

# THIRD FIVE-YEAR REVIEW REPORT

Walsh Landfill Superfund Site  
(a.k.a. Welsh Road/Barkman Landfill)

Honey Brook Township  
Chester County, Pennsylvania

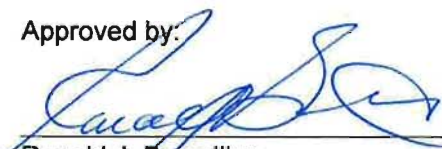
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# Five-Year Review Report

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## **List of Acronyms**

ARAR	Applicable or Relevant and Appropriate Requirement
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
EPA	United States Environmental Protection Agency
ET	Evaporation Transpiration
GMP	Groundwater Monitoring Plan
HBBA	Honey Brook Borough Authority
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
NCP	National Contingency Plan (the National Oil and Hazardous Substances Pollution Contingency Plan)
NPL	National Priorities List
O&M	Operation and Maintenance
PADEP	Pennsylvania Department of Environmental Protection
PADER	Pennsylvania Department of Environmental Resources
PRPs	Potentially Responsible Parties
PRP Group	A group of PRPs including Alcoa, Unisys Corp., and Waste Management
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RDWP	Remedial Design Work Plan
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SDWA	Safe Drinking Water Act
SVOC	Semi-Volatile Organic Compounds
UAO	Unilateral Administrative Order
USACE	U.S. Army Corps of Engineers
VOC	Volatile Organic Compound

## Executive Summary

The remedy for the Walsh Landfill Superfund Site in Honey Brook, Pennsylvania, included: extension of the Honey Brook Borough Authority (HBBA) water supply system, clearing the surface of the Site, capping the landfill area, institutional controls, and groundwater monitoring. The Site achieved construction completion status when the Preliminary Close Out Report (PCOR) was signed by EPA on August 16, 2006. The trigger for this Five-Year Review was the previous Five-Year Review Report signed on May 22, 2006.

The assessment of this Five-Year Review found that the water supply system extension was constructed in accordance with the requirements of the Operable Unit 1 (OU1) Record of Decision (ROD; 1990). A ROD Amendment for OU1 was issued by EPA in July 2003 and changed the landfill cap remedy design (permitting an evaporation/transpiration (ET) cover system to be used in lieu of a multi-media landfill cover). The ET cover system was constructed in 2006 and has been maintained in accordance with the approved Operation & Maintenance (O&M) Plan. In August 2006, the Potentially Responsible Party (PRP) Group implemented institutional controls (ICs) at the Site in the form of deed notices for all properties on which the ET cover system and associated components were placed. A ROD for OU2 (groundwater) was issued by EPA in February 2006. The OU2 ROD calls for the long-term monitoring of groundwater and implementation of institutional controls. The long-term monitoring of groundwater is being performed under the OU1 ROD Amendment remedy via the EPA-approved Groundwater Monitoring Plan (April 2005).

The remedy at the Walsh Landfill is protective in the short-term because all exposure pathways that could result in unacceptable risks are being controlled. The Site will be fully protective when the Remedial Action Objectives (RAOs) (see pages 13-14) have been achieved. Monitoring of groundwater is expected to continue until cleanup goals are met. An evaluation of the functional equivalence of the ET cover system to the requirements for final covers under the Commonwealth of Pennsylvania's Solid Waste Regulations will be made during the next (4<sup>th</sup>) Five-Year Review. It is expected that cleanup goals (MCLs) for groundwater will be met once the ET cover system becomes fully functional.

The vapor intrusion pathway and off-Site landfill gas migration do not pose an unacceptable risk to any homes located adjacent to the Site.

Institutional controls are in place for this Site.

## **Government Performance Results Act (GPRA) Measure Review**

As part of this Five-Year Review, the GPRA Measures were reviewed. The GPRA Measures and their status are provided as follows:

### ***Environmental Indicators***

Human Exposure (HE) Survey Status: Human Exposure Controlled and Protective Remedy in Place.

Groundwater Migration (GM) Survey Status: Contaminated Groundwater Migration Under Control.

### ***Sitewide RAU***

The Site was determined to be Site-Wide Ready for Anticipated Use (SWRAU) on July 30, 2010.





## Five-Year Review Summary Form, cont'd.

### Issues:

1. Landfill gas (LFG) mitigation measures were implemented at the Site in August 2010 along the landfill property boundary. Limited LFG monitoring data is available to determine if the mitigation measures installed in 2010 were successful.
2. The performance standard for the ET cover system, which is to attain a standard of performance that is functionally equivalent to that required under the Commonwealth of Pennsylvania's Solid Waste Regulations, has not been evaluated.

### Recommendations and Follow-up Actions:

1. Continue landfill gas (LFG) migration monitoring and assess the long-term performance of the LFG mitigation measures installed in 2010. A summary of findings and recommendations for future actions is to be presented in a 2011 quarterly progress report.
2. Prepare a report that evaluates the functional equivalence of the ET cover system to the requirements for final covers under the Commonwealth of Pennsylvania's Solid Waste Regulations. Per the performance standards contained in the 2003 ROD Amendment, the report will be evaluated by EPA and PADEP during the next (4<sup>th</sup>) Five-Year Review of the Site.

### Protectiveness Statement(s):

The remedy at the Walsh Landfill is protective in the short-term because all exposure pathways that could result in unacceptable risks are being controlled. The Site will be fully protective when the Remedial Action Objectives (RAOs) (see pages 13-14) have been achieved. Monitoring of groundwater is expected to continue until cleanup goals are met. An evaluation of the functional equivalence of the ET cover system to the requirements for final covers under the Commonwealth of Pennsylvania's Solid Waste Regulations will be made during the next (4<sup>th</sup>) Five-Year Review. It is expected that cleanup goals (MCLs) for groundwater will be met once the ET cover system becomes functional.

The vapor intrusion pathway and off-Site landfill gas migration do not pose an unacceptable risk to any homes located adjacent to the Site.

Institutional controls (ICs) are in place for this Site.

### Other Comments:

The GPRA Measures and their status are provided as follows:

#### ***Environmental Indicators (verified on 6/22/10)***

Human Exposure (HE) Survey Status: Current Human Exposure Controlled

Groundwater Migration (GM) Survey Status: Contaminated Groundwater Migration Under Control

#### ***Sitewide RAU***

The Site was determined to be Site-Wide Ready for Anticipated Use (SWRAU) on July 30, 2010.

# Five-Year Review Report

## I. 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, and continues to function as designed. The methods, findings and conclusions of reviews are documented in a Five-Year Review report. In addition, a Five-Year Review report identifies issues found during the review, if any, and identifies recommendations to address them.

The United States Environmental Protection Agency (the Agency or EPA) is preparing this Five-Year Review report pursuant to Section 121 of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, (CERCLA) and the National Oil and Hazardous Substances Pollution 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 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. At 40 C.F.R. § 300.430(f)(4)(ii) it 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 United States Environmental Protection Agency Region 3 has conducted a Five-Year Review of the remedial actions implemented at the Walsh Landfill Superfund Site in Honey Brook Township, Chester County, Pennsylvania.

This is the third (3<sup>rd</sup>) Five-Year Review for the Walsh Landfill Superfund Site. The triggering action for this statutory review is the signature date of the last Five-Year Review, as shown in EPA's WasteLAN database: May 22, 2006. The Five-Year Reviews for this Site are required because hazardous substances, pollutants, or contaminants were left on-Site and do not allow for unlimited use and unrestricted exposure.

## II. Site Chronology

A chronology of Site-related events from discovery to the present is summarized in Table 1.

<b>Table 1 Chronology of Site Events</b>	
<b>Event</b>	<b>Date</b>
Disposal of residential and commercial refuse begins at the Site.	1963
Barkman notified by the PA Department of Health for disposing without a permit.	August 1970
Barkman submits an application for a solid waste disposal permit with the PA Department of Health.	January 1971
Phase I application received by PADER and deficiencies are noted.	September 1972
PADER files a criminal complaint against Barkman for operating a disposal facility without a permit and open burning of solid waste.	August 1973
PADER inspections revealed violations; no final cover and salvaging operations.	August 1974
Closure plan for the landfill submitted to PADER.	October 1975
PADER inspection reveals that dumping is continuing and no closure activities have been initiated.	August 1977
PADER receives complaint that drums were dumped on Site and fumes had sickened some local residents.	July 1979
Groundwater sampling of nearby residences performed by PADER and Chester County Health Department.	August 1980
PADER inspection finds drums on Site and burning of solid waste.	March 1981
PADER requires Barkman to complete closure of the Site, conduct a groundwater study, and supply homeowners with potable water.	May 1981
PADER informed Barkman that the groundwater report is deficient, closure is necessary, and an expanded groundwater study needs to take place.	November 1982
SCA Services closed the acquisition of assets of Barkman's solid waste collection system.	November 1983
NPL listing.	09/08/1983 Proposed
	09/21/1984 Final
EPA removal to assess the situation of 55 gallon drums on the Site and conduct well sampling.	March 1985
PADEP begins supplying bottled water to residents near the Site as an interim remedial measure.	March 1989
Remedial Investigation/Feasibility Study complete.	06/29/1990

**Table 1  
Chronology of Site Events**

<b>Event</b>	<b>Date</b>
Record of Decision (ROD) for OU1.	06/29/1990
EPA initiates a groundwater study and the designs for a landfill cap and a water line extension.	May and August 1990
Real estate transfer agreement signed between EPA and the Honey Brook Borough Authority (HBBA).	October 1992
Construction agreement signed between EPA and HBBA for the water line extension project.	January 1995
Start of construction of water tank (standpipe).	May 1996
Start of construction of water system.	November 1996
Acceptance and transfer of the booster pump station, water mains, and water tank to the HBBA (Phase 1).	March 1998
Residents in the vicinity of the Site are connected to public water (Phase 2).	May 1998
Summary Judgement granted in the case of U.S. vs. Ernest Barkman, et al.	December 1998
UAO issued to PRP Group for implementation of cap remedy contained in 1990 ROD.	March 1999
PRP Group proposes alternate cap remedy to EPA and PADEP.	June 1999
Acceptance and transfer of the water treatment facility, Suplee Road water mains, and Well #8 to the HBBA (Phase 3).	June 1999
Focused Feasibility Study for alternate cap remedy prepared by the PRP Group.	May 2000
1 <sup>st</sup> Five-Year Review.	05/23/2001
USACE completes rehabilitation of HBBA Well #5	January 2002
Real estate transfer documents associated with the water line extension project are forwarded to HBBA for acceptance.	April 2002
Proposed Plan issued for alternate cap remedy.	August 2002
Motion for Contempt filed against Ernest and Grace Barkman.	December 2002
Schedule established for Ernest and Grace Barkman to clear the surface of the Site so that they would come into compliance with the Court's 1998 Order.	February 2003
ROD Amendment for alternate cap remedy (Evaporation/Transpiration cover system).	07/02/2003
UAO issued to PRP Group for RD/RA cap remedy.	09/05/2003
Real estate transfer documents associated with the water line extension project are executed by HBBA.	January 2005
Surface of the Site is cleared of all materials by Ernest and Grace Barkman.	March - October 2003

**Table 1  
Chronology of Site Events**

<b>Event</b>	<b>Date</b>
Design completed for alternate cap remedy.	May 2005
Start of construction of alternate cap remedy.	September 2005
Deeds associated with the water line extension project are recorded by the County.	October 2005
Record of Decision (ROD) for OU2 (groundwater).	02/02/2006
Pre-final inspection of the alternate cap remedy with the earthwork contractor and pre-construction meeting with tree contractor.	04/20/2006
2 <sup>nd</sup> Five-Year Review.	05/22/2006
Preliminary Close-Out Report (PCOR) prepared.	08/16/2006
Final approval on Interim RA Report for alternate cap remedy.	09/29/2006
Initial landfill gas (LFG) migration mitigation measures installed.	December 2006
Site-Wide Ready for Anticipated Use (SWRAU) designation.	07/30/2010
Supplemental LFG migration mitigation measures installed.	August 2010

### **III. Background**

#### **Physical Characteristics**

The Walsh Landfill Site (a.k.a. Welsh Road, Barkman Landfill, or Site) is located on approximately seven (7) acres, near the top of Welsh Mountain, approximately 1.25 miles north of the town of Honey Brook, Pennsylvania. See Attachment 1. The Site was placed on the National Priority List (NPL) in September 1984. The National Superfund electronic database identification number for the Site is PAD980829527.

The entrance to the Site borders on Welsh Road, 200 feet east of the intersection of Welsh Road with PA Route 10. Approximately five-sixths of the property area lies south of the Chester/Lancaster County line in Honey Brook Township, Chester County, while the remainder is located in Caernarvon Township, Lancaster County.

The predominant feature at the Site is a landfill that covers nearly the entire Site. The landfill was apparently constructed as a side-hill facility directly on top of the existing land surface. The Site was capped in 2006 with an evaporation/transpiration (ET) cover system consisting of approximately 4,000 hybrid poplar trees. Prior to installation of the ET cover system, the surface of the landfill area was cleared of buildings, offices, vehicles, equipment and other debris. An access road is located along the western and southern borders of the Site. A fifty-foot power line/utility right-of-way also lies along the southern portion of the boundary of

the Site. Aerial photographs that contrast the surface of the Site as it appeared in April 1984 and in 2008 are provided in Attachments 2 and 3, respectively.

#### **IV. Geology/Hydrogeology**

The topography of the Site area is dominated by Welsh Mountain, a ridge trending northeast-southwest with a range in elevation from about 740 feet to about 965 feet above mean sea level (MSL). The Site is situated on the southeastern side of Welsh Mountain. Elevations at the Site range from approximately 880 feet to 920 feet MSL. Areas south of the Site are low-lying, irregular hills and valleys.

The bedrock encountered at the Walsh Landfill is comprised of Granodiorite Gneiss and the Chickies Quartzite (and its basal Hellam Conglomerate Member). Groundwater occurs in and moves through fractures in the rock. South of the Site, groundwater also occurs in the saprolites (weathered bedrock) of the two units. Groundwater movement within the saprolites occurs within the remnant bedrock fractures at depth and in pore spaces nearer the surface.

The Granodiorite Gneiss is Precambrian in age and lies below the Hellam Conglomerate in the Site area. This unit is medium grained, light pink to greenish gray; largely quartz, feldspar and mica; commonly gneissic, containing alteration minerals and interfingers with gabbroic gneiss.

The Cambrian Chickies Quartzite is a vitreous to granular quartzite with interbedded quartzose schist. Bedding within the Chickies ranges from massive to thin bedded. This formation is light gray, hard, interbedded, and contains dark slate units near the top. The thickness of this formation is estimated to be about 500-1000 feet. Based on discussions with personnel from the nearby quarry, phyllite/kaolinite clay beds comprise approximately 5 percent of the Upper Chickies. The largest clay beds are found near the upper section of the formation.

The basal Hellam Conglomerate Member varies in character and contains conglomerate, sandstone, arkosic schist, black mica schist, blue quartz grains, and feldspar fragments. An erosional contact separates the older Precambrian gneiss from the younger Cambrian Hellam Conglomerate. The thickness of this member in Chester County is about 50 feet and it may be 200 to 400 feet thick at Welsh Mountain.

Two soil series have been mapped in the immediate Site area. Clymer series soils have been identified in those portions of the Site that are located in Lancaster County. Soils in the area of the Site in Chester County have been mapped as Edgemont Series Soils.

The permeability of the Clymer Series soils is moderate (0.6 to 2.0 inches/hour) in the subsoil and substratum; the available water capacity is moderate (3.3 to 5.2 inches/inch) to high (greater than 5.2 inches/inch). Runoff is medium. The permeability of the Edgemont series is moderately rapid (2.0 to 6.2 inches/hr) in the upper horizons and moderate (0.63 to 2.0 inches/hr) in the subsoil and substratum; the available moisture capacity is very low (0.18 inches/inch).

## **V. Land and Resource Use**

The areas east, southeast, northeast, and west/southwest of the Site are wooded with light residential population. Wood lots, farm fields, and pastures are located directly south of the Site. The nearest surface water consists of a series of three small ponds located within pasture land approximately ½ mile south of the Site.

The current land use in the area surrounding the Site is residential and agricultural. The official zoning designation for the portion of the Site in Honey Brook Township, Chester County, is agricultural, while the portion of the Site located in Caernarvon Township, Lancaster County, is open space conservation.

The groundwater aquifer underlying the Site is currently not used as a drinking water source. In 1998, forty-five residents in the vicinity of the Site were connected to public water by EPA. As a condition to connection to public water, the private water wells were properly abandoned by EPA.

## **VI. History of Contamination**

The Walsh Landfill Site was constructed as a side-hill facility in which the landfill materials were placed directly on the existing ground surface near the ridge line of Welsh Mountain. The Site reportedly received mixed municipal and industrial wastes for disposal between approximately 1963 and 1976, but anecdotal information obtained through EPA interviews of then-current and former Barkman employees and neighbors indicates that disposal may have continued through the 1980s.

The Site consists of several land parcels, bought at different times by Ernest and Grace Barkman. Mr. Barkman operated a trash hauling business and a landfill on the property during this period. From 1970 through the reported time of landfill closure in 1976, Mr. Barkman made several attempts to obtain State and Township approval for a landfill at this location. Due to citizen complaints regarding the activities at the property and continued non-compliance with municipal solid waste regulations, the operation was never permitted.

Between 1978 and 1984, citizen complaints continued. Inspections by State and County officials also revealed continued non-compliance with environmental regulations. Local residential wells were sampled in June 1984 and found to contain elevated levels of organic and inorganic compounds. Monitoring wells were then installed around the Site; the groundwater from these wells also contained elevated levels of organic and inorganic compounds. Waste material found on-Site was also sampled and found to contain various hazardous substances including toluene, ethylbenzene, 1,1-dichloropropane, and chlorobenzene. Inorganics detected include lead, mercury, and arsenic.

## **VII. Basis for Taking Action**

EPA proposed the Site for inclusion on the NPL on September 8, 1983, and placed it on the NPL on September 21, 1984.

Past operations at the Site resulted in contamination occurring in various media at the Site. Indicator chemicals from the 1988 Remedial Investigation Report and 1990 Feasibility Study (i.e., chemicals observed at the Site which are most likely to pose a threat to public health and the environment), and the media they apply to for the Walsh Landfill Site are summarized below.

### **Surface Water**

- Cadmium
- Lead

### **Soils**

- PAHs
- Arsenic
- Cadmium
- Lead
- Nickel

### **Groundwater**

- 1,1-Dichloroethane
- Chloroform
- Benzene
- Trichloroethylene (TCE)
- Tetrachloroethylene (PCE)
- Arsenic
- Cadmium
- Lead
- Mercury

### *Initial Risk Assessment*

The Risk Assessment conclusions contained in the 1990 Record of Decision (OU1) stated that the surface soils and groundwater from the Site had a significant potential adverse health impact on receptor populations. There were three complete exposure pathways identified: the air exposure pathway via inhalation of groundwater vapors and particulates by receptors; the groundwater exposure pathway via ingestion, inhalation, and dermal contact by receptors of private water supply wells; and, the soil exposure pathway via ingestion and dermal contact by receptors.

The air pathway was not deemed to represent a significant health hazard with respect to the volatilization of organics from the surface waters or from surface soils. However, the air



pathway was deemed to represent a potential health hazard from inhalation of volatile organic compounds (VOCs) during showering and bathing, and fugitive dust caused by vehicle traffic. The chemicals contributing the most significantly to the potential adverse health impacts and risks from the inhalation of VOCs included chloroform, benzene, trichloroethylene, and tetrachloroethylene. These contaminants were detected in the groundwater samples collected during and after the RI/FS. The exposed population included children and adults living in the local area and using the groundwater for domestic purposes. The chemicals contributing the most significantly to the potential adverse health impacts and risks from fugitive dust inhalation included PAHs, arsenic, cadmium, lead, and nickel. The exposed population included landfill workers and local residents living downwind of the landfill.

The soil pathway was identified as a health hazard from ingestion and dermal contact exposure to contaminated surface soils and sediments. The landfill workers are potentially at risk from dermal contact with surface soils contaminated with PAHs, arsenic, and lead. In addition, the children in the area are potentially at risk from ingestion and dermal contact with sediments contaminated with PAHs and lead. However, it should be noted that only one on-Site sediment sample was contaminated with PAHs and lead.

The groundwater exposure pathway represented a potentially significant health risk, as indicated by chronic health index values greater than one, and projected carcinogenic risk values above the target risk values of  $1 \times 10^{-6}$ . The compounds contributing the most to the potential health impacts were 1,1-dichloroethane, chloroform, benzene, trichloroethylene, tetrachloroethylene, arsenic, cadmium, lead and mercury. The exposed population includes children and adults living and working in the local area and using the groundwater for domestic purposes. The exposed population was preliminarily defined as the 49 residences situated along PA Route 10 and Welsh Road, whose water supply wells were sampled during the RI/FS, and where contaminants were detected at elevated levels. In addition, residences situated along the general direction of regional groundwater flow are included in the group as potentially impacted by contaminated groundwater in order to address possible future health impacts.

### *Risk Assessment Update*

In 1993, a Baseline Risk Assessment limited only to the groundwater pathways was conducted since the second operable unit (OU2) focused on groundwater contamination. Risks were calculated based on inhalation, ingestion, and dermal contact of groundwater from both residential and monitoring wells at the Site. The risk calculation was based on the levels of contaminants found during the course of the 1992 Focused Groundwater Study (FGS). Separate calculations were made for those that cause cancer (carcinogens) and for those that cause non-carcinogenic health effects, including current and future risk. The 1993 Risk Assessment did not take into account the fact that nearby residents were connected to public water. EPA has also established criteria for drinking water called Maximum Contaminant Levels (MCLs). These are concentration levels promulgated pursuant to the Safe Drinking Water Act, 42 U.S.C. § 300g-1, for various contaminants below which drinking water is considered safe.

There were both VOCs and inorganic compounds of concern identified in the groundwater at the Walsh Landfill. The major VOCs contributing to risk were benzene and

vinyl chloride. Inorganic contaminants such as antimony, arsenic, beryllium, copper, and manganese were the significant sources of risk in both residential and monitoring wells.

Potential human health problems are identified by the risk level and hazard index. Potential carcinogenic risks are identified by the risk level of  $1 \times 10^{-6}$ , which indicates one additional chance in 1,000,000 that an individual will develop cancer above the expected normal rate of approximately 250,000 in 1,000,000. The hazard index identifies the potential for the most sensitive individuals to be adversely affected by non-carcinogenic chemicals. If the hazard index exceeds one (1.0), there may be a concern for potential non-carcinogenic effects. As a rule, the greater the value of the hazard index above 1.0, the greater the level of concern. Changes in the hazard index, however, must be one or more orders of magnitude (e.g., 10 times greater) to be significant.

The Baseline Risk Assessment performed in 1993 can be summarized as follows:

Groundwater use from nearby residential wells includes both current and future resident off-Site scenarios. Increased cancer risks are in the range of 1 in 10,000 ( $1 \times 10^{-4}$ ). This risk is driven by arsenic, beryllium, vinyl chloride, and benzene. Non-carcinogenic risks due to the ingestion of inorganic contaminants by children were calculated to have a hazard index as high as 15. Antimony, arsenic, copper, and manganese were the most significant sources contributing to the non-carcinogenic risk.

The groundwater from the monitoring wells at the Site is not used as a potable water source. Under the scenario where a future on-Site resident would utilize this groundwater as a potable water supply, its use would represent an increased cancer risk of 1 in 10,000 due to arsenic. The non-carcinogenic health risks for inorganics and organics were also calculated to be a maximum hazard index of 291 and 2.13, respectively. Inorganic contaminants such as arsenic and manganese were the most significant sources.

It is important to note that the current risk is based on a theoretical human in a theoretical circumstance. For the OU2 ROD issued in February 2006, the Risk Assessment calculations from 1993 were not updated with recent groundwater monitoring data and the Risk Assessment does not take into account that all residences in the vicinity of the Site were connected to public water in 1998. This information, coupled with the fact that concentrations of contaminants have been declining over time, produces an overly conservative risk estimate. In addition, risk was not calculated for the vapor intrusion pathway. Although quantitative calculations were not performed for this pathway, very low VOC concentrations in groundwater (less than MCLs and consistently declining) indicate that vapor intrusion does not pose a threat to residential receptors. Consequently, the results of recent sampling have been compared to the MCLs which are established "safe" levels for specific contaminants. Groundwater monitoring data from the last five years show only arsenic, and, occasionally, thallium above MCLs in a few monitoring wells (EPA-2, EPA-2A, and EPA-3) that are located within 200 feet of the limits of the landfill.

## VIII. Remedial Actions

### Remedy Selection

Based on the findings presented in the RI/FS, EPA Region III issued a Record of Decision (ROD) on June 29, 1990. The ROD, among other things, announced that the Site would be divided into two (2) operable units (OUs) as follows:

Operable Unit 1 (OU1): Landfill cap (final source control action)  
Alternate water supply (extension of a municipal water system)

Operable Unit 2 (OU2): Groundwater

EPA issued two RODs and one ROD Amendment that addressed the OUs stated above. The following provides a summary of each decision document.

#### *June 1990 ROD – OU1 (Landfill Cap and Water Line Extension)*

On June 29, 1990, EPA issued the first ROD for the Walsh Landfill Site. The remedy for OU1 addressed the threats to public health posed by the ingestion and/or inhalation of contaminated groundwater by requiring the extension of a municipal water line to service affected residents in the vicinity of the Site. The remedy also addressed the threats to public health posed by the ingestion of, inhalation of, and dermal contact with contaminated landfill soils by requiring the construction of a cap over the landfill and fencing the area. The construction of the landfill cap would have also addressed the threat to the environment by substantially reducing the amount of percolation through the landfill, and thus the amount of contaminants entering the groundwater.

The major components of the remedy selected in the June 1990 ROD for OU1 included the following actions:

1. The extension of the Honey Brook Borough Authority (HBBA) water supply system to serve those households receiving bottled water and those whose wells have been contaminated from the Site.

The water line extension will include construction of new water service lines, mains, hydrants, valves, and the connection to the HBBA's water supply mains. The HBBA water supply system will be upgraded to provide sufficient capacity to service the impacted residences near the Site. A water supply well will be installed and connected to the HBBA water supply system. A booster pump and water storage tank will also be required to service the residents.

Control of all the components associated with the water line extension, including properties, easements, and customers are to be transferred to the HBBA as soon as possible after construction is completed.

2. Groundwater monitoring data will be collected to monitor the current contaminant levels and possible migration. Wells will be sampled as part of the focused groundwater study to be completed for the second operable unit at the Site.
3. Construction of a multi-media cap that meets the requirements of the Pennsylvania Municipal Solid Waste Regulations. Resource recovery activities are also required to remove bulky items and debris from the surface of the landfill in order to prepare for construction of the landfill cap. Additional information will be collected regarding the composition of the landfill materials during design of the landfill cap.
4. Installation of a fence around the perimeter of the Site in order to restrict unauthorized Site access and the use of the property for continued or future waste activity.
5. Modification of the property deeds for the landfill area, where appropriate, to indicate the presence of the landfill, to restrict future use and property development, and to restrict the use of groundwater by placing limitations on the installation of groundwater wells.

July 2003 ROD Amendment – OUI (Landfill Cap Remedy)

On July 2, 2003, EPA issued a ROD Amendment for an alternate source control action for the landfill. The Amendment modified the cleanup by changing the type of landfill cap that was required for the Site from a multi-media cap, as selected in the 1990 ROD, to an Evaporation/Transpiration (ET) cover system. The ET cover system consists of a soil cover densely planted with deep rooting hybrid poplar trees and shallow rooting plants. The alternate source control remedy included the following components:

1. Demolition of those structures identified in the 1993 Final Design Analysis Report, and off-Site disposal of all items/materials/debris from the surface of the Site.
2. Design and installation of an ET cover system for the landfill.
3. Performance monitoring to ensure effective operation and development of the ET cover system, including evaluation of infiltration through the landfill as measured against predictive modeling (Post-Construction Monitoring).
4. Long-term groundwater monitoring to determine the impact of the ET cover system on the quality of groundwater at the Site, including installation of new groundwater monitoring wells, as necessary (Groundwater Monitoring).
5. Use of surface water management controls to minimize soil erosion and sedimentation.
6. Implementation of institutional controls; deed notices and elimination of the requirement for barbed or razor wire on the perimeter fence.

The 2003 ROD Amendment recognized that the tree cover component of the remedy would take several years to become established and efficient at reducing infiltration. As a result, EPA will evaluate the performance of the ET cover system during the Five-Year Review, but not less than five (5) years after EPA acceptance of the Interim RA Report for this action.

The performance standard for the ET cover system requires it to attain a standard of performance that is functionally equivalent to that required under the Commonwealth of Pennsylvania's Solid Waste Regulations. Functional equivalence shall be deemed met if the following criteria are satisfied:

- The ET cover system has been properly operated and maintained in accordance with the approved O&M Plan;
- The monitoring data collected from the ET cover system indicates that the cover system is performing adequately based on a comparison of data to predictive modeling;
- The ET cover system is performing at a level equal to or better than a cover system designed in accordance with the Commonwealth of Pennsylvania's regulations based upon actual field data from EPA's Alternative Cap Assessment Program (ACAP) or other EPA approved test sites; and
- The groundwater data show no statistically significant increase in concentrations over baseline conditions.

#### February 2006 ROD – OU2 (Groundwater Remedy)

On February 2, 2006, EPA issued a second ROD that addresses the groundwater impacted by the Site. The components of this remedy consist of measures for long-term monitoring of contaminants in groundwater and institutional controls to restrict future groundwater use at the Site.

This ROD provides that no further remedial actions, beyond those selected by EPA in the 1990 ROD and the 2003 ROD Amendment for OU1, will be taken at the Site. The groundwater monitoring required for the ET cover system under the OU1 ROD Amendment (July 2003) will be used to monitor trends and evaluate groundwater quality at the Site. In April 2005, EPA approved a PRP-prepared Groundwater Monitoring Plan (GMP) for the OU1 remedy. The GMP describes the location, frequency, procedures, and analytical requirements for the groundwater monitoring program that will be employed at the Site.

Under the GMP, two baseline groundwater sampling events were conducted in 2005, prior to construction of the ET cover system. Groundwater sampling will continue to be conducted on a semi-annual basis during the second and fourth quarters of each year, beginning in the second quarter of 2006. A total of twelve (12) monitoring wells will be sampled for Target Compound List (TCL) volatile organic compounds (VOCs), TCL semi-volatile organic

compounds (SVOCs), target analyte list (TAL) total and dissolved inorganics, and TCL pesticides, and polychlorinated biphenyls (PCBs). The specific monitoring wells to be sampled under the GMP include: MW-3, MW-5, MW-7, MW-BH, EPA-2, EPA-2A, EPA-3, EPA-4, EPA-4A, EPA-5, EPA-5A, and EPA-6. The construction details regarding the monitoring wells and a location map for the monitoring wells can be found in Attachments 4 and 5 of this Report.

The groundwater performance standards for OU2 will be evaluated at the same time the ET cover system is evaluated. This evaluation will be made during the Five-Year Review, but not less than five (5) years after EPA acceptance of the Interim RA Report for OU1. Any approved changes or modifications made to the GMP during implementation of the OU1 remedy shall be applicable to the OU2 remedy. If the requirement for groundwater monitoring under the ET cover system no longer becomes necessary, the GMP may be revised or amended as appropriate to continue groundwater sampling if cleanup goals have not been achieved under OU2.

In addition, the OU1 cap remedy requires that deed notices which provide notice of the landfill's presence, notice of the restrictions on future use and development of the properties, and notice of the restrictions on the use of groundwater, be filed in the recorder's office, the registry of deeds, or other appropriate office in the Commonwealth of Pennsylvania. These deed notices will provide notice to potential future purchasers of the properties of the restrictions on the use of the properties and use of groundwater in the area.

#### Remedial Action Objectives (RAOs)

The ROD for OU1 was issued by EPA on June 29, 1990. Remedial Action Objectives (RAOs) were developed as a result of data collected during the remedial investigation and to aid in the development of screening of remedial alternatives to be considered in the ROD. The RAOs for the alternatives in the OU1 ROD were to eliminate or reduce the health risk posed to the local community by exposure to contaminated groundwater and landfill soils.

On July 2, 2003, EPA issued a ROD Amendment for an alternate source control action for the landfill. The Amendment modified the cleanup by changing the type of landfill cap that was required for the Site from a multi-media cap, as selected in the 1990 ROD, to an ET cover system. The ET cover system will reduce infiltration through the landfill, thereby preventing further degradation of groundwater quality. The RAOs for this remedy are:

- Prevent inhalation or ingestion of, or direct contact with Site soils, sediments, or solid waste containing polynuclear aromatic hydrocarbons (PAHs) or metals at concentrations that would pose unacceptable hazards based on cumulative chronic hazard or carcinogenic indices; and
- Reduce infiltration through the landfill and further limit the potential for migration of contaminants of concern into groundwater, surface water, and/or sediments.

EPA issued a ROD for OU2 (groundwater) on February 2, 2006. OU2 is the second and final operable unit at the Site. The RAOs for OU2 were based on the results of a Focused

Groundwater Study and subsequent groundwater monitoring events, the Baseline Risk Assessment, and acceptable contaminant levels. As a result, the RAOs for OU2 are:

- Prevent the ingestion of groundwater containing Site-related contaminants of concern in excess of MCLs;
- Prevent the inhalation of volatile organic compounds in the groundwater at unacceptable cumulative chronic hazards or carcinogenic index values; and
- Restore the local groundwater aquifer quality to MCLs for all Site-related contaminants of concern.

### Groundwater Cleanup Levels

The ROD for OU2 set forth the groundwater performance standards for the Site. The contaminants of concern (COCs) for OU2 and their respective clean-up levels, Federal Maximum Contaminant Levels (MCLs), are listed in Table 2.

<b>Table 2 Groundwater Performance Standards</b>	
<b>Contaminant of Concern</b>	<b>Federal MCL (µg/l)</b>
Arsenic	10
Barium	2,000
Thallium	2

### Remedy Implementation

Following issuance of the 1990 ROD, EPA initiated a number of activities at the Site which were performed by EPA Fund-Lead. In 1991, a Focused Groundwater Study (FGS) was conducted at the Site and the FGS Report was finalized in November 1992. During 1992 and into 1993, a Focused Feasibility Study (FFS) for OU2 was developed and finalized in November 1993. The FFS evaluated the results of the FGS and presented alternatives to remediate the contaminants of concern in the groundwater at the Site.

EPA entered into several Interagency Agreements (IAGs) with the United States Army Corps of Engineers (USACE) for design, construction, and real estate activities associated with the 1990 ROD. In August 1990, EPA entered into an IAG for the landfill cap design. An IAG for the design of the alternate water supply (extension of the municipal water system) was executed in January 1991 and IAGs for the construction and acquisition of the real estate associated with the alternate water supply were initiated in July and August 1992, respectively.

EPA issued a Unilateral Administrative Order (UAO) to the Site owners in March 1991 which gave them the opportunity to remove all scrap material (e.g., junk vehicles, scrap metal, tires, etc.) from the landfill surface and to relocate their operations at the Site. The Site owners responded by preparing a Work Plan for a Removal Action that would be accomplished in two phases. EPA approved the Work Plan and removal operations began in July 1991. By December 1991, the removals in the first phase were completed. However, the Site owners failed to finish the removals in the second phase by the April 1992 schedule date. In September 1993, EPA amended the UAO to clarify that the actions to be taken by the Site owners were mandatory. However, the second phase of the removals became stalled due to the Site owners' inability to find a suitable location to relocate their business.

In February 1993, EPA approved a United States Army Corps of Engineers (USACE) prepared design document entitled, "*Final Design Analysis Report for the Welsh Road/Barkman Landfill Site*". This document summarized the design criteria and results of pre-design investigations for the multi-media landfill cover system. The design for the landfill cap portion of the remedy consisted of the following components:

- a 6-inch (150-mm) thick vegetative soil cover;
- an 18-inch (450-mm) thick barrier soil layer;
- composite geonet/geotextile drainage layer;
- a 40-mil thick high-density polyethylene geomembrane layer; and
- a variable-thickness grading layer.

The design also included an active landfill gas management system, surface water controls for the final cover, and a stormwater management pond at the perimeter of the cover.

In 1996, the project to extend the HBBA water supply system was initiated by EPA via an interagency agreement with the USACE. Two construction contracts were awarded by the USACE in 1996. One contract was for construction of a water supply tank and the other contract was for the remainder of the water system, including the treatment plant, booster pump station, water mains, and laterals. Transfer of the water line extension project to the HBBA was completed in phases to allow the connection of the affected residences in the vicinity of the Site. In March 1998, the HBBA accepted the water mains, a water storage tank, an access road, and a booster pump station. By May 1998, a total of 45 residences were connected to the public water system. The HBBA accepted the final phase of the water line extension project, which included the water treatment plant and groundwater production well, in June 1999. The HBBA provides operation and maintenance of all hardware transferred to them as part of their existing public water system. As a condition of connection to the public water supply system, private wells were properly abandoned as part of this project.

In March 1999, EPA issued a UAO to all of the known PRPs requiring them to implement the EPA-approved design for the landfill cap. In October 2000, several PRPs united (PRP Group) and submitted a proposal for implementing an ET cover system in lieu of the EPA-approved design. In July 2003, EPA issued an Amendment to the OU1 ROD specifying the ET cover system as the EPA-approved landfill capping system for the Site. That same month, EPA



amended the 1999 UAO to the PRPs requiring them to implement the Amendment to the OU1 ROD.

In the meantime, EPA pursued legal action against the Site owners requiring them to remove all of their property from the Site. In early 2003, the Site owners began removing materials from the Site and relocating their businesses pursuant to a court order. However, the Site owners stalled in their removal efforts and were found in contempt of court because they did not comply with the schedule established by the court. As a result, one of the Site owners was incarcerated for a short period of time. By October 2003, all materials and buildings were cleared from the surface of the Site.

Additional groundwater monitoring events for OU2 were conducted by EPA in 1999 and 2002 to supplement the 1992 Focused Groundwater Study. During these events, only groundwater monitoring wells were sampled since residential wells were abandoned when access to the public water system was provided. In 1999, EPA conducted two (2) rounds of groundwater sampling from existing monitoring wells at the Site. The first round of sampling was conducted in April 1999 and involved twenty (20) monitoring wells located either on or adjacent to the landfill. The second groundwater sampling event was limited to ten (10) of the twenty (20) monitoring wells and was based on the locations and the analytical results of the first sampling event. The second round of sampling was conducted in July 1999. In 2002, the same ten (10) monitoring wells were sampled.

The PRP Group began development of a Remedial Design Work Plan (RDWP) for the ET cover system in October 2004. Pre-design activities commenced in March 2004, following EPA approval of the RDWP. Several design submittals in progressive phases were submitted to EPA for review in 2004 and early 2005. The Final Design, which included a Groundwater Monitoring Plan (GMP) for the ET cover system, was approved by EPA in May 2005. The purpose of the GMP was to evaluate the groundwater quality conditions at the Site and to evaluate the performance of the landfill cover system. Initial baseline groundwater sampling was conducted at the Site in June and July 2005 in accordance with the GMP.

In September 2005, the earthwork contractor for the ET cover system (Shaw Group Inc.) mobilized at the Site. Initial activities included setting up erosion and sediment control structures and clearing and grubbing the Site. From October through mid-December 2005, earthwork operations were conducted which included relocation of landfill waste, placement of cover soils, and construction of a stormwater channel and detention basin. Approximately 7,200 cubic yards of landfill waste were excavated from periphery areas of the Site. This waste was relocated to the center of the Site where it was compacted and covered with clean fill. The Site received approximately 40,000 cubic yards of topsoil and subsoil from a borrow source in nearby Parkersburg, PA. This soil was used as the rooting layer for the ET cover system. Cover soil thickness at the Site is a minimum of four (4) feet on slopes less than or equal to 10 percent and three (3) feet on slopes greater than 10 percent. Due to the onset of winter, construction activities were shut down in mid-December 2005.

Construction activities resumed in March 2006 with the earthwork contractor repairing minor erosion damage, grading the Site, amending the soil, hydroseeding the Site, completing

stormwater drainage features, and installing a fence around the Site. A final construction inspection was held on April 20, 2006, and a final punch-list of work items was forwarded to the earthwork contractor. The earthwork contractor completed the punch-list work items in May 2006.

EPA held a pre-construction meeting with the tree contractor, Ecolotree, Inc., on the same day as the final construction inspection. The tree contractor's scope of work was to install the trees and shrubs on the Site. The majority of the trees (90 percent) planted were hybrid poplar with the remaining 10 percent native species. Native species were included to increase biodiversity and aid in the long-term transition to a climax forest. In total, approximately 4,090 trees were planted as part of the ET cover system in May 2006. The Site achieved construction completion status on August 16, 2006, when the Preliminary Close-Out Report was signed by EPA.

### **System Operations/Operation and Maintenance**

There is an EPA-approved Operation and Maintenance (O&M) Plan for the OU1 remedy (ET cover system), as well as an EPA-approved Groundwater Monitoring Plan (GMP, April 2005) in place at the Site. The O&M Plan can be found in Appendix J of the 100% Remedial Design for Operable Unit 1 (May 2005). The O&M Plan includes instructions for post-closure operation and maintenance activities for the major components of the ET cover system, which include the following: 1) soil cover component, 2) vegetative component, 3) fencing and institutional controls, and 4) groundwater monitoring.

The PRP Group is responsible for implementing the O&M Plan for the ET cover system and groundwater monitoring. Geosyntec Consultants (Geosyntec) performs management of these activities, project consulting, and oversight for the PRP Group.

Maintenance requirements for the ET cover system were more intensive during the initial three (3) years following installation in 2006. Consequently, the post-installation inspection frequency was greater during the first several growing seasons (2007-2009) and reduced in the more recent years. The initial inspection frequency was monthly during the growing season (i.e., March through October) and every two (2) months from November through February for the first three years following installation of the ET cover system. Currently, the inspection frequency is quarterly. Site maintenance inspection log sheets are completed by Geosyntec during every Site visit.

The first groundwater sampling event under the approved GMP took place in June 2005. A second sampling event occurred in July 2005. Both groundwater sampling events were conducted prior to construction of the ET cover system. The GMP requires sampling to be conducted on a semi-annual basis during the second and fourth quarters of each year. Sampling events since 2007 have been conducted in April and October. Groundwater samples are analyzed for a broad range of organic compounds including VOCs, SVOCs, inorganics, including total and dissolved metals, and cyanide. Twelve (12) monitoring well locations were selected as groundwater sampling locations. The construction details regarding the monitoring

wells and a location map for the monitoring wells can be found in Attachments 4 and 5 of this Report.

In preparation for EPA's evaluation of the ET cover system, the PRP Group will prepare a comprehensive report summarizing the O&M activities performed since the installation of the ET cover system. The report will be prepared and evaluated during the Five-Year Review which occurs five (5) years after EPA acceptance of the Interim RA Report for the ET cover system. In this case, the evaluation will take place during the next Five-Year Review (4<sup>th</sup>) for the Site as the Interim RA Report was approved by EPA on September 29, 2006. The report will also include an assessment of the performance monitoring data, including groundwater monitoring, and final comparisons to the performance standards.

### **Institutional Controls (ICs)**

An integral component of the OU1 remedy was the implementation of institutional controls to restrict future Site uses that could potentially affect performance of the various components of the remedial action and exposure risks to groundwater. The institutional controls (ICs) employed at the Site were in the form of deed notices. The deed notice includes a declaration of easements, covenants, and restrictions for the affected properties. The declarations were executed between the PRP Group and the property owners. The deed notices for parcels in Honey Brook Township were recorded in the land records of Chester County on August 30, 2006, and one parcel located in Caernarvon Township was recorded in the land records of Lancaster County on October 13, 2006.

Copies of each declaration of easements, covenants, and restrictions to affected properties can be found on the web at the following address:

[http://www.epa.gov/ictssw07/public/export/03/PAD980829527/PAD980829527\\_report.HTM](http://www.epa.gov/ictssw07/public/export/03/PAD980829527/PAD980829527_report.HTM)

Another institutional control in place for the Site is the rules and regulations for well drilling in Chester County. The Chester County Health Department (CCHD) promulgates these rules and regulations. Under Chapter 500 §501.12.2.4 of the CCHD Rules and Regulations, no new wells may be permitted or constructed within the delineated Plume Area of a contaminated site or within the ¼ mile Area of Concern unless hydrologic evidence is provided to the CCHD, and accepted as satisfactory by US EPA or PA DEP, which verifies that installation of the well will not have any impact on the Plume or remediation effort. This regulation applies to all NPL-caliber sites in Chester County. A Portable Document Format (PDF) file of Chapter 500 of the CCHD Rules and Regulations can be found on the web at the following address:

<http://dsf.chesco.org/health/lib/health/regs/501.pdf>

**IX. SUMMARY OF PROJECT REMEDIATION COSTS**

The PRP Group is responsible for the long-term operation and maintenance of the ET cover system and groundwater monitoring at the Site. The ET cover system has an EPA-approved O&M Plan in place.

Remedial system construction and O&M costs were estimated in the June 29, 1990 ROD at approximately \$3,768,000. Costs were estimated for an anticipated 30-year O&M time period; a discount rate of five (5) percent was used in the ROD estimate. Details of the cost estimate documentation can be found in Table H of the ROD.

The total remedial action capital construction costs, exclusive of design and oversight costs, are listed below:

1) Water Line Extension Project	\$ 2,750,000
2) ET Cover System	\$ 1,140,000
<b>TOTAL CAPITAL</b>	<b>\$ 3,890,000</b>

The estimated cost for groundwater monitoring and maintenance of the ET cover system is in the range of \$90,000 - \$100,000 per year.

**X. PROGRESS SINCE LAST FIVE-YEAR REVIEW**

This is the third (3<sup>rd</sup>) Five-Year Review for the Walsh Landfill Superfund Site. Table 3 summarizes the progress at the Site over the past 5 years. The issues and recommendations in Table 3 were generated from the previous Five-Year Review Report for the Site.

<b>Table 3 Actions Taken Since the Last Five-Year Review</b>					
Issues	Recommendations/ Follow-up Actions	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Vegetation needs to be established for the ET cover system.	The ET cover system needs to be completed.	PRP Group	By September 2006	Remedial construction was completed. Interim RA Report approved by EPA.	September 29, 2006
Hybrid poplar trees and shrubs need to be planted for the ET cover system.	The ET cover system needs to be completed.	PRP Group	By September 2006	Remedial construction was completed. Interim RA Report approved by EPA.	September 29, 2006

**Table 3**  
**Actions Taken Since the Last Five-Year Review**

<b>Issues</b>	<b>Recommendations/ Follow-up Actions</b>	<b>Party Responsible</b>	<b>Milestone Date</b>	<b>Action Taken and Outcome</b>	<b>Date of Action</b>
Institutional Controls (deed notices) need to be placed on all properties on which the ET cover system components are placed.	The ET cover system needs to be completed.	PRP Group and Site owner	By September 2006	Declaration of Easement, Covenant, and Restrictions was executed for affected properties.	August 9, 2005
The performance of the ET cover system, which includes groundwater monitoring, will need to be evaluated in the future.	The performance of the ET cover system will be evaluated during the Five-Year Review which occurs five (5) years after EPA acceptance of the Interim RA Report for the ET cover system.  Groundwater monitoring will continue until MCLs are met at the Site.	PRP Group/ EPA/PADEP	No earlier than September 29, 2011	No action taken. The interim RA Report was approved by EPA on September 29, 2006, triggering the ET cover system evaluation to be performed during the next (4 <sup>th</sup> ) Five-Year Review.	

**Vapor Intrusion Evaluation**

The groundwater-to-soil gas-to-indoor air pathway is potentially complete where a vapor source is present with the potential to cause vapor intrusion. The groundwater plume at the Walsh Landfill Site is mostly limited to the footprint of the landfill with occasional contaminant detections within 200 feet of the landfill. There are two homes located adjacent to the Site within 100 feet of the landfill. However, it should be noted that these homes are either a manufactured or a trailer-type structure and their foundation system consists of footings with either concrete block or elevated piers. One of the homes has skirting installed along the bottom of the structure while the other home is exposed underneath. In either case, both homes are well ventilated underneath the structure. The ground is dry under the homes and this helps avoid potential moisture problems for the structures.

Groundwater data from all monitoring wells at the Site over the last ten years have demonstrated that no viable organic compounds have been detected at concentrations exceeding their respective MCLs. The closest monitoring wells to the two homes are wells MW-BH and MW-7. These wells are approximately 100 feet away from the homes. Groundwater data from these two wells over the past 5 years have consistently been non-detect for most volatile and semi-volatile compounds with well MW-BH having an occasional estimated value for benzene and chlorobenzene above the method detection limit (MDL) but below the practical quantitation

limit (PQL). As a result of this information, no further investigation for the vapor intrusion pathway is necessary.

Landfill gas (LFG) migration is also monitored at the Site and on the properties of two adjacent homes. The properties of the homes are monitored through a combination of landfill gas monitoring wells, bar-punch probe locations, and in the crawlspace of the structures. A handheld gas analyzer is used to take methane and oxygen measurements. The concentrations of methane in the LFG monitoring wells of the adjacent properties have been found at concentrations higher than 100% of the lower explosive limit. As a result, LFG mitigation measures are being implemented at the Site to address this issue. Bar-punch probe locations, which are located closer to the structures, have mostly been non-detect for methane with a few locations having less than 1% methane. There has never been methane detected in the crawlspace of either structure since LFG migration monitoring began in 2007. This information, coupled with the fact that the foundation system for the structures allows for ventilation, suggests that the off-Site LFG migration does not pose an unacceptable risk to the adjacent homes.

## **XI. Five-Year Review Process**

### **Administrative Components**

The Walsh Landfill Five-Year Review Team was led by Frank Klanchar (EPA Remedial Project Manager), with EPA technical support staff Bruce Rundell (hydrogeologist), Dawn Ioven (toxicologist), and Dave Polish (community involvement coordinator). Bonnie McClennen, PADEP project officer from the Norristown, PA office, assisted in the review as the representative of the support agency.

Beginning in October 2010, the review team established the review schedule whose components included:

- Community Involvement;
- Document Review;
- Data Compilation and Review;
- Site Inspection;
- Local Interviews; and
- Five-Year Review Report Development and Review.

The Five-Year Review schedule extended through March 2011.

The PRP Group and its technical consultant, GeoSyntec Consultants, also provided information to assist EPA in development of the Five-Year Review.

### **Community Involvement**

EPA provided notice to the public that it would be conducting a Five-Year review in an announcement in the *Daily Local News* on November 24, 2010. Attachment 12 contains a copy

of the announcement as published in the newspaper. The announcement provided email addresses and telephone numbers so that the public could contact EPA with any questions or comments.

The EPA Community Involvement Coordinator, Mr. David Polish, and the EPA RPM, Mr. Frank Klanchar, met with local officials and residents living near the Site on October 22, 2010, to discuss the Five-Year Review process and to solicit comments regarding any concerns with the Site. The local officials interviewed included Mr. Michael Shuler of the HBBA and Mr. Heath Eddy, Director of Planning and Zoning for Honey Brook Township. Mr. Shuler indicated that he had not heard of any recent activity at the Site. He informed EPA that a new home was being constructed along Welsh Road and that the homeowner would be required to connect to the public water system. EPA informed Mr. Shuler that EPA first became aware of the situation several months earlier when contacted by the Chester County Health Department about a property owner applying for a private well permit on Welsh Road. Mr. Shuler had no additional comments regarding the Site. In the interview with Mr. Eddy, EPA explained the remedial activities that were conducted at the Site. Mr. Eddy was relatively new in the position. EPA confirmed with Mr. Eddy that the person building the new home along Welsh Road was required to be connected to public water. Mr. Eddy had no comments about the Site.

EPA also met with two residents who live immediately adjacent to the Site. One resident expressed a few concerns with their property. The concerns included: 1) that the property was not properly draining surface water, 2) that the weeds along the perimeter fence were not being maintained, and 3) the migration of landfill gas. EPA inspected the drainage swale on the property and concluded that the swale has not changed since the remediation work was completed in 2006. The swale does have slope to carry surface water off the property. However, the slope is very gradual and it would be difficult to improve the swale to remove surface water more rapidly. As a result, the drainage swale would be the last area in the yard to dry out following a storm event. EPA informed the resident that the weeds at the base of the fence would be addressed during maintenance activities and that landfill gas mitigation measures were installed over the summer. Landfill gas monitoring would continue every quarter and the results would be evaluated. The other resident stated that the Site looked nice and that storm water drainage issues on his property have been resolved.

On March 7, 2011, the EPA RPM contacted Caernarvon Township and spoke to the Secretary/Treasurer, Ms. Kathy Norris. Ms. Norris was unfamiliar with the Site and had recently started in the position. The EPA RPM explained some background and history of the Site, the remedies which were in place, and the Five-Year Review process. The EPA RPM suggested bringing up the Five-Year Review of the Site at the next Board of Supervisors meeting. Ms. Norris indicated that the next meeting was that evening and that she would bring the information to the supervisors' attention. The EPA RPM provided a phone number to Ms. Norris so that any supervisor could call if there were any concerns regarding the Site.

Following signature of this Five-Year Review, the 3<sup>rd</sup> Five-Year Review Report for the Walsh Landfill Superfund Site will be available to the public on the internet at:

<http://cfpub.epa.gov/fiveyear/index.cfm?fuseaction=home.showSearchForm>.

## **Document Review**

The complete list of documents that were reviewed are referenced in Section XVII. Documents reviewed in the process of conducting this Five-Year Review included the previous Five-Year Review, the June 1990 Record of Decision, the July 2003 ROD Amendment, the February 2006 ROD for OU2, Groundwater Monitoring Reports, Quarterly Progress Reports, and Annual Operations and Maintenance Reports.

Groundwater Monitoring Reports were reviewed for analytical data trends and date back to 2005. Quarterly Progress Reports have been provided since operation and maintenance activities began for the ET cover system in 2006. The Annual Operations and Maintenance Reports have been prepared since 2007 and describe activities conducted at the Site under the following plans: 1) the Groundwater Monitoring Plan, 2) the Landfill Gas Migration Mitigation Plan, and 3) the Operation and Maintenance Plan.

The Applicable or Relevant and Appropriate Requirements (ARARs) listed in the July 2003 ROD Amendment and February 2006 ROD were also reviewed. Many of the ARARs no longer apply since construction-type activities have been completed. The remaining ARARs for the Site are presented in Attachment 13.

## **Data Review**

### *ET Cover System Maintenance*

Geosyntec Consultants performs routine Site inspections for the PRP Group and serves as the primary contractor responsible for maintenance of the soil cover, understory vegetation, and stormwater management structures. The cover system maintenance approach consists of two main components: (i) visual inspections to identify additional maintenance needs; and (ii) non-routine or contingent maintenance activities implemented to address deficiencies observed during the Site inspections or recommendations from prior reports.

Site inspections have been conducted every month since the ET cover system was considered complete in August 2006. Inspection findings are documented in the Maintenance Inspection Logs which can be found in the Annual Operations and Maintenance Reports. Photographic records of the Site inspections are also provided in the Annual O&M Reports. Since maintenance issues prior to 2010 have been addressed by the PRP Group, this Five-Year Review only focuses on maintenance issues that were identified in 2010.

The findings of the Site inspections performed in 2010 indicated that vegetative and soil cover components and performance monitoring equipment were performing as designed with only a few minor maintenance needs identified, including:

- EM 50 Datalogger DG-2 was noted to be malfunctioning due to apparent battery failure during the April 5, 2010 Site visit. However, during the next Site visit (May 11, 2010), Geosyntec was unable to collect data from that datalogger. Geosyntec retrieved that datalogger with two other dataloggers, DG-1 and DG-3, which were identified as



malfunctioning in 2009. Geosyntec shipped the dataloggers to the manufacturer (Decagon Device, Inc), who confirmed that the malfunction was a hardware failure that was beyond repair. Geosyntec obtained three new dataloggers and replaced the instruments on September 16, 2010.

- Excessive weed and grass growth was noted in the understory and areas outside of the cover system during the summer 2010 Site inspections. The Site was mowed by Green Start, Inc. in October 2010.
- The EM 50 datalogger at location DG-3 was damaged during mowing activities completed in October 2010. The datalogger was repaired and reinstalled in November 2010, and
- Small holes in the cover system, apparently caused by burrowing animals, were observed on several occasions. When observed, the holes were backfilled with topsoil from the on-Site soil stockpile.

Site inspections also indicated that the stormwater management features were functioning as designed with only a few minor maintenance needs identified during 2010, including:

- Broken wires on several gabion baskets in the northwestern corner of the stormwater basin were observed during the May 2010 Site visit. The damaged wires were fixed during the June 2010 Site visit, and
- Invasive trees and other plants were observed growing within the floor and out of the gabion walls of the infiltration basin during the April 2010 Site visit. That vegetation was removed during the May 2010 Site visit.

### *Groundwater and Landfill Gas (LFG) Monitoring*

The groundwater monitoring program was performed by Geosyntec Consultants in accordance with the Groundwater Monitoring Plan (GMP) presented in the Final RD and subsequent amendments to the GMP approved by EPA. The LFG monitoring program included scheduled, quarterly migration monitoring as well as investigation, implementation, and monitoring for supplemental LFG migration mitigation measures installed during 2010. The remainder of this section presents a summary of the groundwater and LFG migration monitoring programs.

#### *Groundwater Monitoring Data*

From 2007 through 2010, groundwater monitoring was performed at the Site semi-annually in the months of April and October. During each event, Geosyntec measured water levels in 17 on-Site wells and collected groundwater samples from all 12 on-Site monitoring wells included in the monitoring network (Attachments 4 and 5). A detailed description of the methods, findings and conclusions of each groundwater monitoring event are documented in the individual Groundwater Monitoring Reports (GMRs) which are submitted to EPA.

## **Background**

The 2<sup>nd</sup> Five-Year Review found there were no MCL exceedances for any VOCs or SVOCs in monitoring wells in 2005. Groundwater monitoring wells exceeding MCLs were observed for arsenic and thallium in a subset of wells (EPA-2, EPA-2A, EPA-4, and EPA-4A). Metal concentrations observed in 2005 were generally less than historical levels.

## **Metals Data**

Metals detected above MCLs at the Site during the 2007 through 2010 time period included arsenic and an infrequent thallium. During this time, concentrations of arsenic found in monitoring well EPA-2 averaged 43.6 µg/l and monitoring well EPA-2A averaged 26.0 µg/l. Thallium was last detected above MCLs in October 2008. At that time, thallium was found in monitoring well EPA-3 at 20 µg/l. The MCLs for arsenic and thallium are 10 µg/l and 2 µg/l, respectively.

As summarized in Attachment 6, 16 of 23 metals analyzed were detected in at least one well sampled in October 2010. As also shown in Attachment 6, arsenic was the only metal detected above its respective MCL (EPA-2 and EPA-2A). In addition, concentrations exceeding secondary MCLs were reported for manganese in twelve (12) wells sampled, for iron in nine (9) wells, and for aluminum in two (2) wells.

Review of time-series plots for metals, as presented in Appendix C of the October 2010 GMR, indicates no apparent upward trend in metals concentrations. Calcium and magnesium concentrations from well MW-3 appear to have increased since baseline monitoring began in 2005; however, recent data do not suggest an increasing trend.

## **VOC and SVOC Data**

Review of groundwater data from 2007 through 2010 shows that there were no MCL exceedances for any VOCs or SVOCs. As shown in Attachment 7, only five (5) organic compounds were detected during the October 2010 monitoring event, none of which were detected at concentrations exceeding applicable drinking water standards. In fact, all of the detected compounds were reported at estimated concentrations below the limit of quantification, except:

- Chlorobenzene (MCL = 100 µg/l), detected at concentrations of 6 µg/l in EPA-4A and MW-3; and
- Chloroethane (no MCL), detected at concentrations of 38 µg/l and 76 µg/l in EPA-4A and MW-3, respectively.

Time series graphs for VOCs and SVOCs, as presented in Appendix C of the October 2010 Groundwater Monitoring Report (GMR), indicate that organic compounds historically detected have stabilized at low, estimated concentrations or are no longer detected. One potential exception is the detection of chloroethane in wells MW-3 and EPA-4A. Chloroethane was detected at relatively low concentrations in those wells during pre-construction monitoring

(June and July 2005). Since 2006, chloroethane concentrations have generally been higher than pre-construction concentrations, and the October 2010 chloroethane concentration at MW-3 was the highest concentration observed to date. Nonetheless, chloroethane trend data from those two wells does not exhibit a clear trend over the last several monitoring events.

Attachment 8 provides a compilation of sampling results from the past six years showing concentrations and well locations where MCLs have been exceeded at the Site. As shown, arsenic is the only contaminant which is consistently found at the Site above MCLs (EPA-2 and EPA-2A). Based on the sampling results, the groundwater plume for the Site is mostly limited to the footprint of the landfill with occasional contaminant detections within 200 feet of the landfill.

### Landfill Gas Monitoring Data

#### **Background**

The LFG migration monitoring program originally established in the O&M Plan consisted of quarterly monitoring of eight perimeter LFG monitoring probes. During the initial LFG migration monitoring event in July 2006, Geosyntec observed methane concentrations exceeding 100% of the lower explosive limit (LEL) at several perimeter monitoring wells.

In response to those detections, Geosyntec prepared a Landfill Gas Migration Mitigation Plan (LFGMMP) on behalf of the PRP Group, that included a plan for construction of a landfill gas cutoff trench along the northern and northeastern boundaries of the Site; installation of six passive landfill gas vents in the landfill (PV-01 through PV-06); installation of two additional monitoring points (LFG-2R and LFG-3R) close to the western property boundary; and continued LFG monitoring at newly installed wells, several bar punch probe locations on and off-Site, and in crawlspaces beneath the trailers on the adjacent properties to the east. LFG migration mitigation measures were installed in accordance with that plan in December 2006, and LFG monitoring was performed throughout 2007 and 2008.

By the end of 2008, the LFG mitigation measures installed in December 2006, appeared to be successful at limiting off-Site landfill gas migration, except along the eastern Site property boundary. To further assess off-Site subsurface LFG concentrations, monitoring wells LFG-09 and LFG-10 were installed on the property to the east and well LFG-11 was installed on the Ern Bark, Inc. property in the third quarter of 2009. Data collected from those wells indicated that LFG was present at concentrations exceeding 100% of the LEL for methane.

In February 2010, Geosyntec initiated a subsurface investigation along the boundary of the property to the east in accordance with a subsurface investigation work plan that was submitted and approved by EPA on February 1, 2010. The purpose of the subsurface investigation was to collect data that could be used to develop supplemental mitigation measures along that boundary. The subsurface investigation included advancement of 11 boreholes and installation of 21 soil gas implants (SGIs) along the eastern Site perimeter, and completion of two LFG monitoring events in February and March 2010. The findings of the subsurface investigation suggested that LFG migration along the eastern property boundary occurred preferentially in coarser grained soils at depths greater than approximately five feet below

ground surface, and that the fine grained near surface soils likely served to confine LFG migration and limit venting to the atmosphere. A summary of the results of that investigation and a work plan for supplemental mitigation measures was submitted and approved by EPA. In accordance with the May 11, 2010 Work Plan, seventeen (17) landfill gas passive vent wells (PV-07 through PV-23) were installed by BL Meyers Bros., Inc. of Glenmoore, Pennsylvania, along the Site boundary to the east in July 2010. Following passive vent well installation, Geosyntec installed solar/wind powered vents (Aura Solar Fan, Model: ASF-4) on top of each well riser in August 2010 to enhance venting. The supplemental LFG mitigation system was completed on August 12, 2010. LFG migration mitigation features and monitoring locations present at the end of 2010 are detailed on Attachment 9.

### **LFG Monitoring Results**

LFG migration monitoring performed during 2010 included: (i) four quarterly LFG monitoring events at each of the on-Site permanent probes, bar punch locations<sup>a</sup>, and passive vents in the landfill; and (ii) ten additional monitoring events at select locations to assess performance of the LFG migration mitigation measures. Those additional monitoring events included seven events to assess performance of passive vents installed along the eastern property boundary: (i) weekly monitoring for five consecutive weeks following installation of mitigation measures in August 2010; and (ii) two supplemental monitoring events completed during the November 29 and December 29, 2010 Site visits to assess long-term performance of the mitigation measures along the eastern property. In addition, Geosyntec also measured methane concentrations at passive vents installed during August to evaluate the relative performance of those vents over time. Completed LFG field forms from each of the monitoring events conducted in 2010 are provided in Appendix D of the 2010 Annual O&M Report, and a summary of methane concentrations recorded during 2010 at existing monitoring locations are presented in Attachment 10. Attachment 11 provides a summary of methane measurements obtained from passive vents installed along the eastern property.

Based on the data presented in Attachment 10, Site-wide LFG migration results were consistent with historical results in that LFG concentrations at the property boundaries were less than 100% of the LEL at all perimeter locations, except those along the border with the eastern property (LFG-06 and LFG-07) and, periodically, along the Ern Bark, Inc. property (LFG-04 and LFG-05). Methane was also detected at concentrations exceeding the LEL in off-Site permanent wells on the eastern property (LFG-09 and LFG-10) and the Ern Bark, Inc. property (LFG-11) during the majority of the monitoring events conducted, but methane concentrations tended to decrease later in the year at the off-Site locations. In addition, LFG was not detected in the shallow subsurface, off-Site bar punch probes or in crawl spaces beneath the residences on the eastern properties. Also, shut-in pressure readings obtained at permanent wells during the monitoring events were very low and on-Site personnel did not observe other obvious signs of significant LFG migration such as odors, stressed vegetation, or visible emissions from passive vents at those properties. Those data were consistent with historical data and suggested that LFG generation in the landfill was relatively low and that migration was not driven by large pressure gradients.

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<sup>a</sup> Bar punch locations were not monitored during the January 2010 sampling event due to frozen ground conditions.

Accordingly, given the apparent low volume of gas migration and the distance between locations having measurable amounts of gas and neighboring Site structures, risks posed to those structures from methane migration are considered to be very low. Nevertheless, in accordance with the May 11, 2010 Work Plan, Geosyntec, on behalf of the PRP Group, offered to install residential indoor landfill gas alarms at two residences. One resident accepted the offer and Geosyntec provided a Sierra Monitor, Model 2001, to him on September 16, 2010. The other resident declined the offer of an alarm system.

As described above, LFG monitoring data collected during 2010 were also used to assess performance of mitigation measures installed in August. As shown in Attachment 10, a total of eight LFG monitoring events were completed following installation of passive vents along the boundary with the eastern property. A time-series plot of methane concentrations in perimeter and off-Site wells on the eastern property preceding and following installation of passive vents is presented in the 2010 Annual O&M Report.

Concentrations in off-Site monitoring wells decreased significantly during the initial five week monitoring period following installation of passive vents, but rebounded slightly during the autumn. In addition, as shown in Attachment 11, methane concentrations at the passive vents tended to be higher during the August monitoring events, than those measured later in the year. Those data suggest that a greater volume of gas was venting in the initial weeks following installation of the measures than in subsequent months. The observed conditions could also be due to changes in exhaust fan strength or subsurface gas concentration resulting from changing meteorological conditions. Nevertheless, based on the data collected to date, it appears that the August 2010 mitigation measures were successful at reducing perimeter and off-Site methane concentrations, particularly in the weeks following installation, but additional monitoring is warranted to assess long-term performance of the measures.

In summary, LFG migration data collected during 2010 suggested that: (i) LFG mitigation measures installed during prior years have been successful at limiting migration along the west, northern, and northeastern property boundaries; (ii) the LFG mitigation measures installed during 2010 have significantly reduced methane concentrations at perimeter and off-Site landfill gas monitoring well locations along the eastern property boundary, but methane concentrations at some wells continued to exceed the LEL; (iii) methane concentrations exceeding the LEL were periodically observed at wells adjacent to the Ern Bark, Inc. property, but concentrations observed in late 2010 were lower than those historically observed; and (iv) LFG migration appears to consist of small gas quantities migrating primarily by diffusion or very low pressure gradients. In either case, such migration mechanisms are judged to pose a low potential for adverse affect by landfill gas on off-Site structures.

#### *ET Cover Performance Monitoring*

The 2003 ROD Amendment required the quantification of percolation through the ET cover system. To that end, the PRP Group constructed a performance monitoring system, located on the northwestern corner of the ET cover system, consisting primarily of a pan lysimeter and three passive capillary lysimeters (drain gauges), referred to as DG-1, DG-2 and DG-3. Those lysimeters were installed at the base of the ET cover system to monitor percolation

through the cover system. These components can be found on Attachment 9 even though the figure was prepared to highlight landfill gas monitoring locations. In accordance with recommendations from the 2009 Annual O&M Report, the performance monitoring program was revised to eliminate drain gauges as supplemental percolation monitoring devices. Therefore, data from the drain gauges were not collected during 2010 and data from the pan lysimeter were used for all percolation evaluations.

The performance monitoring system also includes a Site-specific meteorological monitoring station and soil moisture monitoring stations that includes nested probes installed at 1-ft intervals in the cover system above each drain gauge. The meteorological monitoring station provides Site-specific precipitation data for use in comparison against the percolation data.

The ET cover system was expected to mature over approximately three to four years following planting. Tree planting was completed in 2006; however, due to substantial mortality during the first growing season, approximately 20 percent of the cap was replanted in November 2007. Therefore, the 2010 growing season was the fourth growing season for the entire ET cover system plantation. Accordingly, 2010 monitoring data represents the first year of percolation data for the mature plantation that could be compared to the performance standards. The following sections describe the results of performance monitoring during 2010.

### **Percolation Monitoring**

Percolation measurements obtained from the pan lysimeter were retrieved during the 12 monthly Site visits in 2010. Percolation into the pan lysimeter was measured using a dosing siphon. Discharge from the pan lysimeter collects in the dosing siphon to a predetermined level and then discharges to a drainage pipe. Because the dosing siphon is designed to discharge a constant volume, the volume of water that drains from the pan lysimeter for any given period is calculated by counting the number of dosing siphon discharges for that period and multiplying the discharge count by the volume of each discharge, which is determined based on the dimensions of the dosing siphon and the constant change in water level during each discharge event. To calculate flow through the pan lysimeter, the water level in the dosing siphon is monitored at one-minute intervals using a pressure transducer. The transducer data are analyzed to identify abrupt decreases in water level resulting from a discharge event. Analysis is accomplished using an algorithm programmed into the Site-wide database that generates a date and time data point for each discharge event. Discharge counts from the water level measurements are calculated following each Site visit, and validated by checking against data obtained from a float switch and digital counter in the dosing siphon, which are also recorded during each Site visit. The total percolation for a given period is calculated by dividing the volume of water discharged in a given period by the area of the pan lysimeter.

A summary and example of the calculations, and conversions used to transform the water level data from the pressure transducer measurements into percolation measurements can be found in Appendix E of the 2011 Annual Operations and Maintenance Report. Dosing siphon data collected from July 2009 to June 2010 (the analysis period) were selected for an accurate percolation analysis. Total percolation from the ET cover system was 214 mm (8.4 in.) compared to 1,368 mm of precipitation measured at the Site during the analysis period. Based

on those data, only 15.6 percent of the total precipitation percolated through the cover system during the year, a reduction of 84.4 percent. Those data indicate that total percolation through the cover system during the analysis period was near the high end of modeled percolation reduction presented in the Final RD, which was reported to range from approximately 46 to 86 percent. The data also indicate that the vast majority of percolation occurred during dormant periods in the late winter months and that percolation was negligible during the growing season.

It should also be noted that the pan lysimeter is located at the toe of the slope and stormwater run-on from the slope contributed to the percolation results reported above; however, the models used in the RD did not account for stormwater run-on contributions. Therefore, total percolation recorded by the pan lysimeter would be expected to be higher than the model predictions. In addition, approximately 58 percent (125 mm) of total percolation during the analysis period occurred over an approximate 10-day period (from February 23, 2010, to March 5, 2010), as the snow pack melted from two record-breaking snowstorms that occurred during February. Total precipitation recorded from the analysis period (12 months) was 1368 mm (54 in.), substantially exceeding Site average annual precipitation of approximately 44 in. Therefore, despite run-on into the pan lysimeter that overstated percolation measurements, unprecedented snowfall melt during the first quarter of 2010, and unusually high precipitation, the percolation rate and percent reduction observed during the analysis period were well within the expected average annual range of percolation reduction.

### **Meteorological Monitoring**

Meteorological station data were downloaded during monthly Site visits. Following data retrieval, Geosyntec reviewed precipitation data quality by comparing results against Lanchester Landfill weather station data available on the Chester County Solid Waste Authority (CCSWA) website. The Lanchester Landfill is located approximately two miles west of the Site. Based on those comparisons, precipitation measured on-Site during 2010 (46 in.) appears consistent, albeit slightly higher in total, than precipitation measurements obtained at the Lanchester Landfill weather station (42 in.).

### **Soil Moisture Data**

Three nested soil moisture monitoring stations are located adjacent to the drain gauges. Each station uses four Decagon Devices, Inc. EC20 dielectric soil moisture probes, which are set in the cover system at 1-ft intervals ranging from approximately 0.5 ft bgs to 3.5 ft bgs. Those devices record the volumetric water content (VWC) of soil on an hourly basis; data are stored in an EM 50 datalogger. The 2010 soil moisture data are summarized in Attachment 1 of the 2010 Annual O&M Report. Dataloggers for locations DG-1 and DG-3 were identified as malfunctioning in August 2009. In addition, datalogger malfunction was also identified at DG-2 on March 13, 2010. Dataloggers were replaced at those three locations on September 16, 2010. Subsequently, the datalogger at DG-3 was damaged by mowing activities on October 12, 2010, and was replaced a second time on November 29, 2010. Accordingly, data from those instruments were obtained as follows:

- DG-1: Data available from September 16, 2010, to December 29, 2010;

- DG-2: Data available from January 1, 2010, to March 13, 2010, and from September 16, 2010, to December 29, 2010; and
- DG-3: Data available from September 16, 2010, to October 12, 2010, and from November 29, 2010, to December 29, 2010.

Additionally, several minor data quality issues were identified, as described below:

- Unlikely high values (greater than 40% VWC) were recorded from soil moisture probe DG-2-2.5 from the beginning of the year through mid-February. Those data were rejected and excluded from the data-set;
- Several soil moisture probes recorded a non-numeric value for a period of several days when soil moisture readings approached what appeared to be saturated soil conditions (i.e., elevated soil moisture readings above anticipated field capacities for the cover system soil types); and
- The moisture probe at depth of 0.5 ft bgs at DG-3 (DG-3-0.5) malfunctioned and did not produce valid data during 2010.

### **Site Inspection**

A Site Inspection is conducted during the Five-Year Review to provide information about a site's status and to visually confirm and document the conditions of the remedy, the site, and the surrounding area.

On October 22, 2010, an inspection of the Site was conducted by EPA and PADEP. EPA and PADEP representatives present for the Site Inspection included: Mr. Bruce McClain, PADEP Project Officer; Mr. Dave Polish, EPA Community Involvement Coordinator; and Mr. Frank Klanchar, EPA Remedial Project Manager. Representatives from the PRP Group and their consultant were also in attendance and included: Mr. Mark DeVine and Mr. Martin Howe, PRP Group; Mr. Paul Botek, Geosyntec; and Mr. Lei Yuan, Geosyntec. The purpose of the inspection was to assess the protectiveness of the remedy, including the presence of a fence to restrict access, the integrity of the landfill cap (ET cover system) and surface water controls, and the condition of the groundwater and landfill gas monitoring well network. The weather on the day of the Site Inspection was mostly sunny and 50 degrees F. No significant issues with the remedy were identified during the Site Inspection.

EPA made the following observations during the Site Inspection:

#### *Fencing and Site Access*

The perimeter fence for the Site was intact and has been effective at preventing trespassers on the Site. The perimeter fence is constructed of 6-foot high steel wire mesh with 6-inch diameter wood posts spaced approximately every eight feet. The fence was installed in 2006 and was designed to be a temporary fence. The agricultural gate was locked and in



working order. Based on the existing condition of the fence, if properly maintained, it should last at least through the next Five-Year Review. The “living fence” which was planted around the cap area has not yet lived up to the expectation of providing a hedgerow of dense vegetation that provides an equivalent level of protection for the Site as a six-foot high fence. The plants that comprise the “living fence” were generally 2-3 feet high and sparse in some areas. Spacing was such that it was easy to walk in between plants without coming into contact with them. EPA indicated during the Site Inspection that replanting the “living fence” was not critical since the existing wire mesh fence has been effective at providing security. EPA recommended to the PRP Group that it focus on maintaining the existing perimeter fence since it may take many years before the “living fence” matures to provide an effective barrier.

### *ET Cover System*

The ET cover system was effective at preventing direct contact with landfill material. There were no signs of erosion on the capped area. The hybrid poplar trees planted as part of the remediation in 2006 are approximately sixteen to twenty feet tall and in great condition. Native tree species which were interplanted among the hybrid poplars are also doing well but are not as tall. Tree canopy closure was beginning to occur in limited areas of the Site. There were a couple of areas on the Site where trees needed to be replanted as part of O&M activities. These areas included planting additional trees (1-2 years old bare rooted stock) in a localized area (approximately 15 ft by 15 ft) near PV-02, and planting the remainder of the Site access road with cuttings from cover system trees.

Per the July 2003 ROD Amendment, the performance standard for the ET cover system, which is to attain a standard of performance that is functionally equivalent to that required under the Commonwealth of Pennsylvania’s Solid Waste Regulations, will be evaluated during the Five-Year Review which occurs five (5) years after EPA acceptance of the Interim RA Report for the remedy. The Interim RA Report was approved by EPA on September 29, 2006. This approval date triggers the evaluation to be performed during the next (4<sup>th</sup>) Five-Year Review.

Other than the data logger (DG-3), which was damaged during mowing of the Site in early October, there were no other observable problems noted with the performance monitoring system for the ET cover system. The performance monitoring system includes a pan lysimeter and three passive capillary lysimeter (drain gauges), referred to as DG-1, DG-2, and DG-3. The consultant for the PRP Group noted that repairs to the data logger would be made in November 2010, as part of routine O&M activities.

The meteorological station was in good shape and operating as designed.

### *Surface Water Drainage Systems*

The stormwater management system, which was installed in 2006, was performing as designed. The system routes stormwater from the northern side of the Site to a retention infiltration basin on the southern side of the Site. There was no erosion damage to any of the features. The infiltration basin was empty at the time of the Site Inspection.

### *Landfill Gas Monitoring Network*

The landfill gas (LFG) migration monitoring network which consists of 14 perimeter LFG monitoring wells, 23 passive vent locations, and 9 bar punch locations was in good condition and operating properly.

### *Groundwater Monitoring Wells*

The 12 groundwater monitoring wells that are utilized at the Site for semi-annual groundwater sampling events were in good condition and operating properly.

### *Site Mowing*

The vegetative grass on the ET cover system and inside the perimeter fence was mowed on October 12, 2010. At the time of the Site Inspection, no additional mowing maintenance needs were identified for the Site. EPA suggested maintaining mowed paths for Site maintenance, inspection, and monitoring for approximately one-half of the existing access road on the ET cover system and around the western and southern perimeter of the Site. Site mowing within the trees should continue until full canopy closure is reached.

### *Other Observations*

EPA and PADEP observed that a new home was being constructed on the south side of Welsh Road approximately 800 feet east from the entrance to the Site. The EPA RPM noted that the Chester County Health Department (CCHD) had contacted him earlier in the year about an application for a well permit for a new home along Welsh Road. At that time, the EPA RPM recommended that the CCHD contact the HBBA due to the fact that there was a water main along Welsh Road and HBBA has a mandatory connection ordinance in place. EPA also noted during the phone conversation that the home location is probably within ¼ mile of the Site.

### **Site Interviews**

Interviews and discussions were conducted with various parties connected to the Site during the Five-Year Review. During the Site Inspection, EPA and PADEP conducted a meeting with the PRP Group and their technical consultant. Mr. Mark DeVine and Mr. Martin Howe of the PRP Group, and Mr. Paul Botek and Mr. Lei Yuan of Geosyntec Consultants, were interviewed. The PRP Group has been associated with the Site since 1999. The PRP Group and their consultant have been performing O&M at the Site since the ET cover system was constructed in 2006. The PRP Group was pleased with the overall condition of the ET cover system thus far and understands that the performance of the remedy will be evaluated during the next (4<sup>th</sup>) Five-Year Review. It was noted that additional landfill gas mitigation measures were recently completed in August 2010 and that there has only been one round of sampling which is not enough data to determine if the mitigation measures were successful. No major changes are proposed or planned for the Site at this time. Minor changes to the O&M program may be provided as recommendations in the Annual O&M Report.

The EPA Community Involvement Coordinator, Mr. David Polish, and the EPA RPM, Mr. Frank Klanchar, met with local officials and residents living near the Site on October 22, 2010, to discuss the Five-Year Review process and to solicit comments regarding any concerns with the Site. The local officials interviewed included Mr. Michael Shuler of the HBBA and Mr. Heath Eddy, Director of Planning and Zoning for Honey Brook Township. Mr. Shuler indicated that he had not heard of any recent activity at the Site. He informed EPA that a new home was being constructed along Welsh Road and that the homeowner would be required to connect to the public water system. EPA informed Mr. Shuler that EPA first became aware of the situation several months earlier when contacted by the Chester County Health Department about a property owner applying for a private well permit on Welsh Road. Mr. Shuler had no additional comments regarding the Site. In the interview with Mr. Eddy, EPA explained the remedial activities that were conducted at the Site. Mr. Eddy was relatively new in the position. EPA confirmed with Mr. Eddy that the person building the new home along Welsh Road was required to be connected to public water. Mr. Eddy had no comments about the Site.

EPA also met with two residents who live immediately adjacent to the Site. One resident expressed a few concerns with their property. The concerns included: 1) that the property was not properly draining surface water, 2) that the weeds along the perimeter fence were not being maintained, and 3) the migration of landfill gas. EPA inspected the drainage swale on the property and concluded that the swale has not changed since the remediation work was completed in 2006. The swale does have slope to carry surface water off the property. However, the slope is very gradual and it would be difficult to improve the swale to remove surface water more rapidly. As a result, the drainage swale would be the last area in the yard to dry out following a storm event. EPA informed the resident that the weeds at the base of the fence would be addressed during maintenance activities and that landfill gas mitigation measures were installed over the summer. Landfill gas monitoring would continue every quarter and the results would be evaluated. The other resident stated that the Site looked nice and that storm water drainage issues on his property have been resolved.

On March 7, 2011, the EPA RPM contacted Caernarvon Township and spoke to the Secretary/Treasurer, Ms. Kathy Norris. Ms. Norris was unfamiliar with the Site and had recently started in the position. The EPA RPM explained some background and history of the Site, the remedies which were in place, and the Five-Year Review process. The EPA RPM suggested bringing up the Five-Year Review of the Site at the next Board of Supervisors meeting. Ms. Norris indicated that the next meeting was that evening and that she would bring the information to the supervisors' attention. The EPA RPM provided a phone number to Ms. Norris so that any supervisor could call if there were any concerns regarding the Site.

### **Potential for Reuse of the Site**

The Site, as it exists today, contains approximately seven (7) acres, of which approximately 5.2 acres are capped by the ET cover system. The ET cover system is constructed on the area of the former landfill. The remaining 1.8 acres of the Site contains the surface water drainage channel and infiltration basin, access road, and limited buffer areas. The perimeter of the Site is fenced by a six-foot high steel wire mesh fence.

The ET cover system consists of a three (3) to four (4) foot thick soil rooting layer and a vegetative layer. The vegetative layer is composed primarily of hybrid poplar trees, willows, and eastern cottonwoods interplanted with native hardwoods and conifers, consistent with the biodiversity of nearby forested areas surrounding the Site. In total, approximately 4,090 trees were planted as part of the ET cover system. The trees were installed at a frequency of 705 hybrid poplar/willow trees per acre and 75 interplanted trees per acre. The interplanting of native tree species will aid in the long-term (>30 years) transition to a climax forest.

The ET cover system has been designed to remain in place for an indefinite period and the trees are an integral part of the remedy. Therefore, the potential for reuse of the Site is extremely limited. Institutional controls (ICs) are in place on all properties on which the ET cover system components are placed in the form of deed notices. The deed notices provide a declaration of easements, covenants and restrictions for the affected properties. The restrictions are to limit groundwater use and to prohibit any activity that may disturb the integrity of the ET cover system and its components. The declarations of easements, covenants and restrictions for the properties can be found on the following web site:

[http://www.epa.gov/ictssw07/public/export/03/PAD980829527/PAD980829527\\_report.HTM](http://www.epa.gov/ictssw07/public/export/03/PAD980829527/PAD980829527_report.HTM)

EPA will continue to evaluate whether deed notices are the proper IC to ensure long-term integrity of the remedy. Aside from providing excellent habitat for small mammals and birds, the Site is expected to remain as forest and open, undeveloped space.

## **XII. Technical Assessment**

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

Yes. The review of documents and the results of the Site Inspection indicate that the completed elements of the remedy are functioning as intended by the June 1990 ROD, the July 2003 ROD Amendment, and the February 2006 ROD for OU2.

### ET Cover System

On July 2, 2003, EPA issued a ROD Amendment for an alternate source control action for the landfill. The Amendment modified the cleanup by changing the type of landfill cap that was required for the Site from a multi-media cap, as selected in the 1990 ROD, to an Evaporation/Transpiration (ET) cover system. The ET cover system will reduce infiltration through the landfill, thereby preventing further degradation of groundwater quality. The RAOs for this remedy are:

- Prevent inhalation or ingestion of, or direct contact with Site soils, sediments, or solid waste containing polynuclear aromatic hydrocarbons (PAHs) or metals at concentrations that would pose unacceptable hazards based on cumulative chronic hazard or carcinogenic indices; and

- Reduce infiltration through the landfill and further limit the potential for migration of contaminants of concern into groundwater, surface water, and/or sediments.

The ET cover system has been effective at meeting the remedial objective of preventing inhalation or ingestion of, or direct contact with Site soils, sediments, or solid waste.

The 2003 ROD Amendment recognized that the ET cover system would take several years to become established and efficient at reducing infiltration. As a result, the ROD Amendment determined that evaluation of the performance of the ET cover system would take place during the Five-Year Review process, but not less than five (5) years after EPA acceptance of the Interim RA Report for this action. In this case, the RA Report was approved by EPA on September 29, 2006. As a result, this approval date triggers the evaluation to be performed during the next (4<sup>th</sup>) Five-Year Review.

In the interim, ET cover system monitoring data from 2010, which represents the first year of percolation data for the mature plantation that could be compared to the performance standards, is showing promising results. Percolation data collected from the pan lysimeter during 2010 totaled 217 mm (8.5 in.) compared to 1,159 mm (45.6 in.) of total precipitation. These data indicate that the ET cover system percolation reduction as a function of total precipitation was greater than 81 percent, which was near the high end of the range of average percolation reduction predicted by the models presented in the Final RD (i.e., 46% to 86% reduction). The data also showed that approximately 58% of the 2010 percolation occurred during an approximately 10-day period (late February to early March) when melting from two back-to-back record-breaking snowfall events occurred.

#### Groundwater (OU2) Monitoring

EPA issued a ROD for OU2 (groundwater) on February 2, 2006. OU2 is the second and final operable unit at the Site. The RAOs for OU2 were based on the results of a Focused Groundwater Study and subsequent groundwater monitoring events, the Baseline Risk Assessment, and acceptable contaminant levels. As a result, the RAOs for OU2 are:

- Prevent the ingestion of groundwater containing Site-related contaminants of concern in excess of MCLs;
- Prevent the inhalation of volatile organic compounds in the groundwater at unacceptable cumulative chronic hazards or carcinogenic index values; and
- Restore the local groundwater aquifer quality to MCLs for all Site-related contaminants of concern.

Monitoring of the groundwater at the Site is performed in accordance with the Groundwater Monitoring Plan (GMP) approved by EPA in May 2005. Detailed summaries of analytical data are documented in the Groundwater Monitoring Reports, which are prepared semi-annually and used to identify data trends. Since 2007, routine groundwater monitoring is performed at the Site semi-annually in the months of April and October. During each event,

water level measurements are taken from 17 wells and groundwater samples are collected from the 12 monitoring wells. The most recent sampling event was performed in October 2010 and only 5 organic compounds and 16 metals were detected. These findings are generally consistent with recent monitoring events, and no obvious increasing trends in constituent concentrations exist. None of the 5 organic compounds were detected at concentrations exceeding applicable drinking water standards. Arsenic was the only metal detected above drinking water standards and was found in only two wells (EPA-2 and EPA-2A). The groundwater plume at the Site is mostly limited to the footprint of the landfill with the exception of the location of wells EPA-2 and EPA-2A.

### Institutional Controls

An integral component of the OU1 remedy was the implementation of institutional controls to restrict future Site uses that could potentially affect performance of the various components of the remedial action and exposure risks to groundwater. The institutional controls (ICs) employed at the Site were in the form of deed notices. The deed notice includes a declaration of easements, covenants, and restrictions for the affected properties. The declarations were executed between the PRP Group and the property owners. The deed notices for parcels in Honey Brook Township were recorded in the land records of Chester County on August 30, 2006, and one parcel located in Caernarvon Township was recorded in the land records of Lancaster County on October 13 2006.

Copies of each declaration of easements, covenants, and restrictions to affected properties can be found on the web at the following address:

[http://www.epa.gov/ictssw07/public/export/03/PAD980829527/PAD980829527\\_report.HTM](http://www.epa.gov/ictssw07/public/export/03/PAD980829527/PAD980829527_report.HTM)

Another institutional control in place for the Site is the rules and regulations for well drilling in Chester County. The Chester County Health Department (CCHD) promulgates these rules and regulations. Under Chapter 500 §501.12.2.4 of the CCHD Rules and Regulations, no new wells may be permitted or constructed within the delineated Plume Area of a contaminated site or within the ¼ mile Area of Concern unless hydrologic evidence is provided to the CCHD, and accepted as satisfactory by US EPA or PA DEP, which verifies that installation of the well will not have any impact on the Plume or remediation effort. This regulation applies to all NPL-caliber sites in Chester County. A pdf file of Chapter 500 of the CCHD Rules and Regulations can be found on the web at the following address:

<http://dsf.chesco.org/health/lib/health/regs/501.pdf>

### Optimization Opportunities

There were no opportunities for system optimization observed during this review. The monitoring well network provides sufficient data to assess groundwater contamination at the Site. The PRP Group and their technical consultant, Geosyntec Consultants, evaluate the ET cover system maintenance, and monitor the groundwater and landfill gas performance of existing

systems during the preparation of the Annual Assessment Report. Any opportunities for system optimization would be provided in the Annual O&M Report.

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

Yes. The exposure assumptions, toxicity data, cleanup levels, and RAOs used have not changed and are still valid. The RAO of restoring ground water to its beneficial use (as drinking water) is expected to be met once the ET cover system becomes fully functional. The cleanup levels associated with this RAO are the Maximum Contaminant Levels (MCLs) and non-zero Maximum Contaminant Level Goals (MCLGs) specified in the Safe Drinking Water Act (SDWA), which have not changed for the contaminants at this Site.

Vapor intrusion is a phenomenon that environmental agencies have recently begun to explore. It is the concern where VOCs are present in the subsurface material and have the potential to migrate as a gas into buildings. The groundwater plume at the Walsh Landfill Site is mostly limited to the footprint of the landfill with occasional contaminant detections within 200 feet of the landfill. Groundwater data from all monitoring wells at the Site over the last ten years have demonstrated that no organic compounds have been detected at concentrations exceeding their respective MCLs. There are two homes located adjacent to the Site within 100 feet of the landfill. These homes are either a manufactured or a trailer-type structure and the foundation system consists of footings with either concrete block or elevated piers. The closest monitoring wells to the two homes are wells MW-BH and MW-7. These wells are approximately 100 feet away from the homes. Groundwater data from these two wells over the past 5 years have consistently been non-detect for most volatile and semi-volatile compounds with well MW-BH having an occasional estimated value for benzene and chlorobenzene above the method detection limit (MDL) but below the practical quantitation limit (PQL). As a result of the above information, no further investigation for the vapor intrusion pathway is necessary.

Landfill gas (LFG) migration is also monitored at the Site and on the property of two adjacent homes. The properties of the residences are monitored through a combination of landfill gas monitoring wells, bar-punch probe locations, and in the crawlspace of the structures. A handheld gas analyzer is used to take methane and oxygen measurements. The concentrations of methane in the LFG monitoring wells of the adjacent properties have been found at concentrations higher than 100% of the lower explosive limit. As a result, LFG mitigation measures are being implemented at the Site to address this issue. Bar-punch probe locations, which are located closer to the structures, have mostly been non-detect for methane with a few locations having less than 1% methane. Methane has never been detected in the crawlspace of either structure since LFG migration monitoring began in 2007. This information coupled with the fact that the foundation system for the structures allows for ventilation suggests that the off-Site LFG migration does not pose an unacceptable risk to the adjacent residences.

Land use near the Site has not changed significantly since the last Five-Year Review, and still remains a mixture of agricultural and residential. No physical changes to Site conditions have been made that would affect the protectiveness of the remedy.

No new human health or ecological routes of exposure or receptors have been identified or changed in a way that could affect the protectiveness of the remedy. There have been no newly identified contaminants, contaminant sources, or unanticipated toxic byproducts of the remedy that were not previously addressed by the decision documents. Standardized risk assessment methodologies have not changed in a way that could affect the protectiveness of the remedy.

#### Changes in Standards or To Be Considereds

As remedial work was completed, ARARs for construction-type activities cited in the ROD have been met. ARARs that still must be met at this time are presented in Attachment 13. There have been no changes in these ARARs and no new standards or TBCs affecting the protectiveness of the remedy.

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

No. There is no new information that calls into question the protectiveness of the remedies as specified in the June 1990 ROD, the July 2003 ROD Amendment, and the February 2006 ROD for OU2.

#### Summary of Technical Assessment

According to the data reviewed, the Site inspection, and the interviews, the remedy is functioning as intended by the June 1990 ROD, July 2003 ROD Amendment, or the February 2006 ROD for OU2. 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 the toxicity factors for the contaminants of concern that were used in the baseline risk assessment, and there have been no changes to the standardized risk assessment methodology that could affect the protectiveness of the remedy. Tree canopy closure for the ET cover system was beginning to occur at limited areas of the Site. ET cover system monitoring data from 2010, which represents the first year of percolation data for the mature plantation that could be compared to the performance standards, is showing promising results. An evaluation of the functional equivalence of the ET cover system to the requirements for final covers under the Commonwealth of Pennsylvania's Solid Waste Regulations will be made during the next (4<sup>th</sup>) Five-Year Review. Landfill gas mitigation measures implemented in August 2010, appear to be successful at reducing perimeter and off-Site methane concentrations, particularly in the weeks following installation, but additional monitoring is warranted to assess long-term performance of the measures. There is no other information that calls into question the protectiveness of the remedy.



### XIII. Issues

The Table 4 below summarizes the current issues at the Walsh Landfill Site:

<b>Table 4 Five-Year Review Issues</b>		
<b>Issues</b>	<b>Affects Current Protectiveness (Y/N)</b>	<b>Affects Future Protectiveness (Y/N)</b>
1. Landfill gas (LFG) mitigation measures were implemented at the Site in August 2010 along the landfill property boundary. Limited LFG monitoring data is available to determine if the mitigation measures installed in 2010 were successful.	N	Y
2. The performance standard for the ET cover system, which is to attain a standard of performance that is functionally equivalent to that required under the Commonwealth of Pennsylvania's Solid Waste Regulations, has not been evaluated.	N	Y

### XIV. Recommendations and Follow-Up Actions

EPA's recommendations and follow-up actions for the Walsh Landfill Site are presented in Table 5.

<b>Table 5 Recommendations and Follow-up Actions</b>						
<b>Issue</b>	<b>Recommendations and Follow-up Actions</b>	<b>Party Responsible</b>	<b>Oversight Agency</b>	<b>Milestone Date</b>	<b>Affects Protectiveness (Y/N)</b>	
					<b>Current</b>	<b>Future</b>
1.	Continue landfill gas (LFG) migration monitoring and assess the long-term performance of the LFG mitigation measures installed in 2010. A summary of findings and recommendations for future actions is to be presented in a 2011 quarterly progress report.	PRP Group	EPA, PADEP	By December 31, 2011	N	Y

**Table 5  
Recommendations and Follow-up Actions**

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
2.	Prepare a report that evaluates the functional equivalence <sup>1</sup> of the ET cover system to the requirements for final covers under the Commonwealth of Pennsylvania's Solid Waste Regulations. Per the performance standards contained in the 2003 ROD Amendment, the report will be evaluated by EPA and PADEP during the next (4 <sup>th</sup> ) Five-Year Review of the Site.	PRP Group	EPA, PADEP	Report may be submitted as early as September 29, 2011 but no later than May 22, 2015.	N	Y

<sup>1</sup> - Per the July 2, 2003 ROD Amendment, functional equivalence shall be deemed met if the following criteria are satisfied:

- 1) The ET cover system has been properly operated and maintained in accordance with the approved O&M Plan;
- 2) The monitoring data collected from the ET cover system indicates that the cover system is performing adequately based on a comparison of data to predictive modeling;
- 3) The ET cover system is performing at a level equal to or better than a cover system designed in accordance with the Commonwealth of Pennsylvania's regulations based upon actual field data from EPA's Alternative Cap Assessment Program (ACAP) or other EPA approved test sites; and
- 4) The groundwater data shows no statistically significant increase in concentrations over baseline conditions.

**XV. Protectiveness Statement(s)**

The remedy at the Walsh Landfill is protective in the short-term because all exposure pathways that could result in unacceptable risks are being controlled. The Site will be fully protective when the Remedial Action Objectives (RAOs) (see pages 13-14) have been achieved. Monitoring of groundwater is expected to continue until cleanup goals are met. An evaluation of the functional equivalence of the ET cover system to the requirements for final covers under the Commonwealth of Pennsylvania's Solid Waste Regulations will be made during the next (4<sup>th</sup>)

Five-Year Review. It is expected that cleanup goals (MCLs) for groundwater will be met once the ET cover system becomes fully functional.

The vapor intrusion pathway and off-Site landfill gas migration do not pose an unacceptable risk to any homes located adjacent to the Site.

Institutional controls are in place for this Site.

## **XVI. Next Review**

EPA will conduct another Five-Year Review within five (5) years of the completion of this Five-Year Review Report. The completion date is the date of the signature on the front of this Report.

## **XVII. References**

Walsh Landfill Superfund Site Record of Decision. U.S. EPA Region III; June 29, 1990.

Amendment No. 1 to the Record of Decision; Welsh Road Landfill Superfund Site, Operable Unit #1. U.S. EPA Region III; July 2, 2003.

Administrative Order No. III-99-012-DC In The Matter Of: Welsh Road Superfund Site; Honey Brook, Pennsylvania, Ernest Barkman, Grace Barkman, Ern-Bark, Inc., Bark-Ern, Inc., E.B. Corp., Inc., Alcoa, Sun Company, Unisys Corp., Waste Management of PA, Inc., and Waste Management Disposal Services of PA, Inc. Respondents. July 29, 2003. [As modified by the First Amendment to Administrative Order for Remedial Design/Remedial Action]

Groundwater Monitoring Plan, Welsh Road Landfill Superfund Site, Honey Brook, Pennsylvania. GeoSyntec Consultants; April 2005.

Record of Decision for Operable Unit #2; Walsh Road Landfill Site. U.S. EPA Region III; February 2, 2006.

Five-Year Review Report, Walsh Landfill Superfund Site, Chester County, Pennsylvania. U.S. EPA Region III; May 22, 2006.

Groundwater Monitoring Report – Sampling Events; Welsh Road Landfill Superfund Site, Honey Brook, Pennsylvania. GeoSyntec Consultants; 2005 thru 2010.

Quarterly Progress Reports for the Welsh Road Landfill, Remedial Action for OU1. Geosyntec Counsultants; 1<sup>st</sup> Quarter 2009 thru 3<sup>rd</sup> Quarter 2010.

Annual Operations and Maintenance Report for the Welsh Road Landfill, Honey Brook, Pennsylvania. Geosyntec Counsultants; 2007-2010.

# **Attachments**

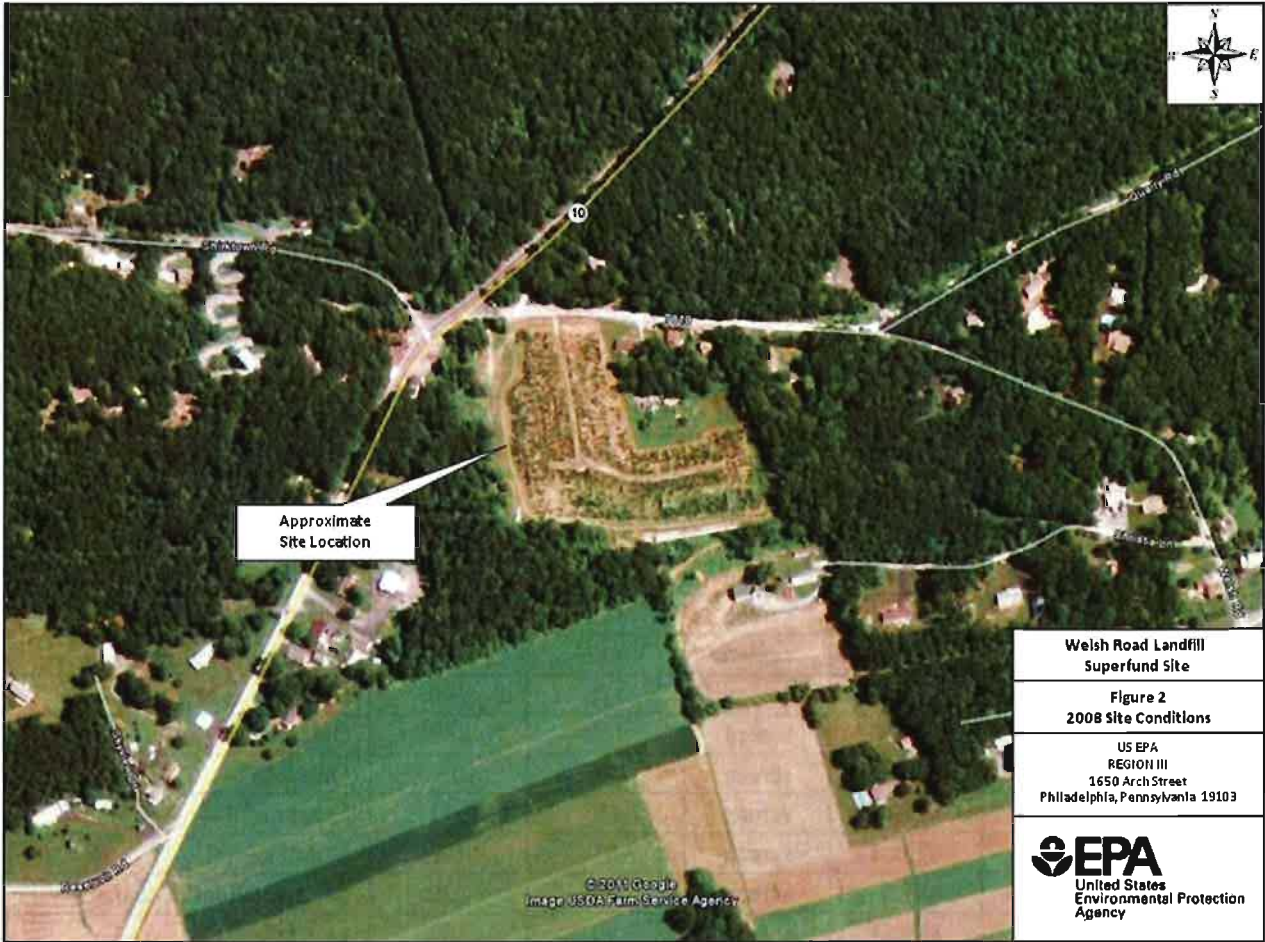
**Attachment 1 – Site Location Map**



**Attachment 2 – Walsh Landfill (April 1984)**



**Attachment 3 – Walsh Landfill (2008)**



Attachment 4 – Groundwater Monitoring Well Details

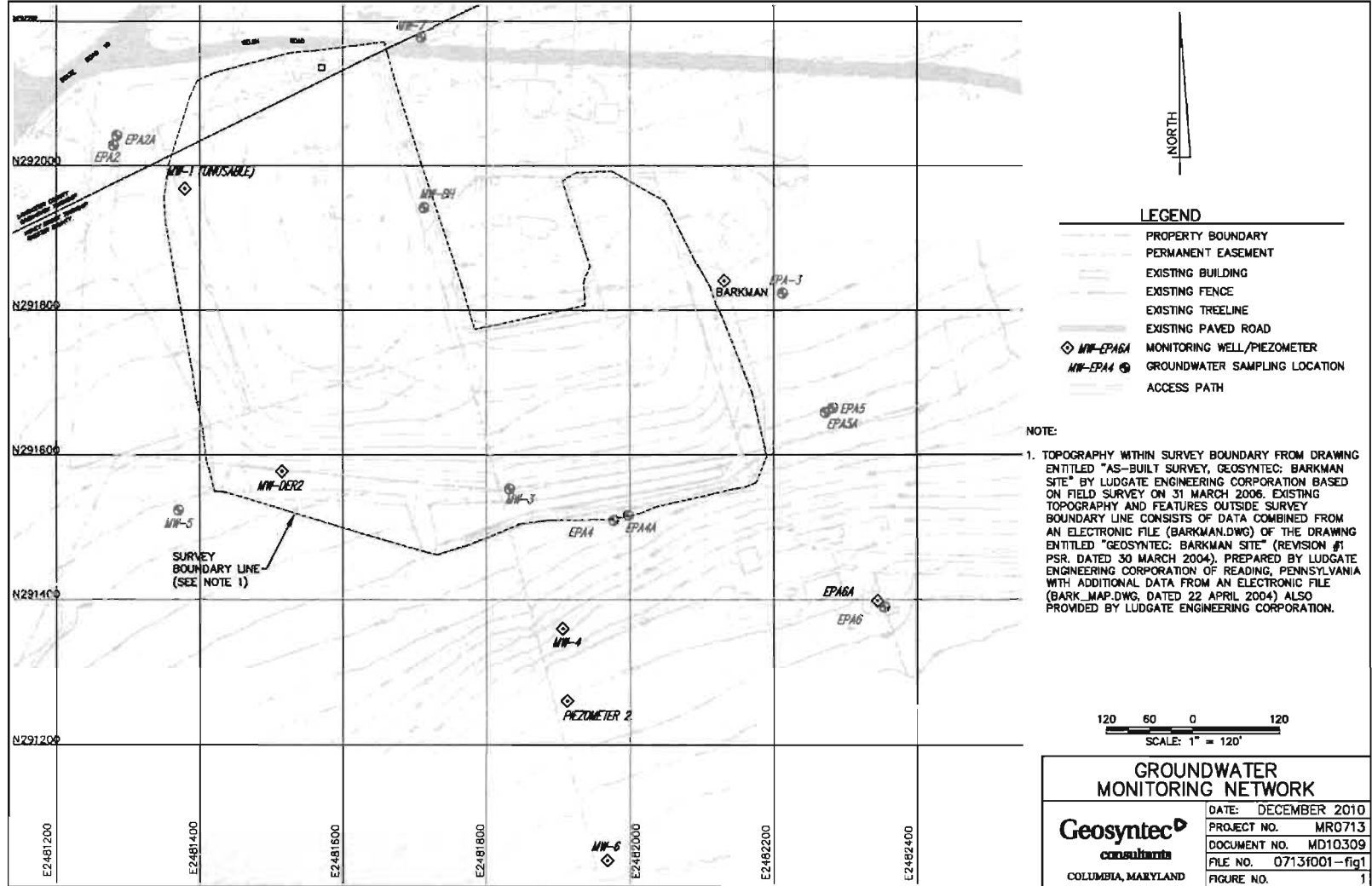
Groundwater Monitoring Well Details Walsh Landfill Superfund Site						
Well ID	Groundwater Sampling Location	Top of Casing Elevation (ft, MSL)	Screen or Open Borehole	Top of Screen Depth – bgs	Bottom of Screen Depth – bgs	Strata
MW-1		912.90	open	22	135	White/tan conglomerate
MW-2		962.01	screen	175	195	White/tan conglomerate
MW-3	X	882.34	screen	70	85	Red/grey conglomerate
MW-4		846.90	screen	125	140	Grey/green conglomerate
MW-5	X	890.70	screen	56	71	Grey/red conglomerate
MW-6		817.47	screen	103	118	Granodiorite
MW-7	X	932.78	screen	TBD	TBD	Quartzite
MW-BH	X	914.18	screen	58	71	Quartzite
EPA-1		967.41	screen	170	195	Quartzite
EPA-1A		967.95	screen	112	129.5	Quartzite/conglomerate
EPA-2	X <sup>(1)</sup>	916.63	screen	176	196	Quartzite
EPA-2A	X	916.00	screen	147	162	Quartzite
EPA-3	X	898.10	screen	82.5	102.5	Quartzite
EPA-4	X <sup>(1)</sup>	872.12	screen	126	141	Quartzite
EPA-4A	X	872.48	screen	83	98	Quartzite
EPA-5	X <sup>(1)</sup>	881.53	screen	208	228	Sand, medium to coarse
EPA-5A	X	881.51	screen	90	102	Quartzite
EPA-6	X <sup>(1)</sup>	830.05	screen	110	130	Sandy clay
EPA-6A		830.88	screen	39	54	Clay/sandy silt
DER-2		891.93	screen	51	61	Conglomerate
Piezometer 1		843.29	open	107	150	Grey conglomerate
Piezometer 2		831.61	open	95	150	Precambrian Gneiss
SMW-4		844.08	screen	32	47.5	Saprolite
SMW-6		817.65	screen	35	48	Saprolite

Notes:  
<sup>(1)</sup> Location is sampled annually.



# Attachment 5 - Groundwater Monitoring Well Locations

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SUMMARY OF DETECTED METALS<sup>1</sup>

October 2010 Sampling Event  
 Welsh Road Landfill  
 Honey Brook Township, Pennsylvania

PARAMETER	Method Detection Limit	Units	MCL	RESULT												
				EPA-2	EPA-2A	EPA-3	EPA-4	EPA-4A	EPA-5	EPA-5A	EPA-6	MW-3	MW-5	MW-7	MW-BH	
Aluminum	0.0802	mg/L	0.2*	N.D.	0.112 J	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	0.149 J	N.D.	N.D.	2.11	0.284
Arsenic	0.00095	mg/L	0.01	0.0449	0.0302	0.0084	0.0011 J	0.0023	N.D.	N.D.	N.D.	0.0056	0.0071	N.D.	N.D.	N.D.
Barium	0.00060	mg/L	2	0.0882	0.0847	0.127	1.97	0.432	0.665	0.345	0.353	0.239	0.555	0.0816	0.182	
Cadmium	0.0020	mg/L	0.005	0.0028 J	0.0021 J	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Calcium	0.0702	mg/L	NA	12.8	10.6	24.9	15.2	48.6	42.7	2.29	16.5	170	8.83	17.5	16.2	
Cobalt	0.0021	mg/L	NA	N.D.	N.D.	N.D.	0.270	0.0837	0.0491	0.0349	N.D.	N.D.	0.0526	0.0093	0.0035 J	
Copper	0.0027	mg/L	1.0*	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	0.0028 J	N.D.	
Iron	0.0522	mg/L	0.3*	105	105	57.3	30.9	75.0	0.652	5.45	N.D.	38.7	69.9	N.D.	N.D.	
Magnesium	0.0172	mg/L	NA	8.63	9.15	8.96	12.4	23.7	5.00	1.65	5.41	53.9	7.58	6.07	6.91	
Manganese	0.00084	mg/L	0.05*	0.863	0.606	0.425	18.5	8.23	4.44	5.55	0.0810	1.17	1.67	1.02	0.335	
Mercury	0.000056	mg/L	0.002	N.D.	N.D.	N.D.	0.000069 J	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	0.00028	N.D.
Nickel	0.0018	mg/L	NA	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	0.0059 J	N.D.	
Potassium	0.239	mg/L	NA	1.65	1.21	10.6	8.04	13.4	7.97	9.31	7.20	25.3	7.19	4.21	3.61	
Sodium	0.433	mg/L	NA	30.6	30.6	29.4	64.1	82.2	24.0	18.6	24.1	32.7	32.1	43.2	14.6	
Thallium	0.00015	mg/L	0.002	N.D.	N.D.	N.D.	0.00099	N.D.	N.D.	0.00083	N.D.	N.D.	N.D.	0.00089	N.D.	
Zinc	0.0081	mg/L	5*	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	0.114	N.D.	

Notes:

- 1 = All metals samples were filtered using a 0.45 micron filter.
- MCL = USEPA Maximum Contaminant Level.
- \* = USEPA Secondary Maximum Contaminant Level.
- mg/L = milligrams per liter.
- J = Estimated value; Value reported is above the Method Detection Limit but below the Practical Quantitation Limit.
- N.D. = analyte not detected above Method Detection Limit.
- NA = Not applicable - No MCL set by USEPA.
- Highlighted = Value above MCL.

SUMMARY OF DETECTED VOLATILE AND SEMI-VOLATILE ORGANIC COMPOUNDS

October 2010 Sampling Event  
 Welsh Road Landfill  
 Honey Brook Township, Pennsylvania

PARAMETER	Method Detection Limit	Units	MCL	RESULT											
				EPA-2	EPA-2A	EPA-3	EPA-4	EPA-4A	EPA-5	EPA-5A	EPA-6	MW-3	MW-5	MW-7	MW-BH
1,1-Dichloroethane	1	µg/L	NA	N.D.	N.D.	N.D.	1 J	N.D.	1 J	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
1,4-Dichlorobenzene	0.9	µg/L	75	N.D.	2 J	2 J	3 J	3 J	2 J	N.D.	1 J	2 J	3 J	N.D.	N.D.
Benzene	0.5	µg/L	5	1 J	3 J	3 J	3 J	2 J	2 J	N.D.	1 J	3 J	2 J	N.D.	0.6 J
Chlorobenzene	0.8	µg/L	100	0.9 J	2 J	3 J	3 J	6	2 J	N.D.	2 J	6	4 J	N.D.	1 J
Chloroethane	1	µg/L	NA	N.D.	N.D.	3 J	4 J	38	N.D.	N.D.	4 J	76	N.D.	N.D.	N.D.

Notes:

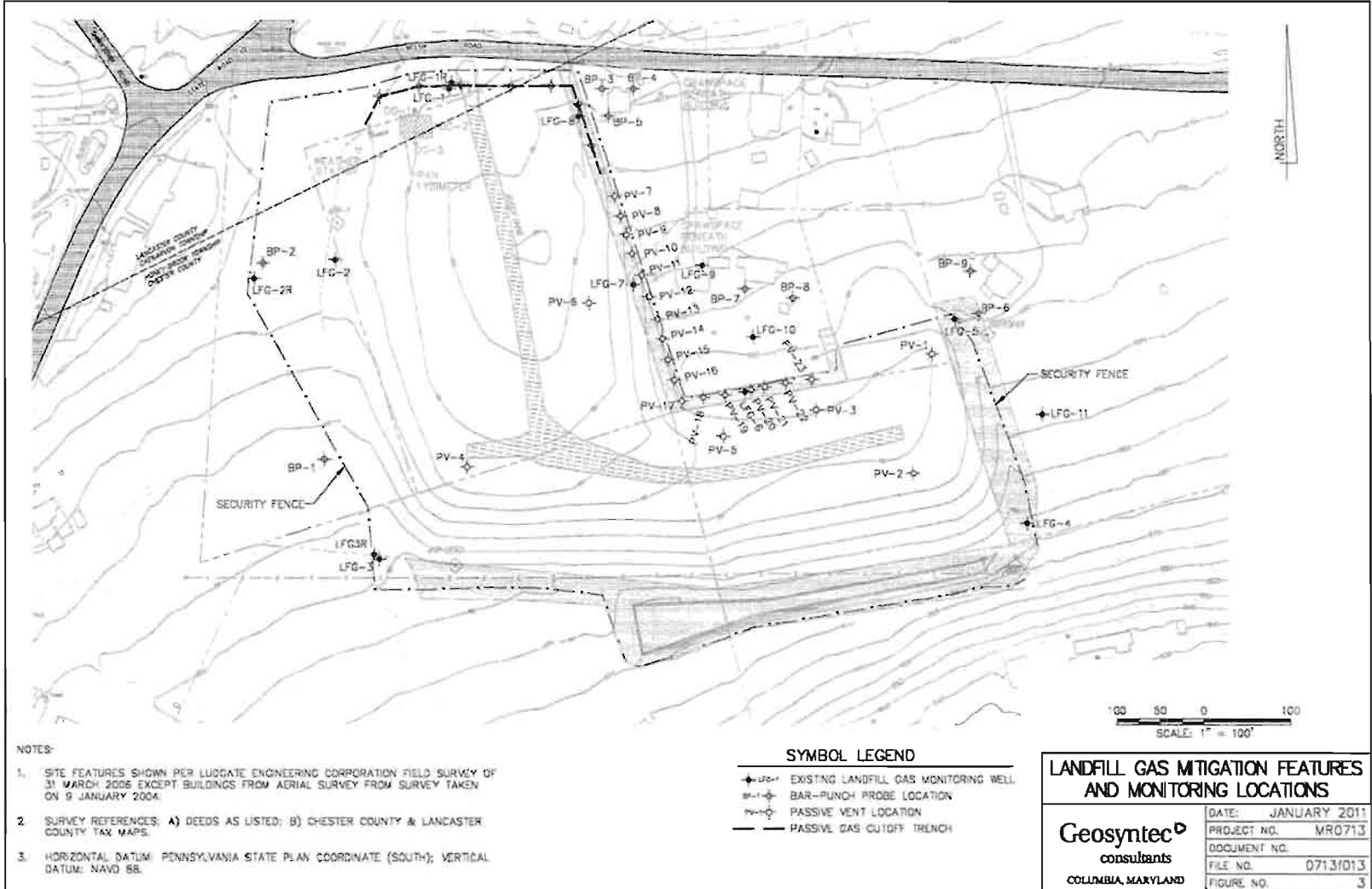
- MCL USEPA Maximum Contaminant Level
- µg/L micrograms per liter.
- J Estimated Value; Value reported is above the Method Detection Limit but below the Practical Quantitation Limit
- N.D. analyte not detected above Method Detection Limit.
- NA Not applicable - No MCL set by USEPA.

**Attachment 8 - Summary of MCL Exceedances over the Past 6 Years**

<b>Summary of MCL Exceedances over the Past 6 Years at the Walsh Landfill Superfund Site</b>							
<b>Sampling Event</b>	<b>Contaminant Concentrations and Well Locations</b>						
	<i>Arsenic</i> (MCL = 10 µg/L)			<i>Thallium</i> (MCL = 2 µg/L)			<i>Barium</i> (MCL = 2,000 µg/L)
	<b>EPA-2</b>	<b>EPA-2A</b>	<b>EPA-3</b>	<b>EPA-4</b>	<b>EPA-4A</b>	<b>EPA-5A</b>	<b>EPA-4</b>
October 2010	44.9	30.2					
April 2010	40.1	22.1					
October 2009	29.3	19.3 J		15.1 J			
April 2009	46.1	31.4					
October 2008	52.0	32.3	20.0				
April 2008	45.0	26.8					
October 2007	48.3	27.0	11.6 J	14.4 J			
April 2007	42.9	19.0 J					
July 2005	38.4	22.6			17.5 J	10.1 J	2,210
June 2005	35.6	17.3 J		20.9	25.2	16.7 J	2,510
<p>Notes:                      All concentrations are in micrograms per liter (µg/L).                      A blank cell indicates that contaminant was below MCLs or not detected.                      No sampling was performed in 2006 due to ET cap construction.</p>							

# Attachment 9 - Landfill Gas Monitoring Locations

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Attachment 10 – Summary of Methane Concentrations at Existing Monitoring Points

SUMMARY OF METHANE CONCENTRATIONS <sup>(1)</sup>  
AT EXISTING MONITORING POINTS

Welsh Road Landfill Superfund Site  
Honey Brook, Pennsylvania

Location	Date													
	1/7/2010 <sup>(2)</sup>	1/15/10	3/1/10	4/5/2010 <sup>(2)</sup>	6/21/10	7/26/2010 <sup>(2)</sup>	8/25/10	8/27/10	9/3/10	9/10/10	9/16/10	10/22/2010 <sup>(2)</sup>	11/29/10	12/29/10
LFG-1	0.1	0	0	0	0	4.8	0.3	NS	0	0	NS	0	NS	NS
LFG-1R	0.1	0	0	0	0	0	0	NS	0	0	NS	0	NS	NS
LFG-2	<b>6.9</b>	2.5	0.3	0.4	<b>6.9</b>	0	0.3	NS	0	0	NS	0	NS	NS
LFG-2R	0	0	0	0	NS	0	0	NS	0	0	NS	0	NS	NS
LFG-3	0.1	0.2	<b>7.4</b>	<b>25</b>	NS	<b>5.4</b>	<b>22.7</b>	NS	<b>20</b>	4.3	NS	0	NS	NS
LFG-3R	0	0.1	0	0	NS	4.8	0	NS	1.8	0.2	NS	0	NS	NS
LFG-4	0.2	0	0.1	<b>14.8</b>	NS	0	<b>15.6</b>	NS	0.3	0	NS	0.6	NS	NS
LFG-5	<b>29.3</b>	0	0	<b>34.2</b>	<b>19.7</b>	<b>17.8</b>	<b>30.7</b>	NS	<b>18</b>	<b>5.4</b>	NS	1.6	NS	NS
LFG-6	0.3	0.3	<b>78.2</b>	<b>66.7</b>	<b>65.1</b>	<b>16.3</b>	<b>13</b>	<b>8</b>	<b>5.7</b>	<b>4</b>	NS	<b>38.5</b>	<b>33.2</b>	<b>17.1</b>
LFG-7	0.2	0	<b>79.6</b>	<b>46.4</b>	<b>28.9</b>	<b>24</b>	<b>13.4</b>	<b>6.9</b>	<b>6.7</b>	<b>2.7</b>	NS	<b>19.6</b>	<b>17.3</b>	<b>24.9</b>
LFG-8	0.1	0	0	0	0	0	0	NS	0	0	NS	0	NS	NS
LFG-9	<b>9.6</b>	<b>22.2</b>	<b>51.5</b>	<b>28.5</b>	<b>25.6</b>	<b>16.5</b>	<b>26.7</b>	<b>6.3</b>	<b>2.3</b>	<b>0</b>	<b>10.4</b>	<b>0.4</b>	<b>3.9</b>	<b>3.6</b>
LFG-10	<b>61.7</b>	<b>55.6</b>	<b>2.8</b>	<b>54.6</b>	<b>36.7</b>	<b>34.1</b>	<b>52.1</b>	<b>29.8</b>	<b>23.7</b>	<b>5.4</b>	<b>46.8</b>	<b>8.8</b>	<b>32</b>	<b>23</b>
LFG-11	<b>68.6</b>	<b>62.9</b>	<b>77.7</b>	<b>76.9</b>	NS	NS	<b>68.8</b>	NS	2.9	1.1	NS	<b>10</b>	NS	NS
BP-1	GF	GF	GF	0	NS	NS	NS	NS	NS	NS	NS	0	NS	NS
BP-2	GF	GF	GF	0	NS	NS	NS	NS	NS	NS	NS	0	NS	NS
BP-3	GF	GF	GF	0	NS	0	NS	NS	NS	NS	NS	0	NS	NS
BP-4	GF	GF	GF	0	NS	0	NS	NS	NS	NS	NS	0	NS	NS
BP-5	GF	GF	GF	0	NS	0	NS	NS	NS	NS	NS	NS	NS	NS
BP-6	GF	GF	GF	0	NS	0	NS	NS	NS	NS	NS	0	NS	NS
BP-7	GF	GF	GF	0	NS	NS	NS	NS	NS	NS	NS	0	NS	NS
BP-8	GF	GF	GF	0	NS	0	NS	NS	NS	NS	NS	0	NS	NS
BP-9	GF	GF	GF	0	NS	0	NS	NS	NS	NS	NS	0	NS	NS
PV-1	0	31	1	10	NS	14.6	12.2	NS	16.5	0.3	NS	4.2	NS	NS
PV-2	0.2	23.9	1.4	30.3	NS	3.8	26.9	NS	16.6	0.3	NS	3.2	NS	NS
PV-3	0	51.7	0	47.6	NS	37.5	42.1	NS	22.2	15.9	NS	5.1	NS	NS
PV-4	0.1	0	0	0	NS	17	1	NS	32.9	11.7	NS	4.9	NS	NS
PV-5	0.1	7.1	6.8	14.3	NS	0	16.2	NS	0	0	NS	0	NS	NS
PV-6	0.1	0.1	0	0	2.9	0.4	12.7	NS	7.2	1.4	NS	0	NS	NS
Shank Crawlspace	0.1	0	0	0	0	0	0	NS	0	0	NS	0	NS	0
Ford Crawlspace	0.1	0	0	0	0	0	0	NS	0	0	NS	0	NS	0

Notes: <sup>(1)</sup> All concentrations are in percent.

<sup>(2)</sup> Quarterly monitoring events

<sup>(3)</sup> Bold fonts represent methane concentrations higher than 100% LEL.

NS = Not Sampled during this event. GF = Ground Frozen, not sampled.

**SUMMARY OF METHANE CONCENTRATIONS <sup>(1)</sup>  
AT PASSIVE VENTS ALONG SHANK PROPERTY BOUNDARY**

**Welsh Road Landfill Superfund Site  
Honey Brook, Pennsylvania**

**Attachment 11 – Summary of Methane Concentrations at Passive Vents**

ID	Date			
	8/25/2010	8/27/2010	10/22/2010	12/29/2010
PV-07	5.9	3.2	0	0.1
PV-08	17.7	21.9	0	0.1
PV-09	31.4	23.9	0.2	0.4
PV-10	5.1	11.4	0.3	0.6
PV-11	1.6	8.3	0	0.3
PV-12	0.6	6.2	0	0.7
PV-13	6.2	19.5	0.2	2.6
PV-14	6.3	0	0	0.8
PV-15	0.0	2	0	0.1
PV-16	7.2	5.5	0	0.6
PV-17	1.6	0.5	0	0
PV-18	8.5	7.5	0.4	2.7
PV-19	17.5	9.4	0.2	2.3
PV-20	16.2	1.1	2.6	26.2
PV-21	0.0	NS	0.2	NS
PV-22	0.0	NS	0.1	NS
PV-23	9.4	NS	0.3	NS

**Notes:** <sup>(1)</sup> All concentrations are in percent.  
NS = Not Sampled during this event.





## **Attachment 13 – Applicable or Relevant and Appropriate Requirements (ARARs)**

[From July 2003 ROD Amendment and February 2006 OU2 ROD]

### **A. Identification of ARARs**

ARARs are generally divided into three categories: chemical-specific, location-specific, and action-specific. Chemical-specific ARARs provide guidance on acceptable or permissible contaminant concentrations in soil, air, and water. Location-specific ARARs govern activities in critical environments such as floodplains, wetlands, endangered species habitats, or historically significant areas, while action-specific ARARs are technology or activity-based requirements.

#### **1. Chemical-Specific ARARs**

PADEP identifies the Land Recycling and Environmental Remediation Standards Act, 35 P.S. 6026.101 *et seq.* (July 18, 1995) (“Act 2”), as an Applicable or Relevant and Appropriate Requirement (“ARAR”) for groundwater cleanups in the Commonwealth. EPA determined that Act 2 does not, on the facts and circumstances of this remedy, impose any requirements more stringent than the federal standards set forth in Section 300g-1 of the Safe Drinking Water Act (“SDWA”), 42 U.S.C. Section § 300g-1, and its implementing regulations at 40 C.F.R. Part 141. The SDWA provides standards for the regulation of contaminants in all surface or ground waters utilized as potable water supplies and provides enforceable standards for specific contaminants found in water supplies. Accordingly, groundwater cleanup MCLs and non-zero MCLGs, as set forth in accordance with the SDWA, are relevant and appropriate requirements for the groundwater (OU2) remedy.

#### **2. Action-Specific ARARs**

The Municipal Solid Waste Landfill Closure Regulations, 25 PA Code, Chapter 273, provides the Performance Standards for final covers for municipal solid waste landfills in the Commonwealth of Pennsylvania. The regulations are applicable to the ET cover remedy. However, EPA is waiving these requirements because the ET cover system will attain an equivalent standard of performance in the protection of human health and the environment through the cover system, continued operation and maintenance, and long-term groundwater monitoring.

Due to the several growing seasons required for the ET cover system to become established and efficient at reducing infiltration, the performance standards for this cover system will be evaluated during the Five-Year Review that occurs five (5) years after EPA acceptance of an Interim RA Report for this action.