____
Contact _____ (Name) | _____ (Title) | _____ (Date) | _____ (Phone No.)
Problems/suggestions ☐ Report attached: _____

Agency _____
Contact _____ (Name) | _____ (Title) | _____ (Date) | _____ (Phone No.)
Problems/suggestions ☐ Report attached: _____

4. **Other Interviews** (optional) ☐ Report attached: _____

III. ON-SITE DOCUMENTS AND RECORDS VERIFIED (check all that apply)

1. **O&M Documents**

☒ O&M manual	☒ Readily available	☐ Up to date	☐ N/A
☒ As-built drawings	☒ Readily available	☐ Up to date	☐ N/A
☒ Maintenance logs	☒ Readily available	☐ Up to date	☐ N/A

Remarks: _____

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☐ Up to date ☐ N/A

☒ Contingency plan/emergency response plan ☒ Readily available ☐ Up to date ☐ N/A

Remarks: _____

3. **O&M and OSHA Training Records** ☒ Readily available ☐ Up to date ☐ N/A

Remarks: _____

4.	**Permits and Service Agreements**				
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A	
	☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A	
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A	
	☐ Other permits: _____	☐ Readily available	☐ Up to date	☒ N/A	
	Remarks: _____				
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A	
	Remarks: _____				
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A	
	Remarks: _____				
7.	**Groundwater Monitoring Records**	☒ Readily available	☐ Up to date	☐ N/A	
	Remarks: _____				
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A	
	Remarks: _____				
9.	**Discharge Compliance Records**				
	☐ Air	☐ Readily available	☐ Up to date	☒ N/A	
	☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A	
	Remarks: _____				
10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A	
	Remarks: _____				

IV. O&M COSTS

1.	**O&M Organization**	
	☐ State in-house	☐ Contractor for state
	☐ PRP in-house	☒ Contractor for PRP
	☐ Federal facility in-house	☐ Contractor for Federal facility
	☐ _____	

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☒ Funding mechanism/agreement in place ☐ Unavailable

Original O&M cost estimate: _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From: mm/dd/yyyy	To: mm/dd/yyyy	_____	☐ Breakdown attached
Date	Date	Total cost	
From: mm/dd/yyyy	To: mm/dd/yyyy	_____	☐ Breakdown attached
Date	Date	Total cost	
From: mm/dd/yyyy	To: mm/dd/yyyy	_____	☐ Breakdown attached
Date	Date	Total cost	
From: mm/dd/yyyy	To: mm/dd/yyyy	_____	☐ Breakdown attached
Date	Date	Total cost	
From: mm/dd/yyyy	To: mm/dd/yyyy	_____	☐ Breakdown attached
Date	Date	Total cost	

3. **Unanticipated or Unusually High O&M Costs during Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing Damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: _____

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on site map ☐ N/A

Remarks: Signs present.

C. Institutional Controls (ICs)

1. **Implementation and Enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (e.g., self-reporting, drive by): _____

Frequency: _____

Responsible party/agency: _____

Contact _____ _____ mm/dd/yyyy _____

Name Title Date Phone no.

Reporting is up to date ☐ Yes ☐ No ☒ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☒ No ☐ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks: _____

D. General

1. **Vandalism/Trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: _____

2. **Land Use Changes On Site** ☒ N/A

Remarks:

3. **Land Use Changes Off Site** ☒ N/A

Remarks: _____

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads Damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: _____

B. Other Site Conditions

Remarks: _____

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (low spots) ☐ Location shown on site map ☒ Settlement not evident

Arial extent: _____ Depth: _____

Remarks: _____

2.	**Cracks**	☐ Location shown on site map	☒ Cracking not evident
	Lengths: _____	Widths: _____	Depths: _____
	Remarks: _____		
3.	**Erosion**	☐ Location shown on site map	☒ Erosion not evident
	Arial extent: _____		Depth: _____
	Remarks: _____		
4.	**Holes**	☐ Location shown on site map	☒ Holes not evident
	Arial extent: _____		Depth: _____
	Remarks: _____		
5.	**Vegetative Cover**	☒ Grass	☒ Cover properly established
	☐ No signs of stress	☐ Trees/shrubs (indicate size and locations on a diagram)	
	Remarks: _____		
6.	**Alternative Cover** (e.g., armored rock, concrete)		☒ N/A
	Remarks: _____		
7.	**Bulges**	☐ Location shown on site map	☒ Bulges not evident
	Arial extent: _____		Height: _____
	Remarks: _____		
8.	**Wet Areas/Water Damage**	☒ Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Arial extent: _____
	☐ Ponding	☐ Location shown on site map	Arial extent: _____
	☐ Seeps	☐ Location shown on site map	Arial extent: _____
	☐ Soft subgrade	☐ Location shown on site map	Arial extent: _____
	Remarks: No wet areas observed on cap although ponding was observed on the old road alongside the cap.		
9.	**Slope Instability**	☐ Slides	☐ Location shown on site map
	☒ No evidence of slope instability		
	Arial extent: _____		
	Remarks: _____		
B. Benches		☐ Applicable	☒ N/A
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
2.	**Bench Breached**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay

Remarks: _____

C. Letdown Channels ☐ Applicable ☒ N/A

(Channel lined with erosion control mats, riprap, grout bags or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ No evidence of settlement

Arial extent: _____ Depth: _____

Remarks: _____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation

Material type:_____ Arial extent: _____

Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion

Arial extent: _____ Depth: _____

Remarks: _____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting

Arial extent: _____ Depth: _____

Remarks: _____

5. **Obstructions** Type: _____ ☐ No obstructions

☐ Location shown on site map Arial extent: _____

Size: _____

Remarks: _____

6. **Excessive Vegetative Growth** Type: _____

☐ No evidence of excessive growth

☐ Vegetation in channels does not obstruct flow

☐ Location shown on site map Arial extent: _____

Remarks: _____

D. Cover Penetrations ☒ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A

Remarks: _____

2. **Gas Monitoring Probes**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A

Remarks: _____

3. **Monitoring Wells** (within surface area of landfill)

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

4. **Extraction Wells Leachate**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A

Remarks: Inactive. Stopped in 2004.

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☒ N/A

Remarks: No longer active.

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**

☐ Flaring ☐ Thermal destruction ☐ Collection for reuse

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Gas Collection Wells, Manifolds and Piping**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)

☐ Good condition ☐ Needs maintenance ☐ N/A

Remarks: _____

F. Cover Drainage Layer ☒ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☒ Functioning ☐ N/A

Remarks: _____

2. **Outlet Rock Inspected** ☒ Functioning ☐ N/A

Remarks: _____

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Area extent: _____ Depth: _____ ☐ N/A

☐ Siltation not evident

Remarks: _____

2.	**Erosion**	Area extent: _____	Depth: _____
	☐ Erosion not evident		
	Remarks: _____		
3.	**Outlet Works**	☐ Functioning	☐ N/A
	Remarks: _____		
4.	**Dam**	☐ Functioning	☐ N/A
	Remarks: _____		
H. Retaining Walls		☐ Applicable	☒ N/A
1.	**Deformations**	☐ Location shown on site map	☐ Deformation not evident
	Horizontal displacement: _____		Vertical displacement: _____
	Rotational displacement: _____		
	Remarks: _____		
2.	**Degradation**	☐ Location shown on site map	☐ Degradation not evident
	Remarks: _____		
I. Perimeter Ditches/Off-Site Discharge		☒ Applicable	☐ N/A
1.	**Siltation**	☐ Location shown on site map	☒ Siltation not evident
	Area extent: _____		Depth: _____
	Remarks: _____		
2.	**Vegetative Growth**	☐ Location shown on site map	☒ N/A
	☐ Vegetation does not impede flow		
	Area extent: _____		Type: _____
	Remarks: _____		
3.	**Erosion**	☐ Location shown on site map	☒ Erosion not evident
	Area extent: _____		Depth: _____
	Remarks: _____		
4.	**Discharge Structure**	☐ Functioning	☒ N/A
	Remarks: _____		
VIII. VERTICAL BARRIER WALLS		☒ Applicable	☐ N/A
1.	**Settlement**	☐ Location shown on site map	☒ Settlement not evident
	Area extent: _____		Depth: _____
	Remarks: _____		

2. **Performance Monitoring** Type of monitoring: Groundwater sampling.

☐ Performance not monitored

Frequency: _____ ☐ Evidence of breaching

Head differential: _____

Remarks: _____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

A. Groundwater Extraction Wells, Pumps and Pipelines ☐ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing and Electrical**

☐ Good condition ☐ All required wells properly operating ☐ Needs maintenance ☐ N/A

Remarks: _____

2. **Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

B. Surface Water Collection Structures, Pumps and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps and Electrical**

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☐ Air stripping ☐ Carbon adsorbers

☐ Filters: _____

☐ Additive (e.g., chelation agent, flocculent): _____

☐ Others: _____

☐ Good condition ☐ Needs maintenance

☐ Sampling ports properly marked and functional

☐ Sampling/maintenance log displayed and up to date

☐ Equipment properly identified

☐ Quantity of groundwater treated annually: _____

☐ Quantity of surface water treated annually: _____

Remarks: _____

2. **Electrical Enclosures and Panels** (properly rated and functional)

☐ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Tanks, Vaults, Storage Vessels**

☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs maintenance

Remarks: _____

4. **Discharge Structure and Appurtenances**

☐ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

5. **Treatment Building(s)**

☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair

☐ Chemicals and equipment properly stored

Remarks: _____

6. **Monitoring Wells** (pump and treatment remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: _____

D. Monitoring Data

1. **Monitoring Data**

☒ Is routinely submitted on time ☐ Is of acceptable quality

2. **Monitoring Data Suggests:**

☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

Remarks: Small area of plume exists in Mine Pool.

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs maintenance ☒ N/A

Remarks: _____

X. OTHER REMEDIES

If there are remedies applied at the site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions).
The remedy was designed to contain waste present on site and to reduce concentrations of contamination in groundwater. The remedy is functioning as designed.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
O&M activities appear to be adequate. Additional studies have been conducted to reduce concentrations of contaminants in groundwater.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.
No issues were observed.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.
An optimization study was conducted to actively reduce concentrations of vinyl chloride in groundwater. No other opportunities for optimization were observed.

Appendix E: Photographs from Site Inspection Visit

Groundwater treatment building

OU4 area with groundwater treatment building in background

Monitoring well outside of slurry wall

OU1 cap

Extraction well 7 on cap

Ponding along old road surrounding cap

Locked gate at northwest corner of the Site

Berm and fence along western edge of cap

Site inspection participants walking along outside of fence

Berm and drainage swale between cap and wetlands

Wetlands

Appendix F: Data

Table F-1: 2014 OU1 Groundwater Results (µg/L)[6]

Well	Date	Cis-1,2-Dichloroethene (70)	Vinyl Chloride (2)
C-1	11/10/2014	<0.5	<0.5
C-2	6/13/2014	0.63	1.3
C-2	11/10/2014	0.72	**2.2**
C-3	11/10/2014	<0.5	<0.5
C-4	11/10/2014	<0.5	<0.5
C-5	11/10/2014	<0.5	<0.5
C-6	11/10/2014	<0.5	<0.5
H-1	11/10/2014	<0.5	<0.5
H-2	11/10/2014	<0.5	<0.5
H-3	11/10/2014	<0.5	<0.5
H-4	11/10/2014	<0.5	<0.5
H-5	11/10/2014	<0.5	<0.5
H-6	11/10/2014	<0.5	<0.5

Table F-2: 2014 OU4 Groundwater Results (µg/L)[7]

Well	Date	Benzene (5)	Cis-1,2-Dichloroethene (70)	Toluene (1,000)	Vinyl Chloride (2)
Mine Void Wells					
MWV-1	11/11/2014	<0.5	<0.5	<0.5	<0.5
MWV-3	11/11/2014	<0.5	<0.5	<0.5	<0.5
MWV-4	11/11/2014	<0.5	0.40J	<0.5	1.2
MWV-5	6/13/2014	<0.5	0.68	<0.5	1.2
MWV-5	11/11/2014	<0.5	1.2	1.5	**5.6**
MWV-6	11/11/2014	<0.5	<0.5	<0.5	<0.5
MWV-7	11/11/2014	<0.5	<0.5	<0.5	<0.5
MWV-8	11/11/2014	<0.5	<0.5	<0.5	<0.5
MWV-9	11/11/2014	<0.5	0.41J	<0.5	**2**
Clarion Aquifer Wells					
MW-7	11/11/2014	<0.5	<0.5	<0.5	<0.5
MW-8	11/11/2014	<0.5	<0.5	<0.5	<0.5
MW-9	11/11/2014	0.95	<0.5	<0.5	<0.5
MWC-2	11/11/2014	<0.5	<0.5	0.24J	<0.5
MWC-4	11/11/2014	0.59	<0.5	<0.5	<0.5
MWC-5	6/13/2014	Dry			
MWC-5	11/11/2014	Dry			

Notes:
"J" indicates the result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

[6] 2014 Annual Groundwater Monitoring Report, Operable Unit 1 and Operable Unit 4, Osborne Landfill Superfund Site, Pine Township, Mercer County, Pennsylvania. Prepared for: Cameron by Civil & Environmental Consultants, Inc. January 8, 2015.

[7] 2014 Annual Groundwater Monitoring Report, Operable Unit 1 and Operable Unit 4, Osborne Landfill Superfund Site, Pine Township, Mercer County, Pennsylvania. Prepared for: Cameron by Civil & Environmental Consultants, Inc. January 8, 2015.

Table F-3: 2013 Analytical Results for Residential Wells (µg/L)[8]

Well	Date	Cis-1,2-Dichloroethene (70)	Vinyl Chloride (2)
Residential Well A	3/23/2015	0.6	2.5
Residential Well B	5/23/2013	<0.5	<0.5
Residential Well C	5/23/2013	<0.5	<0.5
Residential Well D	5/23/2013	<0.5	<0.5
Residential Well E	5/23/2013	<0.5	<0.5
Residential Well F	5/23/2013	<0.5	<0.5

[8] 2013 Annual Groundwater Monitoring Report, Operable Unit 1 and Operable Unit 4, Osborne Landfill Superfund Site, Pine Township, Mercer County, Pennsylvania. Prepared for: Cameron by Civil & Environmental Consultants, Inc. February 17, 2014.

Appendix G: Evaluation of Information in Support of Answering Question B

This appendix provides a summary of the evaluations conducted to determine whether the exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of remedy selection remain valid.

Changes in Standards and TBCs

Have standards identified in the ROD been revised, and does this call into question the protectiveness of the remedy? Do newly promulgated standards call into question the protectiveness of the remedy? Have TBCs used in selecting cleanup levels at the Site changed, and could this affect the protectiveness of the remedy?

Other than arsenic (anticipated to change in the 2004 ESD), the groundwater cleanup standards identified in the 2004 ESD are still valid. Although the MCL has changed for arsenic, arsenic concentrations remain below the revised MCL of 10 µg/L based on rebound testing in 2005 and 2006.

Changes in Exposure Pathways

Has land use or expected land use on or near the Site changed? Have human health or ecological routes of exposure or receptors been newly identified or changed in a way that could affect the protectiveness of the remedy? Are there newly identified contaminants or contaminant sources? Are there unanticipated toxic byproducts of the remedy not previously addressed by the decision documents? Have physical site conditions or the understanding of these conditions changed in a way that could affect the protectiveness of the remedy?

Changes have occurred in the remedy. Air stripper emissions have ceased; therefore, this potential source is no longer relevant. However, due the presence of VOCs in groundwater near a home immediately downgradient of OU4, vapor intrusion is a potential exposure pathway of concern. Cameron International conducted vapor intrusion modeling in March 2010 for a nearby house. The resultant estimated cancer risk was within the target range of $1x10^{-6}$ to $1x10^{-4}$, and the estimated noncancer hazard index (HI) was below the goal of 1.

The owner of Residential Well A is not willing to provide access for indoor air or sub-slab vapor sampling. Therefore, a screening-level risk evaluation of the vapor intrusion pathway was conducted as part of this FYR using the last five years of data. Consistent with EPA guidance, the vapor intrusion pathway was initially evaluated by determining if VOCs are present in the subsurface of six homes where groundwater was sampled. The most recent sampling results (November 2013) indicate that groundwater samples from five of the six homes had no detections of vinyl chloride. One residential home historically had vinyl chloride detected above MCLs and did not provide access to their well in 2013; this well is a mine void well.

EPA's vapor intrusion screening level (VISL) calculator was used to provide a conservative estimate of risk and noncancer hazards. The VISL calculator is an empirical model that predicts indoor air concentrations using conservative "generic" attenuation factors. These factors reflect

worst-case conditions and do not take into account any site-specific conditions such as site soil strata, depth to water table and building properties that may reduce the transport of vapors from groundwater through the soil column. The VISL calculator was run in default mode, which assumes a groundwater temperature of 25 degrees Celsius (77 degrees Fahrenheit). This is a conservative assumption for Pennsylvania groundwater, which is on average 11 degrees Celsius, as outlined in EPA's vapor intrusion guidance.[9]

The VISL calculator was run for the residential well using the current concentration and historical maximum concentration of vinyl chloride over the last five years; although there currently is a residence at this location, a future industrial land use was also evaluated for perspective. In addition, the VISL calculator was run using the historical maximum in OU4 mine void wells under residential and industrial land use scenarios where groundwater continues to show relatively low levels of vinyl chloride concentrations. As shown in Table G-1, the hypothetical residential and industrial cancer risk associated with the historical maxima for the residential well and OU4 mine void wells is well within EPA's risk management range of 1×10^{-6} to 1×10^{-4} and the noncancer HIs are below 1.0 for vinyl chloride, which suggests that the vapor intrusion pathway may not pose a concern.

The distribution of vinyl chloride concentrations across site groundwater does not indicate that a significant ongoing source of vinyl chloride contamination exists; the contaminant trends over time are declining and in many cases are below or close to the MCL. A comparison of mine void data to Clarion well data also indicate that a clean layer of water may overly the more contaminated mine void groundwater, which would render the vapor intrusion exposure pathway incomplete. However, Clarion Aquifer well MWC-5 was dry in 2013 and 2014 which indicates that the Clarion may not always be present year round. Thus, the use of mine void data presents a conservative screen for this pathway because the higher concentration groundwater data did not present risks that exceed EPA's cancer risk range or noncancer threshold of 1.0.

Table G-1. Evaluation of Vapor Intrusion Using the VISL Calculator

Chemical	Historical Maximum Detected Concentration (µg/L)	Residential		Industrial	
		Cancer Risk	Noncancer HI	Cancer Risk	Noncancer HI
Residential Well A March 2015 Concentration (most recent sampling allowed by resident)					
Vinyl chloride	2.5	1.7×10^{-5}	0.03	1×10^{-6}	0.007
Residential Well A Historical Maximum (June 2010)					
Vinyl chloride	9.0	6.1×10^{-5}	0.1	3.7×10^{-6}	0.02
Mine Void Well Historical Maximum (MWV-5 in 2012)					
Vinyl chloride	5.7	3.9×10^{-5}	0.06	2.3×10^{-6}	0.015

Notes:

a. EPA Vapor Intrusion Screening Level Calculator, May 2014 used to calculated cancer risk and noncancer HI. (http://www.epa.gov/oswer/vaporintrusion/documents/VISL-Calculator.xlsm).

[9] User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings. EPA's Office of Emergency and Remedial Response. February 2004.

To confirm this screening-level analysis and rule out this exposure pathway, EPA guidance requires additional lines of evidence, particularly because of the fractured bedrock at the Site. Additional data from more than one environmental medium (e.g., groundwater paired with sub-slab vapor and indoor air) are recommended in a more comprehensive vapor intrusion analysis to reduce the uncertainties in this exposure pathway. Alternatively, the vapor intrusion pathway may be ruled incomplete if information exists that clean groundwater exists in the Clarion layer between the mine void and the residential home and no preferential pathways are present underlying the home.

Changes in Toxicity and Other Contaminant Characteristics

Have toxicity factors for contaminants of concern at the site changed in a way that could affect the protectiveness of the remedy? Have other contaminant characteristics changed in a way that could affect the protectiveness of the remedy?

Toxicity factors have changed since the original risk assessment, as have risk assessment methods. For example, assessments of vinyl chloride, TCE, chromium, and benzo[a]pyrene now include an evaluation of mutagenicity, and the risk assessment guides for dermal and inhalation exposure have changed.

To evaluate the current and future protectiveness, the following risks were considered:

- Risks from current groundwater concentrations (using maximum concentrations for each groundwater area from the most recent data, 2011-2013);
- Risks from groundwater that has a concentration equaling MCLs and ROD standards.

As shown in Attachment A, the OU-1 and mine void wells have not yet met MCLs for vinyl chloride. Vinyl chloride also drives unacceptable risk (cancer risk > $1x10^{-4}$) in those locations. Residential Well A, previously identified in site documents as having unacceptable risk and no longer used as a source of drinking water, still has vinyl chloride at concentrations above the MCL and acceptable cancer-risk levels. In recent years, the Residential Well A owner has not always been available to grant access, so the sampling of this well has become more sporadic.

The other residential wells and the OU-4 Clarion area meet MCLs and acceptable risk-based standards.

If chemicals were present at the ROD standards and MCLs, risks would be unacceptable in combination. At this time, most of the chemicals are well below MCLs and ROD standards.

Soils and sediments listed in the ROD have been excavated or capped, with the exception of the offsite pond sediment. However, the sediment was determined not to be adversely impacted by the site in the 1997 ROD.

Changes in Risk Assessment Methods

Have standardized risk assessment methodologies changed in a way that could affect the protectiveness of the remedy?

There have been significant changes in EPA's risk assessment guidance since the original risk assessment was performed. These include changes in basic methodology, dermal guidance, inhalation methodologies, and exposure factors. Uncertainties involving the risks associated with final cleanup standards were described above, as part of the "Changes in Standards and TBCs" discussion.

Expected Progress Towards Meeting RAOs

Is the remedy progressing as expected?

The OU-1, mine void, and Residential Well A show that vinyl chloride is still above MCLs and levels of concern. These wells are not currently used, and therefore these conditions are currently protective. The currently-used spring at Residence G is at acceptable concentrations. Once the site is ready for a final cleanup determination, then metals should be resampled.

Meeting each of the MCLs/ROD standards exactly would not be protective in combination, but vinyl chloride is the only chemical that actually exceeds MCLs in recent monitoring rounds, and most of other chemical of concern are well below MCLs and ROD standards.

With respect to vapor intrusion, the protectiveness is unknown; the residence most likely to be affected has refused access. EPA will continue to try to gain access for indoor air and sub-slab sampling. VI modeling and conservative estimation of risks indicate that current groundwater concentrations are unlikely to result in unacceptable vapor intrusion risks.

With respect to human health issues, the following items are recommended, as described above:

Evaluate local vapor intrusion if the resident allows..
Maintain containment systems, institutional controls, and monitoring.

Attachment A: Groundwater Protectiveness Evaluation

The 2011-2013 well data were divided as follows:

OU-1: C-1, C-2, C-3, C-4, C-5, C-6, H-1, H-2, H-3 H-4, H-5, H-6, and duplicates
OU-4 Clarion: MW-7, MW-8, MW-9, MWC-2, MWC-4
OU-4 Mine void: MWV-1, MWV-3, MWV-4, MWV-5, MWV-6, MWV-7, MWV-8, MWV-9
Residential wells (evaluated individually): K/K, A, D/D/Cl/F, G (spring), R-L, P-Ea

The maximum concentration of each detected chemical in each grouping was screened against the spring 2014 Regional Screening Levels (RSLs). For OU-1, only dichlorobromomethane (max 0.5 ug/L) and vinyl chloride (max 7.1 ug/L) exceeded RSLs. No chemicals in the OU-4 Clarion wells exceeded RSLs. Only vinyl chloride exceeded RSLs in the mine void (max 5.7 ug/L) and Residential Well A (max 6.2 ug/L). Chloroform (max 7.3 ug/L) exceeded RSLs in the G spring.

These maximum concentrations were entered into a risk assessment, along with the chemical-specific inputs listed below. For the MCL evaluation, the risk at the MCL was estimated for each of the chemicals detected in these wells.

	Kp	B	tau	t*	MW	H	RfD	CSF	RfC	IUR
VC	0.008	0.02	0.23	0.56	62.5	0.028	0.003	0.72 M	0.1	4.4e-6 M
c12-DCE	0.011	0.04	0.37	0.88	97	0.004	0.002	--	--	--
b[a]p	0.71	4.4	2.7	11.8	n/a	n/a	--	7.3 M	--	0.001 M
TCE	0.012	0.05	0.57	1.4	131	0.0098	5e-4	9e-3 M 0.037	2e-3	1e-6 M 3e-6
PCBs	0.43	3.2	11.3	47.9	n/a	n/a	--	2	--	5.7e-4
BDCM	0.004	0.02	0.87	2.1	164	0.002	0.02	0.06	--	3.7e-5
Chlrfm	0.0068	0.03	0.49	1.2	119	0.0037	0.01	0.03	0.098	2.3e-5
Benzene	0.0149	0.05	0.29	0.69	78	0.0056	0.004	0.055	0.03	7.8e-6
Be	1e-3	--	--	--	n/a	n/a	2e-3	--	2e-5	2.4e-3
Cr	2e-3	--	--	--	n/a	n/a	3e-3	0.5 M	1e-4	0.084 M
As	1e-3	--	--	--	n/a	n/a	3e-4	1.5	1.5e-5	4.3e-3
Ni	2e-4	--	--	--	n/a	n/a	0.02	--	9e-5	2.6e-4

Factors were taken from the Regional Screening Table (spring 2014).
MW and H are only used in the showering model (i.e., for volatile chemicals).
FA = 1 for every organic chemical except PCBs, for which FA was 0.5.
Dermal RfDs and CSFs were generated for beryllium, chromium, and nickel using GI absorption factors of 0.007, 0.025, and 0.04, respectively; for all other chemicals, dermal toxicity factors = oral toxicity factors.
M = Mutagenic. Default ADAFs were used to estimate cancer risk for benzo[a]pyrene, chromium, and the mutagenic portion of the carcinogenic TCE risk. Mutagenicity for vinyl chloride was estimated in accordance with its IRIS Toxicological Review, including prorated and non-prorated cancer risks.

Kp= A factor used in estimating exposure and risk to chemicals in water via skin contact; the dermal permeability coefficient of compound in water (cm/hr).
B= A factor used in estimating exposure and risk to chemicals in water via skin contact; the dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis.
tau= A factor used in estimating exposure and risk to chemicals in water via skin contact; lag time per event (hr/event).
t*= A factor used in estimating exposure and risk to chemicals in water via skin contact; time to reach steady state (hr).
MW= Molecular weight (g/mole).
H= Henry's Law constant; A constant used to describe the relationship between a gas in liquid and in a surrounding gas; often used to help predict the likelihood of a chemical volatilizing from water into air.
RfD= Reference Dose (mg/kg/day); EPA's toxicity value for estimating noncancer hazards resulting from exposures at Superfund sites. An estimate (with uncertainty spanning perhaps an order of magnitude or greater) of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects.
RfC:=Reference Concentration (mg/m3); EPA's toxicity value for estimating noncancer hazards resulting from inhalation exposures at Superfund sites. An estimate (with uncertainty spanning perhaps an order of magnitude or greater) of a daily exposure concentration for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects.
CSF= Cancer Slope Factor (1/mg/kg/day); EPA's toxicity value for estimating cancer risks resulting from exposures at Superfund sites. A plausible upper-bound estimate of the probability of a response per unit intake of a chemical over a lifetime.
IUR=Inhalation Unit Risk (m3/ug); EPA's toxicity value for estimating cancer risks resulting from inhalation exposures at Superfund sites. A plausible upper-bound estimate of the probability of a response per exposure concentration of a chemical over a lifetime.

The following exposure factors were used, based on the 2014 updated default exposure factors:

	Child	Adult
IR (L/day)	0.78	2.5
EF (days/yr)	350	350
ED (yrs)	6	20
BW (kg)	15	80
AT-noncancer (days)	365 x ED	365 x ED
AT-cancer (days)	365 x 70	365 x 70
SA (cm^2)	6378	20900
T (hrs/day)	0.54	0.71

The following showering inputs were used for the Foster and Chrostowski, 1987, model: T1 (293 K), Ts (318 K), u1 (1.002 cp), us (0.596 cp), d 1 mm, ts 0.5 sec, flow rate 10 L/min, SV 12 m^3, Ds 43 min, Dt 60 min, Ra 0.01667/min

The following risks were derived for current groundwater conditions, if the water were consumed:

	Child HI	Adult HI	Cancer risk	Risk drivers	Chems > MCL
OU-1	0.1	0.08	3e-4	VC	VC
Mine void	0.1	0.07	2e-4	VC	VC
Res Well A	0.1	0.07	4e-4	VC	VC
Res G (spring)	0.04	0.03	1e-6	--	--

The following risks were derived for MCLs in combination, to demonstrate whether they are protective. This list was compiled from chemicals specifically mentioned in the ROD, with the addition of two chemicals that were also detected in recent rounds above RSLs (DCBM and chloroform):

Chemical	MCL or ROD std (ug/L)	Child HI	Adult HI	Cancer risk
VC*	2	0.04	0.02	1e-4
DCBM*	40+	0.1	0.06	6e-5
chloroform*	40+	0.2	0.2	4e-5
TCE	5	0.6	0.5	5e-6
benzene	5	0.07	0.06	5e-6
c12DCE*	70	2	1	--
b[a]p	0.2	--	--	1e-3
PCBs	0.5	--	--	2e-4
Be	4	0.2	0.1	--
Cr	100	2	1.5	3e-3
As	10	2	1	2e-4
Ni	100	0.2	0.2	--
Total		7	5	5e-3

*Chemical actually present in wells in 2011-2013 samples. Note that metals have not been sampled for in these rounds.
+The MCL for total trihalomethanes (THMs) is 80 ug/L. For simplicity's sake, this estimate divided the total THMs equally, but any combination could be used as long as the total was 80 ug/L.

Lead was also named in the ROD with a goal of 5 ug/L, based on a state standard. This concentration is below the current federal Action Level of 15 ug/L, and would still be protective.