



# Fourth Five-Year Review Report

for

**Bowers Landfill**

**Circleville, Ohio**

**Pickaway County**

**May 2012**

**Prepared by  
U.S. EPA - Region 5**

Approved by:

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5/18/2012  
Date

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**Fourth Five-Year Review Report  
Bowers Landfill Site**

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## List of Acronyms

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DDAGW	Division of Drinking and Ground Water
HI	Hazard Index
MCL	Maximum Contaminant Level
NCP	National Contingency Plan
NPL	National Priorities List
PA/SI	Preliminary Assessment/Site Investigation
O&M	Operation and Maintenance
Ohio EPA	Ohio Environmental Protection Agency
RD/RA	Remedial Design/Remedial Action
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SVOC	Semi-Volatile Organic Compound
UU/UE	Unlimited Use/Unrestricted Exposure
VOC	Volatile Organic Compound

## Executive Summary

The remedy for the Bowers Landfill site in Circleville, Ohio, included capping of contaminated soils and debris on site, institutional controls, monitoring of ground and surface water, and monitoring of landfill gas for methane and volatile organic compounds (VOCs).

The First Five Year Review Report was signed on July 23, 1997. The Second Five Year Review Report was signed on August 23, 2002. The Third five year review was signed on August 15, 2007. The trigger date for this Fourth Five Year Review Report is five years after the signature date of the Third Five Year Report. The assessment of this Fourth Five-Year Review report has found that the remedy was constructed in accordance with the requirements of the Record of Decision (ROD) document. Construction was completed in September 1993 with changes in the design made during construction.

The operation and maintenance activities for the Bowers Landfill site have been conducted by the potentially responsible parties' (PRPs) consultant, Cummings/Riter Consultants, Inc. They have also completed five annual monitoring reports since the last five year review. The latest monitoring event included the sampling and analysis of groundwater from six locations, surface water from three locations, a site inspection, and landfill gas monitoring. As in previous landfill gas monitoring events, there were no anomalies detected.

The remedy is functioning as designed. The immediate threats have been addressed and the remedy continues to be protective of human health and the environment. Exposure pathways that could result in unacceptable risks continue to be controlled. Institutional controls (ICs) are in place, but a title commitment will be performed to ensure that no interests adverse to the deed restriction have been filed since the last five-year review. IC mapping was completed as part of this review to demonstrate that the area is covered by the deed restrictions (See Figure 2). Threats at the site have been addressed through capping of contaminated soils and landfill debris, the installation of fencing and warning signs, the implementation of ICs, drainage improvements and the installation of sheet piling to control erosion. In addition, maintenance is being performed on a regular basis to ensure that the monitoring wells, gas vents and cap remain in good condition.

Long-term protectiveness of the remedial action will continue to be verified by the collection of groundwater and surface water samples. Current monitoring data indicate that barium remains the only contaminant above the MCL. However, the conservative mass loading calculation completed for the last five year review and repeated for this five year review concluded that the estimated in-stream concentration of barium entering the Scioto River was well below the Ohio EPA water quality criteria for barium within the Ohio River drainage basin. The previous determination that the levels of barium are not adversely impacting the Scioto River remains valid. In addition, there

are no actual or potential residential well receptors between the site and the Scioto River where barium was detected. Groundwater and surface water monitoring will continue on the schedule outlined in the updated 2010 Phase V Work Plan-Groundwater Monitoring/Operation and Maintenance Plan (Phase V O&M Plan).

### Five-Year Review Summary Form

#### SITE IDENTIFICATION

<b>Site name:</b> Bowers Landfill		
<b>EPA ID :</b> OHD980509616		
<b>Region:</b> 5	<b>State:</b> Ohio	<b>City/County:</b> Circleville/Pickaway

#### SITE STATUS

<b>NPL status:</b> Deleted	
<b>Multiple OUs?</b> No	<b>Has the site achieved construction completion?</b> Yes

#### REVIEW STATUS

<b>Lead agency:</b> U.S. EPA
<b>Author name:</b> Dion Novak
<b>Author affiliation:</b> U.S. EPA Region 5
<b>Review period:</b> 11 /29 /11 to 3 /15 /12
<b>Date(s) of site inspection:</b> 1 /24 /12
<b>Type of review:</b> Statutory
<b>Review number:</b> 4
<b>Triggering action date:</b> 8/15/2007
<b>Due date (five years after triggering action date):</b> 8/15/2012

## Issues/Recommendations

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

None

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

<b>OU(s): 1</b>	<b>Issue Category: Institutional Controls</b>			
	<b>Issue: An IC monitoring plan is needed to ensure IC enforceability</b>			
	<b>Recommendation: Develop an IC monitoring plan</b>			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	PRP	U.S. EPA/Ohio EPA	December 2012

## Protectiveness Statement(s)

*Operable Unit:*                      *Protectiveness Determination:*

1

Protective

*Protectiveness Statement:* The remedy at Bowers Landfill protects human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled. Institutional controls are in place; the site visit confirmed that current site use is consistent with IC restrictions. The continued legal viability of the deed restrictions will be verified through a title commitment. Threats at the site have been addressed through capping of contaminated soils and landfill debris, the installation of fencing and warning signs, the implementation of institutional controls, drainage improvements and the installation of sheet piling to control erosion. In addition, maintenance is being performed on a regular basis to ensure that the monitoring wells, gas vents, and cap remain in good condition.

For the remedy to be protective in the long-term, the following actions need to be taken to ensure long-term protectiveness: Ongoing implementation of the annual ground and surface water monitoring program. Current data indicates that barium is the only contaminant above the MCL. However, a conservative mass loading calculation concluded that the estimated in-stream concentration of barium entering the Scioto River is below the Ohio EPA water quality criteria for barium within the Ohio River drainage basin. Levels of barium do not appear to be adversely impacting the Scioto River. In addition, there are no known residential well receptors between the site and the Scioto River where barium was detected. Ground and surface water monitoring will continue on the current schedule contained in the Phase V O&M plan.

## Site wide Protectiveness Statement

*Protectiveness Determination:* Protective

*Protectiveness Statement:* The remedy at Bowers Landfill remains protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled. Institutional controls are in place; the site visit confirmed that current site use is consistent with IC restrictions. Threats at the site have been addressed through capping of contaminated soils and landfill debris, the installation of fencing and warning signs, the implementation of institutional controls, drainage improvements and the installation of sheet piling to control erosion. In addition, maintenance is being performed on a regular basis to ensure that the monitoring wells, gas vents, and cap remain in good condition.

Long-term protectiveness of the remedial action will be verified by the continued collection of ground and surface water samples. Current data indicates that barium is the only contaminant above the MCL. However, a conservative mass loading calculation concluded that the estimated in stream concentration of barium entering the Scioto River is well below the OEPA water quality criteria for barium within the Ohio River drainage basin, and that the levels of barium do not appear to be adversely impacting the Scioto River. In addition, there are no actual or potential residential well receptors between the site and the Scioto River where barium was detected. Ground and surface water monitoring will continue on the current schedule contained in the Phase V groundwater monitoring/O&M plan.

## Introduction

The purpose of the Five-Year Review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in the Five-Year Review reports. The Five-Year Review reports also identify issues found during the review and identify recommendations to address them.

The Agency is preparing this Five-Year Review report pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121 and the National Contingency Plan (NCP). CERCLA §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 five 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.*

The Agency interpreted this requirement further in the NCP; 40 Code of Federal Regulation (CFR) §300.430(f)(4)(ii) 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 the initiation of the selected remedial action.*

The First Five-year Review Report was completed on July 23, 1997 by Ohio EPA and reviewed by U.S. EPA, Region 5. The Second Five-Year Review Report was completed on August 23, 2002 by Ohio EPA and approved by U.S. EPA, Region 5. The Third Five Year Review Report was completed by U.S. EPA on August 23, 2007.

This is the Fourth Five-Year Review Report for Bowers Landfill, and it was conducted by U.S. EPA, Region 5, and reviewed by Ohio EPA. Ohio EPA continues to take the lead for oversight of O&M activities at the site under the 1996 State Consent Decree with the PRPs. The triggering action for this statutory review is the signature date of the Third Five-Year Review Report on August 15, 2007.

## Site Chronology

Event	Date
Accepted waste	1958 – 1968
Pre-NPL responses - Ground and surface water were sampled.	1980
NPL listing	September 1983
Remedial Investigation/Feasibility Study initiated	1983
Remedial Investigation/Feasibility Study complete	1989
ROD signature	March 31, 1989
Remedial design start/complete	1990 – 1991
Superfund State Contract	July 5, 1991
Actual remedial action start	February 1992
Construction dates (start, finish)	March 1992/Spring 1993
Construction completion date	September 1993
Remedial Action Report	September 1993
Deletion from NPL	October 29, 1997
First Five-Year Review	July 23, 1997
Second Five-Year Review	August 23, 2002
Third Five-Year Review	August 15, 2007
Approved Phase V O&M Plan	May 2010

## **Background**

### **Physical Characteristics**

Bowers Landfill is located in Pickaway County at the junction of Island and Circleville-Florence Chapel Roads, 2.5 miles north of Circleville, Ohio (Figure 1 and 2). The site lies in the Scioto River flood plain and is L-shaped with its ends abutting the river.

The landfill is approximately 12 acres in size, 3,500 feet long, about 125 feet wide and ten feet above grade. The current owner is a holding company established by the estate of Dr. John M. Bowers.

Bowers Landfill is located in a rural area. At the time of the remedial investigation, 15 houses were found to be located within a half mile of the site. These homes depended on domestic water wells for drinking water. The wells were sampled and no site related contamination was found.

### **Land and Resource Use**

Bowers Landfill began operation in 1958 and was closed in 1968. There was no activity at the site after 1968, except for unauthorized dumping of many large items such as appliances and used tires by individuals.

The surrounding area is rural, with some residences, and ponds to the east where quarrying occurred in the past. The Scioto River is to the west and is used for boating, fishing and swimming. There are no future uses intended for the site. The landfill has been capped and the site is partially fenced, with posted warning signs.

The groundwater underlying the site flows towards and discharges to the Scioto River. No drinking water wells are located between the landfill and the river.

### **History of Contamination**

Information is limited regarding the type and amount of wastes that were deposited at Bowers Landfill. However, an approximation was made that the landfill contains 130,000 cubic yards of waste material.

The type of wastes disposed of at Bowers Landfill consisted mostly of residential waste collected by private haulers from the Circleville area. Beginning in 1963, the site received wastes from local industries. This continued until the landfill was closed in 1968.

### **Initial Response**

Groundwater and surface water were first sampled in 1980. Three monitoring wells

were installed at that time as part of the Preliminary Assessment/Site Investigation (PA/SI) activities. Contamination by VOCs were detected in monitoring wells west of the landfill but not to the east. The VOCs detected were ethylbenzene, toluene and xylene.

Bowers Landfill was added to the NPL in September 1983. The Potentially Responsible Parties (PRPs), E.I. Du Pont de Nemours and Company (Du Pont) and PPG Industries, Inc. (PPG), signed a consent order with Ohio EPA and U.S. EPA to conduct a Remedial Investigation/Feasibility Study (RI/FS). This was conducted from 1985 to 1989.

### **Basis for Taking Action**

Ground water, surface water, sediment and soil were sampled at Bowers Landfill. It was determined that exposure to contaminated ground water and soil, mainly via the ingestion pathway, were the principal threats to be addressed by the remedial action. Barium and benzene exceeded their MCLs in ground water at one monitoring well. However, ground water down gradient of the landfill is not used as a drinking water source. In addition, residential drinking water wells up-gradient of the site were sampled during the RI and showed no effects from the landfill.

A risk assessment of soil contamination indicated that the Hazard Index was exceeded using a worst case scenario for ingestion of contaminated soil. In addition, the total cancer risk was  $3 \times 10^{-6}$ , which represents an incremental increased cancer risk of 3 in 1,000,000.

Despite the low levels of contamination found, potential future risks were possible because the landfill was poorly covered in some areas. In other areas, wastes were covered by less than a foot of soil. Other reasons for proposing remedial action were that hazardous substances were placed in the landfill and that frequent flooding of the area occurs.

## **Remedial Actions**

### **Remedy Selection**

The ROD was signed on March 31, 1989. The remedy selected was capping, with gas and ground water monitoring to be conducted subsequent to capping. The Remedial Design (RD) began in 1990 and was completed the following year. The Remedial Action (RA) began in 1992 and was completed in 1993.

The principal objective of the RA was to reduce the infiltration of precipitation into the landfill by installing a low-permeability clay cover on the landfill. The RA for the site included removing surface debris and vegetation from the landfill, installing a low-permeability clay cover on the landfill, constructing erosion control measures and

drainage improvements, restricting site access and use, installing additional ground water monitoring wells and a gas venting system, maintaining the clay cover after construction, and monitoring ground water and surface water.

Two pre-design field investigations were conducted: 1) a geotechnical investigation to evaluate the properties of potential cover materials and 2) a soil gas study to determine whether a gas venting system should be constructed.

The first investigation determined that the material in the field west of the landfill was acceptable for usage as the clay layer. The excavation pits were converted into wetlands. This area is in the Scioto River flood plain and is frequently inundated with flood waters.

The soil gas survey indicated that a gas collection and venting system was needed as part of the landfill cover. Both methane and VOCs were detected.

During August 1990, ground and surface water sampling was conducted to determine if any changes had occurred subsequent to the last sampling event. The sampling results were used to determine which monitoring wells to use in the long term O&M program.

### **Remedy Implementation**

The following paragraphs highlight the actions taken to complete the requirements of the ROD.

Trees, brush, weeds and exposed/surface debris were removed. Most of the vegetation was burned. Old tires and appliances were decontaminated, removed from the site, and properly disposed of off-site. Land filled material was kept on-site and placed so that it did not interfere with the capping process.

During the RA, eight additional monitoring wells were installed. Five of these wells were placed in the area west of the landfill. The remaining three were installed off-site on the west side of Island Road, about 1,500 feet south of the site. In addition, many of the established monitoring wells had risers attached to them and the areas around them were mounded to make access easier during flood events.

The gas venting system was installed in the grading layer, with the gravel layer placed around the header. Gases generated rise through the graded layer and are vented into the atmosphere.

The cover system included the following from bottom to top: grading and gas venting layer (one foot thick), low permeability clay cover (2.5 feet thick), and vegetated topsoil cover (3.5 feet thick).

The erosion protection and drainage improvements were accomplished by stabilizing the slopes and promoting drainage, installing sheet piling at the ends of the landfill abutting the Scioto River to stabilize the cap in that area, planting grass on the top and sides of the landfill, reducing the infiltration of surface water through the capping process, and reconfiguring the ditch system.

**Institutional Controls**

Institutional controls (ICs) are non-engineered instruments such as administrative and/or legal controls that help minimize the potential for exposure to contamination and protect the integrity of the remedy. Compliance with ICs is required to assure long-term protectiveness for any areas which do not allow for unlimited use or unrestricted exposure (UU/UE). The table below summarizes institutional controls for these restricted areas.

<b>Media, Engineered Controls, &amp; Areas that Do Not Support UU/UE Based on Current Conditions.</b>	<b>IC Objective</b>	<b>Title of Institutional Control Instrument Implemented (note if planned)</b>
Bowers Landfill Site Area and Landfill Cap	Prohibits use of land underlying the site and assures integrity of the landfill cap.	"Bowers Deed Restrictions" attachment to RD/RA CD, recorded at Pickaway County recorder's office on October 16, 1996.
<i>RA Components</i> such as Landfill gas collection and venting system and monitoring wells	Assures integrity of remedy components	"Bowers Deed Restrictions" attachment to RD/RA CD, recorded at Pickaway County recorder's office on October 16, 1996.
<i>Groundwater</i> – current area that exceeds groundwater cleanup standards identified at the site. This area is immediately between the landfill and the Scioto River at monitoring well location P-5B.	Prohibits groundwater use until cleanup standards are achieved.	"Bowers Deed Restrictions" attachment to RD/RA CD, recorded at Pickaway County recorder's office on October 16, 1996.

As recommended as part of the previous Five Year Review, EPA has prepared more detailed mapping which outlines the boundaries of the area covered by the deed restrictions (See Figure 2).

Pursuant to a Consent Decree entered on December 14, 1993 between U.S. EPA, the State of Ohio, and a group of PRPs, United States v. Du Pont de Nemours & Co. and PPG Industries, Inc., 2:91-CV-742 (S.D. OH, E. Div.), the Site owner, the Estate of John N. Bowers by its agent Ellen J. Bowers, agreed to execute and record an appended document titled "Bowers Deed Restrictions." The Consent Decree, at Section V, Para. 9, references this document, directs that a copy be filed in the Pickaway County Recorder's Office, and provides that a notice to successors in title be included in any future transfer of the property. The "Bowers Deed Restrictions" document provides a comprehensive list of land use controls to be observed by the landowner, and covers

each of the IC elements described above.

As discussed above, the Site owner recorded a copy of the "Bowers Deed Restrictions" document with the County Recorder's Office on October 16, 1996 (Instrument No. 9600008220, Vol. 021, page 468-471). The document states that it "runs with the land" and that the obligation to maintain the enumerated restrictions on property use "shall remain in effect until such time as the Ohio EPA files with the Court a written certification," as specified in the document (Deed Restriction, page 3, County Recorder's Office, Vol. 021, page 470). In 2006, the Bowers Estate transferred title of the Site to a holding company constituted by the estate agent. The "Bowers Deed Restrictions" document was duly recorded in the Pickaway County Recorder's office (Vol. 0594, pp. 2071-2075). The table above summarizes ICs for these restricted areas.

In 2007, OEPA reviewed title records for the site and the scope of the deed restrictions, and confirmed that the deed restrictions were appropriately recorded and that they remain enforceable as a valid prior instrument under the State's Uniform Environmental Covenant Act (UECA), which sanctions those restrictions or equitable servitudes that were appropriately developed and recorded prior to Ohio's passage of the UECA statute. EPA continues to work with Ohio EPA to ensure the continued enforceability of the deed restrictions for the Bowers site. The table above summarizes ICs for each of the restricted areas.

### **Operation and Maintenance (O & M)**

The first year of O&M was overseen and conducted by U.S. EPA. The PRPs agreed to do the ground-water monitoring for the first year, with U.S. EPA's contractor, PRC Environmental Management, Inc., being responsible for conducting the remaining tasks.

The specific tasks that were listed for the 30 years of operation and maintenance are as follows: 1) gas monitoring, 2) ground and surface water monitoring, 3) maintenance of the landfill cap, 4) site inspections, and 5) repairs.

The PRPs signed a consent decree with the State of Ohio in September 1996 to conduct all post-construction activities at the site, beginning with the second year of O&M. Early in the second year, the PRPs' contractor abandoned Monitoring Well P15-B because a bailer was caught at the bottom of the well. The well was replaced by Monitoring Well P15-BR.

Initially, ground water sampling was conducted on a quarterly basis and analyzed for VOCs, Semi-Volatile Organic Compounds and metals. Quarterly sampling continued through 1998. In March and June of 1999, due to the lack of any sampling events showing the presence of organic chemicals, analysis of ground water was reduced to sampling for inorganic chemicals only. The next sampling event in April 2001 began annual ground water monitoring for inorganics. Barium is currently the only constituent above the Maximum Contaminant Level (MCL). Certain other inorganics are

statistically elevated compared to background levels, but do not exceed MCLs or present any concern or threat.

Surface water continues to be sampled and analyzed annually in the wetlands and the east ditch when the areas are not dry. Gas monitoring for methane and VOCs occurs on an annual basis.

Cummings-Riter Consultants has been using ChemStat by Starpoint Software to statistically analyze the data. In addition, beginning with the September 1998 sampling event, barium has been undergoing statistical analysis using the Sheward-CUSUM control chart. This compares current sample results against the initial 1998 analysis. These statistical analyses were used by the Volpe National Transportation Systems Center as summarized in their statistical analysis report of the Bowers Landfill prepared on behalf of U.S. EPA Region 5 (September 2002).

In 2003, a massive cutting of encroaching vegetation was needed along the sides of the landfill and along the mounded areas. At one point, damage occurred to the front gate and was repaired. Also, the monitoring well casings were stenciled with the identification numbers.

As part of the continuing O&M, the site is monitored for evidence of trespassing, cap subsidence, and any potential impacts to groundwater or surface water from the landfill. Phase 5 of the site O&M began in 2010 with the approval of the Phase V O&M Plan, which reduced monitoring requirements to six groundwater wells and three surface water locations, in addition to the monitoring tasks described earlier, including gas monitoring and cap maintenance activities.

## Progress Since the Last Five Year Review

At the conclusion of the third Five Year Review, EPA concluded that the remedy was protective of human health and the environment. EPA identified the following issues and recommendations in the previous Five Year Review.

Issues from Previous Review	Recommendations/ Follow-up Actions	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Barium detected above the MCL in Well P-5B.	Continue annual groundwater monitoring program.	PRPs	Ongoing	Annual groundwater monitoring continued through review period	Annually
Mapping of the area covered by the deed restrictions is needed to assure that they are effective	Complete IC mapping.	US EPA	11/2007	IC mapping completed	11/29/07

Issues from Previous Review	Recommendations/ Follow-up Actions	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Long term stewardship must be assured which includes maintaining and monitoring effective ICs	Prepare IC monitoring plan	PRPs	August 2008	Finalize IC monitoring plan	Not completed during this review period but is included in recommendations below

Animal burrow holes in well pads on the cap continue to require periodic filling. As the grass has become thicker around the edges of well pads, the number and size of the burrows have decreased. Monitoring well tags are replaced as needed. Minor repairs to the cap have been made on an ongoing basis.

Minor trespassing has been noted over the last ten years, a decrease from previous years. The decrease in trespassing may be related to neighbor's installation of barbed wire around their property, which has blocked two dirt roads which previously had provided access to the Site.

## Five-Year Review Process

### Administrative Components

EPA notified the PRPs of the initiation of this five-year review through the PRPs consultant, Cummings Riter Consultants, Inc. Due to the uncomplicated nature of the review, EPA did not establish a review team. Ohio EPA conducted the Second Five Year Review, including the site inspection. The Third Five-Year Review report was written by U.S. EPA. EPA prepared this Fourth Five-Year Review. In preparing this Report, EPA consulted with OEPA and reviewed data summary reports on ground and surface water analyses, as well as the EPA led site inspection information.

### Community Involvement

EPA determined that a news release to the community would be sufficient notice for the Fourth Five-Year Review. An advertisement of the Five-Year review process appeared in the Circleville Herald on February 17, 2012. EPA received no public inquiries or comments on this Five Year Review process.

### Data Review

In preparing this Five Year Review Report, EPA reviewed all ground and surface water data. As discussed above, based on reductions of chemicals detected. OEPA determined that the scope and frequency of groundwater and surface water monitoring could be reduced. Accordingly, Phase V of the Site O&M, which provided for this reduced sampling, began in 2010. The PRPs continue to conduct annual sampling for metals in ground water and surface water, pursuant to the Phase V Plan.

Barium continues to be the only constituent detected over its MCL (2,000 ug/l) and has been detected at this level in only one monitoring well, P-5B, at concentrations ranging from 2,310 ug/l to 2,500 ug/l over the duration of reporting period. As a result of these continuing exceedances, the PRPs continue to use an additional statistical tool to further analyze the barium data against the initial barium monitoring data. This analysis continues to use the Shewart-CUSUM control chart. The results of this analysis continue to validate conclusions from the previous Five Year Review that barium is not impacting the Scioto River at levels above regulatory standards.

Institutional controls, including deed restrictions that prohibit use of ground-water for drinking water use continue to ensure that there is no exposure to contaminated ground water from the site. The level of barium in Monitoring Well P-5B has fluctuated slightly over the years at just above the MCL. Monitoring Well P-5B is located between the landfill and the Scioto River within the area restricted from being used for residential wells. Since this location is covered by the site deed restriction, there are no groundwater receptors at this location.

### **Site Inspections**

During the January 2012 joint inspection, the monitoring wells, bumper posts, pads and gas vents were inspected. The grass cover, sheet piling and fencing were checked, as well as areas of the cap that have been previously repaired due to erosion of the cover.

The cover itself is clear of brush and saplings. The access road to the landfill is in good condition.

The wetlands/ponds are well covered in vegetation. The inlets to the ponds from the Scioto River are in good condition and are free of vegetation. Sediment from the river has been deposited in the ponds during flood events, which restricts any negative impacts on the landfill cap.

The sheet piling, monitoring wells, gas vents and fence are in good condition. An area of the sheet piling along the northern portion of the site requires maintenance because a groundwater seep was discovered there during the Site inspection. The grass cover is in good condition. The PRPs have conducted repairs as needed, but such repairs have been minor, such as repainting of wells and gas vents, correcting areas of erosion and filling in animal burrow holes. The PRPs will conduct additional cap repair in several areas where subsidence was discovered during Spring 2012 landfill maintenance.

The fencing and gate securing the site were in good condition. Signs were posted at the entrance to the site and the access road was also in good condition. There is temporary fencing in the landfill's eastern drainage ditch that prevents access to Monitoring Well P-13B, and a tent structure remains in place in this ditch area at the bottom of the steep slope to Island Road. No one has been observed near the tent but

the PRP's contractor has been notified to work with the Ohio EPA to ensure that the tent and any contents are properly inspected and removed and to address any other trespasser activities. This will also be completed as part of the Spring 2012 landfill maintenance and reported to the Agencies when completed.

## **Interviews**

As Ohio EPA retains the overall lead for the site O&M under the 1996 State Consent Decree with the PRPs, both Ohio EPA staff, Project Manager Diana Bynum, and the PRPs representative, Cummings Riter Consultants, were present at the EPA site inspection and were questioned regarding current site conditions and previous maintenance work.

## **Technical Assessment**

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

Yes.

The remedial action is operating and functioning as designed. The capping of the landfill continues to achieve the containment of waste and the prevention of the migration of precipitation to ground water. Institutional controls have prevented ready access to the landfill, and have prevented access to groundwater. To determine whether they remain protective and in place, a title commitment will be conducted. Fencing is in good condition and the warning signs are in place.

Operation and maintenance has been effective. Animal burrowing occurs around some of the monitoring well pads but appears to be lessening as the grass becomes thicker. While these burrows are shallow, they are refilled with soil and reseeded after each discovery. There were several burrow holes identified during the site inspection which will be repaired during Spring 2012 maintenance work. There were several erosional areas identified during the inspection that also will be repaired during Spring 2012 maintenance. The grass cover is well maintained. Maintenance activities, such as painting of monitoring wells, are conducted as needed.

Barium concentrations in Monitoring Well P-5B continue to be above the MCL. The results from the latest sampling data in 2011, showed barium in Monitoring Well P-5B at a concentration of 2,500 ug/l. However, there are no potential drinking water wells at this location between the site and the Scioto River, and the area is covered by the site deed restriction, which prohibits groundwater wells in this area.

At the request of the Ohio EPA, the effect of barium concentrations reported in Monitoring Well P-5B are evaluated using a conservative mass loading calculation from the Shewart-CUSUM control chart modeling. This calculation assumed that ground water monitored in Monitoring Well P-5B contributes base flow to the Scioto River. The

latest calculation concluded that the estimated concentration of barium entering the Scioto River remains 0.04 ug/l, which is well below the Ohio EPA water quality criteria for barium within the Ohio River drainage basin (1,000 ug/l).

**Question B: Are the exposure assumptions, toxicity data, cleanup levels, and Remedial Action Objectives (RAOs) used at the time of the remedy selection still valid?**

Yes.

There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy.

There have been no changes in applicable or relevant and appropriate standards or "to be considered" standards that would apply to the Bowers Landfill Site.

Land use has not changed near the landfill. No new exposure pathways or receptors have been identified. The remedy is progressing as expected.

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

No.

No additional information was discovered to call into question the protectiveness of the remedy.

### **Technical Assessment Summary**

According to the data reviewed and the site inspections, EPA concludes that the remedy is functioning as intended. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. Barium concentrations in ground water have not been reduced, but they are detected in only one monitoring well above the MCL and appear not to be adversely impacting surface water as evidenced by the latest groundwater/surface water modeling. There have been no changes in the MCL standard for barium. There is no other information that calls into question the protectiveness of the remedy.

## Issues

<b>Issues</b>	<b>Affects Current Protectiveness (Y/N)</b>	<b>Affects Future Protectiveness (Y/N)</b>
An IC monitoring plan, which includes the need to conduct a title commitment, needs to be developed to assure effective monitoring and maintenance of site ICs	No	Yes

## Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
An IC monitoring plan, which includes the need to conduct a title commitment, is needed to ensure IC enforceability	Develop IC monitoring plan	PRPs	U.S.EPA/ OEPA	December 2012	No	Yes

## Protectiveness Statement

The remedy at Bowers Landfill protects human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled. Institutional controls are in place and were verified as part of this Five-Year Review. Threats at the site have been addressed through capping of contaminated soils and landfill debris, the installation of fencing and warning signs, the implementation of institutional controls, drainage improvements and the installation of sheet piling to control erosion. In addition, maintenance is being performed on a regular basis to ensure that the monitoring wells, gas vents and cap remain in good condition.

For the remedy to be protective in the long-term, the following actions need to be taken to ensure long-term protectiveness: ongoing implementation of the annual ground and surface water monitoring program. Current data indicates that barium is the only contaminant above the MCL. However, a conservative mass loading calculation concluded that the estimated in stream concentration of barium entering the Scioto River is below the Ohio EPA water quality criteria for barium within the Ohio River drainage basin. Levels of barium do not appear to be adversely impacting the Scioto River. In addition, there are no known residential well receptors between the site and the Scioto River where barium was detected. Ground and surface water monitoring will continue on the current schedule contained in the Phase V O&M plan.

## **Next Review**

The next Five-Year Review for Bowers Landfill is required five years from the signature date of this review.

Figure 1 Site Figure

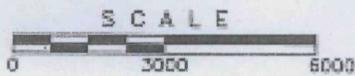


FIGURE 1  
SITE LOCATION MAP  
BOWERS LANDFILL  
CIRCLEVILLE, OH

PREPARED FOR  
E.I. du PONT de NEMOURS AND CO.  
WILMINGTON, DE  
AND  
PPG INDUSTRIES, INC.  
PITTSBURGH, PA

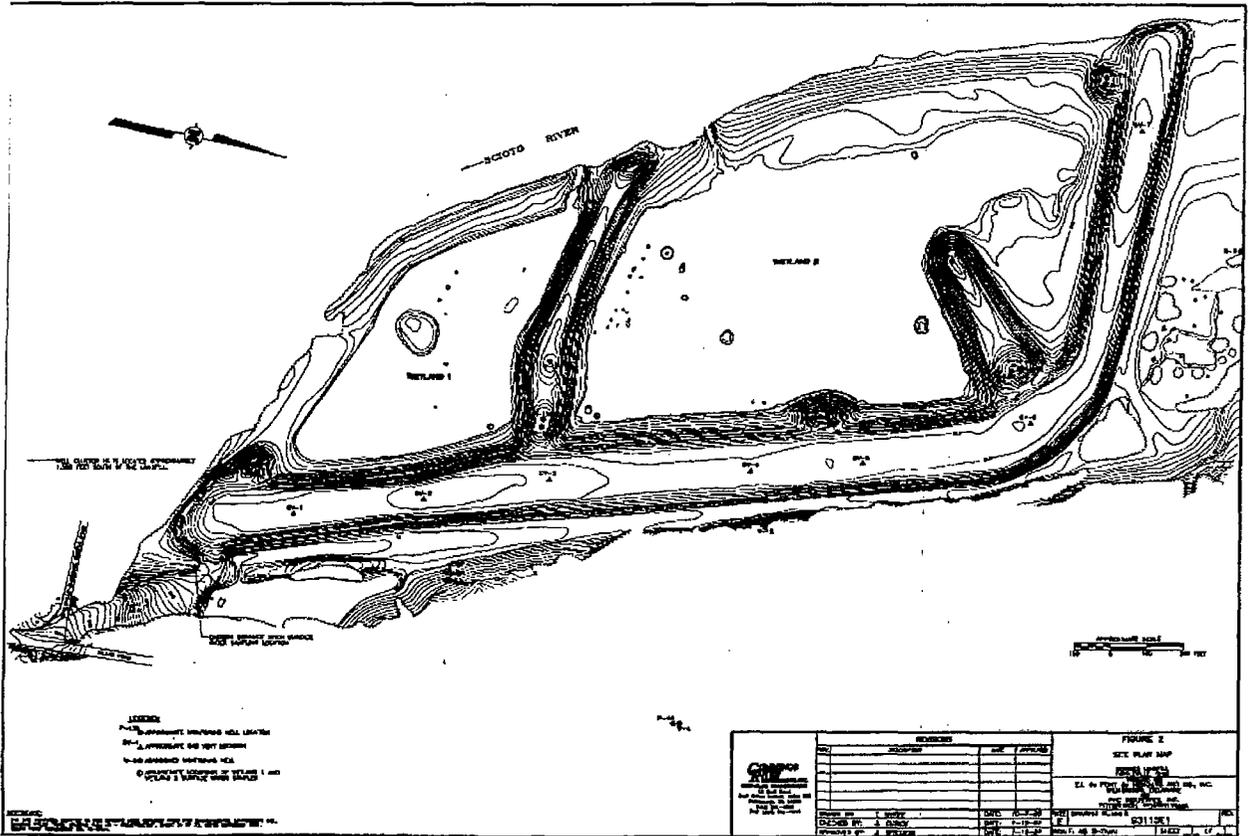
**CUMMINGS  
RITER**  
CONSULTANTS, INC.

DRAWING NUMBER  
93115A6

REFERENCE:  
7.5 MIN. U.S.G.S. TOPOGRAPHIC MAP  
OF ASHVILLE, OH QUADRANGLE.  
DATED: 1958, PHOTOREVISED: 1970,  
SCALE: 1"=2000'

1	5-11-10	SITE LOCATION INDICATOR	DRAWN BY: S. HEINACK	DATE: 6-24-93
			CHECKED BY: D. SPICUZZA	DATE: 6-24-93
REVISION	DATE	DESCRIPTION	APPROVED BY: P. O'HARA	DATE: 6-24-93

# Figure 2 Site Plan Map



### Figure 3 Institutional Controls Map

**Institutional Control (IC) Review**  
 Areas Depicting Required and  
 Implemented Institutional Controls

**Superfund**  
 U.S. Environmental Protection Agency



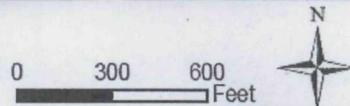
**Bowers Landfill**  
 Pickaway County, OH

OHD980509616



**Legend**

- Bowers Landfill Boundary
- Landfill Cap- Required and Implemented IC
- Land and Groundwater Use Restrictions - Implemented IC\*



\* See the Bowers Deed Restrictions (1996) for the restriction details. Recorded at the Pickaway County, OH recorder's office.

EPA Disclaimer: Please be advised that areas depicted in the map have been estimated. The map does not create any rights enforceable by any party. EPA may refine or change this data and map at any time.

Produced by Sarah Backhouse  
 U.S. EPA Region 5 on 11/29/07  
 Image Date: 2006