THIRD FIVE-YEAR REVIEW REPORT FOR ELIZABETHTOWN LANDFILL SUPERFUND SITE LANCASTER COUNTY, PENNSYLVANIA

JUNE 2018

Prepared by

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Date

Table of Contents

LIST OF ABBREVIATIONS & ACRONYMS

AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
BCEE	Bis(2-chloroethyl)ether
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
COC	Contaminant of Concern
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FFS	Focused Feasibility Study
FS	Feasibility Study
FYR	Five-Year Review
GRC	Groundwater Remedial Component
GSC	Groundwater Study Component
IC	Institutional Control
ISB	In Situ Bioremediation
LFG	Landfill Gas
LRC	Landfill Remedial Component
LTGM	Long-term Groundwater Monitoring
MCL	Maximum Contaminant Level
µg/L	Micrograms Per Liter
mg/L	Milligrams Per Liter
MNA	Monitored Natural Attenuation
MSC	Medium Specific Concentration
NA	Not Applicable
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PADEP	Pennsylvania Department of Environmental Protection
PASWQS	Pennsylvania Surface Water Quality Standard
PCE	Tetrachloroethylene
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RD/RA	Remedial Design/Remedial Action
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
SCA	SCA Services of Pennsylvania, Inc.
SDWA	Safe Drinking Water Act
SVOC	Semi-Volatile Organic Compound
TCA	Trichloroethane
TCE	Trichloroethylene
TCL	Target Compound List
UDI	United Disposal, Inc.
UU/UE	Unlimited Use and Unrestricted Exposure
VOC	Volatile Organic Compound
WMDSPA	Waste Management Disposal Services of Pennsylvania Inc.

I. INTRODUCTION

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

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

This is the third FYR for the Elizabethtown Landfill Superfund site (the Site). The triggering action for this statutory review is the completion date of the previous FYR. The FYR has been prepared because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of a single operable unit (OU), referred to as OU1, that addresses both the landfill cap and groundwater. Both components of OU1 – the landfill remedial component (LRC) and the groundwater remedial component (GRC) – will be addressed in this FYR.

EPA remedial project manager (RPM) Frank Klanchar led the FYR. Participants included EPA community involvement coordinator (CIC) Alexander Mandell, EPA hydrogeologist Ryan Bower, EPA toxicologist Jeff Tuttle, EPA biologist Katie Matta and Pennsylvania Department of Environmental Protection (PADEP) representatives Doug Cordelli and Larry Smith. Skeo provided contractor support to EPA for this FYR. Waste Management Disposal Services of Pennsylvania Inc. (WMDSPA), the Site's potentially responsible party (PRP), was notified of the initiation of the FYR. The review began on September 5, 2017.

Site Background

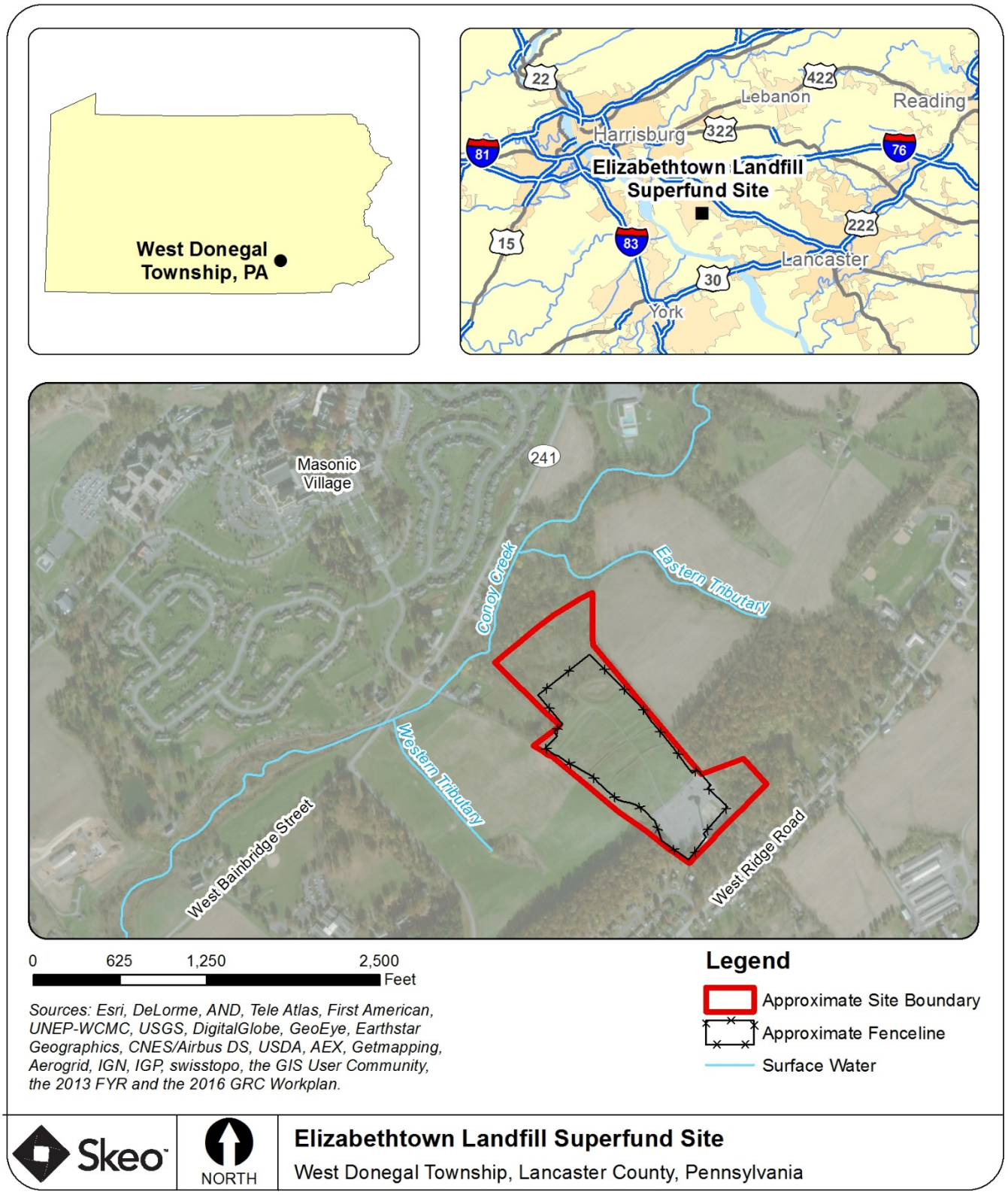
The Site is an inactive landfill that occupies about 16 acres on West Ridge Road in West Donegal Township, Lancaster County, Pennsylvania (Figure 1). The Site is located about 1 mile south of the Borough of Elizabethtown. From 1958 to 1973, the unpermitted landfill accepted industrial and municipal waste from surrounding communities. Landfill operations contaminated surface water and groundwater with volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) and metals. Groundwater contamination underlies the landfill and extends northwest beyond the landfill property boundary.

The landfill property is bounded on the south, southeast and southwest by private residences and on the west, northwest and northeast by agricultural lands. Cattle graze in the pasture adjacent to the west side of the landfill property and rely on spring water as their drinking water source. Additional residences, small businesses and the Masonic Village retirement community are located northwest of the landfill property, along West Bainbridge Street. The ground surface of the landfill property slopes northwestward toward Conoy Creek, which passes the Site approximately 1,000 feet beyond the downhill extent of the landfill. Most of the landfill is covered by an engineered clay cover; the southern portion is covered with asphalt. The landfill is unlined. It has an active landfill gas collection system composed of a series of extraction wells flared at a single on-site station.

All residents near the Site, except for residents of the Masonic Village of Elizabethtown, obtain public water from the Elizabethtown Area Water Authority supply system. The Masonic Village at Elizabethtown has three potable water supply wells, which it owns and operates on its property. Required monitoring of the Masonic Village water supply indicates that the finished water meets drinking water standards.

Appendix A lists the documents reviewed for this FYR. Appendix B is a chronology of significant site events.

Figure 1: Site Vicinity Map



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

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Elizabethtown Landfill		
EPA ID: PAD980539712		
Region: 3	**State:** Pennsylvania	**City/County:** West Donegal Township/Lancaster
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	**Has the site achieved construction completion?** No	
REVIEW STATUS		
Lead agency: EPA		
Author name: Frank Klanchar, with additional support provided by Skeo		
Author affiliation: EPA Region 3		
Review period: 9/5/2017 – 6/19/2018		
Date of site inspection: 10/25/2017		
Type of review: Statutory		
Review number: 3		
Triggering action date: 6/19/2013		
Due date *(five years after triggering action date)*: 6/19/2018		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

Landfill operations ceased on or about July 31, 1973, pursuant to a Consent Decree (CD) between United Disposal Inc. (UDI), the landfill's operator at that time, and the Pennsylvania Department of Environmental Resources (predecessor to PADEP). In March 1976, UDI sold its assets, including the landfill, to SCA Services of Pennsylvania, Inc. (SCA).

In November 1985, an EPA contractor inspected the inactive landfill and reported that leachate constituents had been detected in groundwater and surface water samples collected near the landfill. In 1986 and 1987, SCA installed a compacted clay cap and drainage layer over approximately 12 acres on the northern portion of the inactive landfill. SCA covered the remaining 4 acres of the property with a permeable base of gravel. SCA also installed leachate management and landfill gas management systems. In March 1989, EPA listed the Site on the National Priorities List (NPL) due to the presence of Site-related contaminants in the drinking water aquifer and in a stream downgradient of the landfill.

In September 1990, SCA entered into an Administrative Order on Consent (AOC) with EPA to conduct a remedial investigation and feasibility study (RI/FS). SCA, which changed its name to WMDSPA in 1993, began the RI/FS shortly thereafter and finalized the RI in 1994 and the FS in 1995.

Results from the RI identified groundwater contamination under the former landfill property and in a plume extending northwest beyond the landfill property boundary. Contaminant concentrations in groundwater exceeded maximum contaminant levels (MCLs). The RI also identified surface water contamination in Conoy Creek and its tributaries at concentrations above surface water quality criteria. Table 1 summarizes contaminants of concern (COCs) by media.

Table 1: COCs, by Media

COC[a]	Media
Benzene, chlorobenzene, 1,1-dichloroethene, 1,2-dibromo-3-chloropropane, methylene chloride, tetrachloroethylene (PCE), trichloroethylene (TCE), vinyl chloride, bis(2-ethylhexyl)phthalate, bis(2-chloroethyl)ether (BCEE), arsenic, barium, lead, manganese, thallium	groundwater
Cyanide, lead, chlorobenzene, PCE, methylene chloride, BCEE, bis(2-ethylhexyl)phthalate, 2-chlorophenol, aldrin, endrin	surface water
Notes: a) COCs as identified in Appendix II and Appendix III of the 1997 Record of Decision (ROD).	

Using data from the RI, EPA conducted a baseline risk assessment in 1994, with addenda in 1995 and 1997, to estimate potential risks to human health and the environment. The risk assessment found that residents living near the Site were not currently exposed to contamination from the landfill at unacceptable levels. However, the risk assessment did identify unacceptable risks due to the potential exposure of future well water users to contaminated groundwater through ingestion, dermal contact and inhalation of vapors while showering. EPA's ecological risk assessment found that contaminated groundwater discharging to Conoy Creek and its tributaries could potentially affect aquatic life. The detected contaminants that posed the greatest concern for ecological risk included endrin, chlorobenzene and arsenic.

Response Actions

EPA selected the Site's remedy in a 1997 Record of Decision (ROD). The ROD did not specify remedial action objectives (RAOs). However, the 1995 FS summarized the following RAOs for the Site:

- Protect human health and the environment by cleaning up the plume of contaminated groundwater beyond the boundary of the trash disposal area to background concentrations unless, after selection and implementation of the groundwater remediation, EPA in consultation with PADEP determines that meeting such a goal is technically impracticable from an engineering perspective.
- Control all Site-related discharges to Conoy Creek and its tributaries so that Pennsylvania Surface Water Quality Standards (PASWQSs) are satisfied.
- Control all Site-related discharges to Conoy Creek and its tributaries to prevent future impacts to sediments related to COCs at the Site.
- Prevent, to the extent technically practicable, infiltration and the resulting leachate generation in the southern portion of the landfill.
- Continue to collect and treat landfill gas (LFG).

The ROD selected a remedy for the Site that called for the following major components:

- Installation of an asphalt cap on the southern portion of the Site.
- Installation of upgrades to stormwater controls in the northern and southern landfill areas.

- Implementation of a predesign groundwater and surface water study.
- Construction of a groundwater extraction well system and extraction and on-Site treatment of contaminated groundwater and leachate with discharge to Conoy Creek.
- Extension of the security fence to surround the entire landfill.
- Establishment of deed restrictions to protect the landfill cap, minimize the potential for direct contact with landfill contents, and prohibit use of the water supply well located at the landfill for drinking water.
- Groundwater, surface water, sediment and wetlands monitoring.
- Installation of landfill gas and leachate management systems in the southern portion of the landfill.
- Maintenance of cover, stormwater, landfill gas, leachate, security and other existing landfill systems.
- Monitoring of five residential wells and two Masonic Village public water supply wells.
- Provision of an alternate source of drinking water or treatment for any of the above-noted wells in which EPA determines that Site-related contaminants exceed action levels.

The 1997 ROD acknowledged that the 1995 FS RAO for groundwater, which specified cleanup to background concentrations, was no longer appropriate in consideration of Pennsylvania's promulgation of Act 2 and the implementing regulations in 25 Pennsylvania Code Chapter 250, which established groundwater remediation standards. The 1997 ROD stated that EPA's remediation goal for groundwater was to restore it to drinking water quality, in accordance with the NCP. Table 2 identifies the Site's groundwater cleanup goals and the basis for each cleanup goal, from Appendix II of the 1997 ROD. These cleanup levels apply to the Area of Attainment, which is defined as the area of the Site at and beyond the boundary of the original landfill property. Table 3 identifies the surface water cleanup goals from Appendix III of the 1997 ROD.

Table 2: 1997 Groundwater COC Cleanup Goals

Groundwater COC	1997 ROD Cleanup Goal (micrograms per liter, µg/L)	Basis
Benzene	5	MCL
Chlorobenzene	100	MCL
1,1-Dichloroethene	7	MCL
1,2-Dibromo-3-chloropropane	0.2	MCL
Methylene chloride	5	MCL
PCE	5	MCL
TCE	5	MCL
Vinyl chloride	2	MCL
Bis(2-ethylhexyl)phthalate	6	MCL
BCEE	0.0092	risk-based[a]
Arsenic	50	MCL
Barium	2,000	MCL
Lead	5	state standard[b]
Manganese	50[c]	state standard[d]
Thallium	0.5[e]	MCLG[f]

Notes:

a) Risk-based levels are calculated assuming ingestion of 2 liters per day, 365 days per year, for 70 years by a 70-kilogram individual.
b) State standard adopted under Pennsylvania Act 2.
c) 50 µg/L or to background concentration of manganese.
d) State standard adopted under Pennsylvania's Safe Drinking Water Act and the Land Recycling and Environmental Remediation Standards Act.
e) 0.5 µg/L or to background concentration of thallium.
f) MCLG = maximum contaminant level goal

Table 3: 1997 Surface Water COC Cleanup Goals

Surface Water COC	1997 ROD Cleanup Goal (µg/L)	Basis
Cyanide	5	PASWQS[a]
Lead	4.8	PASWQS
Chlorobenzene	20	PASWQS
PCE	0.7	PASWQS
Methylene chloride	5	PASWQS
BCEE	0.03	PASWQS
Bis(2-ethylhexyl)phthalate	2[b]	PASWQS
2-Chlorophenol	0.1	PASWQS
Aldrin	1.0×10^{-4}	PASWQS
Endrin	2.3×10^{-3}	PASWQS

Notes:
a) PASWQS – Pennsylvania Surface Water Quality Standard, obtained from Pennsylvania Code Title 25, Chapter 16.
b) 2 µg/L or to background concentration.

Status of Implementation

In October 1999, WMDSPA signed a CD agreeing to conduct the remedial design and remedial action (RD/RA) specified in the 1997 ROD. The CD requires implementation of three distinct work components: the LRC, the Groundwater Study Component (GSC) and the GRC.

LRC construction activities began in July 2003 and finished in December 2003. Major LRC remedial components included installation of an asphalt cap in the southern portion of the Site; installation of upgrades to and expansion of the existing gas collection system; installation of upgrades to the existing stormwater basin and stormwater collection systems; installation of a gas extraction well and decommissioning of existing gas monitoring probes; installation of a new condensate tank and sump and relocation of the existing flare; installation of new perimeter fencing on the east and west ends of the Site; and decommissioning of a leachate manhole and leachate containment tank. The asphalt cap in the southern portion of the Site, upgrades to the sewer line and installation of pole lighting were constructed in consideration of potential future reuse of the area. The 2004 Construction Completion Report documents the LRC activities.

The purpose of the GSC was to collect data and information needed for EPA to decide whether the groundwater extraction and treatment remedy or another remedial alternative could achieve the cleanup goals. The February 2008 GSC Report presented the results of the required monitoring. A Wetlands Delineation Report and a Conoy Creek Macroinvertebrate Survey were also completed in February 2008.

Following the GSC, WMDSPA completed a groundwater focused feasibility study (FFS) in 2012. The FFS evaluated several alternatives including monitored natural attenuation (MNA); enhanced in situ bioremediation (ISB) near the landfill and MNA for the downgradient plume; and focused groundwater extraction and treatment near the landfill and MNA for the downgradient plume. EPA approved the FFS Report in October 2012 but highlighted concerns regarding the potential for enhanced ISB to effectively treat BCEE, and requested additional sampling of BCEE with a lower detection limit.

At a meeting in October 2015 with WMDSPA, EPA decided that groundwater extraction and treatment was an appropriate remedy for the Site. In September 2016, EPA required WMDSPA to prepare a GRC Remedial Design Work Plan recognizing that a pre-design investigation would be required to refine the target treatment area for a groundwater extraction and treatment system and that a treatability study for ISB of BCEE would be needed prior

to potentially incorporating that technology into the GRC. EPA approved the GRC Remedial Design Work Plan in March 2017.

The GRC Remedial Design Work Plan indicates that remedy objectives are to contain contaminated groundwater in the immediate vicinity of the landfill to prevent further contaminant migration from the landfill above cleanup goals, which would isolate the downgradient plume from its source. The need for additional active remediation for the downgradient plume will be assessed in the future after confirmation that the near-landfill contamination has been controlled.

The pre-design investigation presented in the GRC Remedial Design Work Plan included the installation of 19 monitoring wells to delineate the horizontal and vertical extent of the near-landfill plume and serve as observation wells for hydraulic testing; borehole geophysics and packer testing; installation of two extraction wells for aquifer testing; and a bench-scale bioremediation treatability study to evaluate the viability of various bacteria strains to degrade chlorobenzene and BCEE. WMDSPA will conduct the pre-design investigation in two phases. Downgradient plume delineation will follow the initial two phases. WMDSPA conducted the first phase of pre-design fieldwork in July and August 2017. The second phase of fieldwork is planned for 2018.

WMDSPA voluntarily connected all properties potentially affected by the contaminant plume to municipal water lines in the early 2000s. In conjunction with providing alternative potable water supplies, and as an additional precautionary measure, WMDSPA proactively reached an agreement with the Masonic Village and provided them with funding to install two new drinking water supply wells (EM600 and EM700) that are several hundred feet downgradient from the existing supply wells. EM600 and EM700 came online in early 2000. Masonic Village water supply wells EM500, EM600 and EM700 are currently in use. These water supply wells continue to be monitored as part of the Site's interim long-term environmental monitoring program. The Masonic Village also monitors their water supply in accordance with PADEP community water system requirements.

Institutional Control (IC) Review

The 1997 ROD called for ICs in the form of a deed restriction to protect the integrity of the landfill cap, minimize exposure to landfill contents and prohibit use of groundwater on the landfill property. WMDSPA recorded an environmental covenant with the Lancaster County Recorder of Deeds in July 2013. The environmental covenant prohibits activities that would interfere with or adversely affect the remedial components and prohibits the use of and withdrawal of groundwater from the property.

Although not required by the 1997 ROD, WMDSPA also worked with landowners whose properties are located downgradient of the Site to record environmental protection easements and declarations of restrictive covenants with the Lancaster County Recorder of Deeds. These easements and covenants were recorded between 2000 and 2003. The properties were located within an area defined as the "deed restriction area" in the 2008 GSC Report.

The environmental protection easements and restrictive covenants prohibit the landowners from using or withdrawing groundwater or surface water on or under their properties for any purpose (Table 4).[1] The restrictions also require that the landowners seal and close any existing wells and prohibit the landowners from installing any new wells on their properties without WMDSPA's authorization. The declaration of restrictive covenants for the Masonic Village property (parcels 1600119500000 and 160195010000) restricts groundwater use only within the portion of the property included in the "deed restriction area" (as defined in the 2008 GSC Report), and the covenant does not restrict use of surface water.

WMDSPA leases a property identified as parcel 1603751900000 to a private party for hunting, agriculture and related purposes. As part of the lease agreement, WMDSPA restricted groundwater and surface water use and installation of wells. This parcel is affected by site groundwater contamination.

[1] However, note that the restrictive covenant for the Masonic Village property (parcels 1600119500000 and 1601950100000) does not restrict use of surface water.

Although the restrictions set forth in the environmental protection easements and restrictive covenants run with the land, current deeds for some downgradient properties affected by site groundwater contamination do not reference the restrictions set forth in the covenants. The original environmental protection easements and restrictive covenants require notification of the restrictions in any instrument, such as deeds, mortgages, leases, etc. that convey any interest in the property.

Table 4 summarizes implemented institutional controls at the Site. Figure 2 shows the parcels with institutional controls in place and the 2016 extent of chlorobenzene contamination in groundwater.[2]

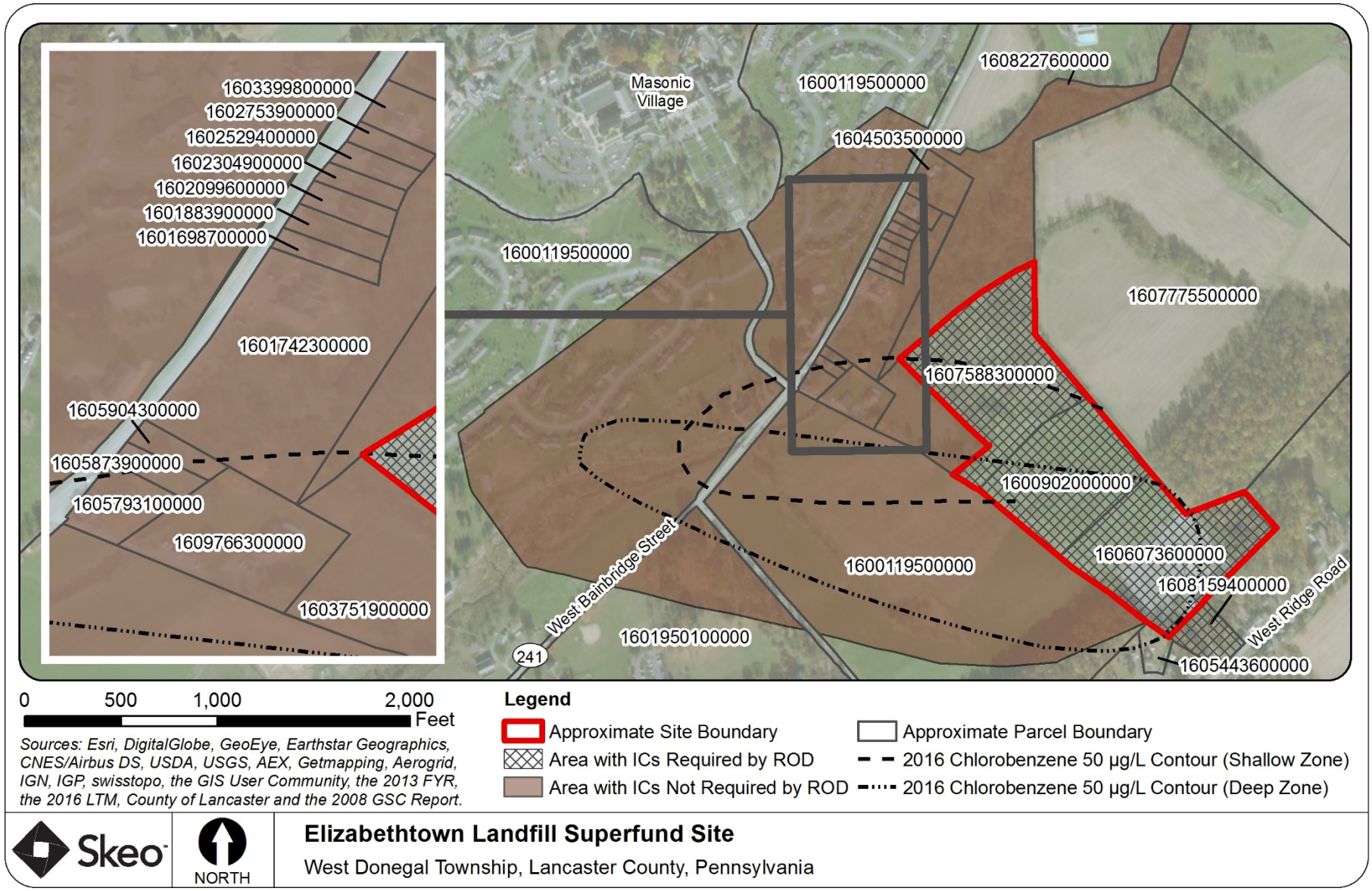
[2] The extent of chlorobenzene contamination is shown in Figure 2 because it is the most widespread contaminant in groundwater.

Table 4: Summary of Planned and/or Implemented ICs[3]

Media, Engineered Controls and Areas That Do Not Support UU/UE Based on Current Conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Landfill property (soil, waste and groundwater)	Yes	Yes	1606073600000, 1600902000000, 1607588300000, 1608159400000	Protect the integrity of the landfill cap, minimize exposure to landfill contents and prohibit use of groundwater on the landfill property.	Environmental Covenant (recorded July 18, 2013)
Downgradient properties overlying site groundwater contamination	Yes	No	Portion of parcels 1600119500000 and 1601950100000 located within "deed restriction area" (as defined in 2008 GSC Report)	Prohibit use of groundwater; restrict installation of wells.	Declaration of Restrictive Covenants for Environmental Protection Purposes (recorded October 18, 2000)
			1609766300000	Prohibit use of groundwater and surface water; restrict installation of wells.	Environmental Protection Easement and Declaration of Restrictive Covenants, (recorded July 15, 2002)
			1605793100000, 1605904300000, 1605873900000	Prohibit use of groundwater and surface water; restrict installation of wells.	Environmental Protection Easement and Declaration of Restrictive Covenants, (recorded October 1, 2003)
			1603751900000	Prohibit use of groundwater and surface water; restrict installation of wells.	Lease agreement between WMDSPA and private tenant (December 27, 2000)
			1608227600000	Prohibit use of groundwater and surface water; restrict installation of wells.	Environmental Protection Easement and Declaration of Restrictive Covenants (recorded August 26, 2002)
			1601742300000	Prohibit use of groundwater and surface water; restrict installation of wells.	Environmental Protection Easement and Declaration of Restrictive Covenants, (recorded May 22, 2003)

[3] As a precautionary measure, WMDSPA recorded environmental protection easements and declarations of restrictive covenants at additional properties near the landfill but not currently overlying groundwater contamination. The additional parcels with implemented institutional controls include parcels 1604503500000, 1603399800000, 1601698700000, 1601883900000, 1602099600000, 1602304900000, 1602529400000 and 1602753900000.

Figure 2: Institutional Control Map



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

Operation & Maintenance (O&M) and Monitoring

WMDSPA is responsible for the long-term O&M of the LFG extraction and treatment system and elements associated with the LRC at the Site. O&M activities for the landfill are conducted in accordance with the April 2002 Landfill Remedial Component Operation and Maintenance Plan (O&M Plan). WMDSPA submits results of the O&M inspections and monitoring in annual reports to EPA and PADEP. WMDSPA also implements an interim long-term groundwater monitoring (LTGM) plan at the Site. Recent activities associated with landfill O&M and interim groundwater monitoring are addressed below.

Landfill Inspections

WMDSPA conducts landfill cover and systems inspections quarterly, which is more frequent than required by the O&M Plan. Site features inspected include the landfill clay cover, landfill asphalt cover, security fence, stormwater basin, LFG condensate tank, LFG flare, gravel access road and paved driveway, vegetation, signage and off-site groundwater monitoring wells. The Twelfth Year Operation and Maintenance Report, dated May 2017 (12th Year O&M Report), the most recent O&M report available, indicated that LRC components were in acceptable condition.

LFG Well Monitoring

WMDSPA monitors on a monthly basis 14 landfill gas wells (W-8 through W-21), two trench heads (THN and THS) and the flare for vacuum and percent methane, carbon dioxide and oxygen (Figure 3). During this FYR period, the flare was shut down from February 1 to February 25, 2014, to repair the centrifugal blower. During the monitoring period, typical repairs (if any) to the LFG extraction system included changing orifice plates, replacing damaged hoses on wells and repair of the actuator in the block valve. Landfill gas monitoring results are discussed in the Data Review section of this FYR.

LFG Condensate Tank and Flare Sampling and Analysis

WMDSPA collects samples from the LFG condensate tank and the LFG flare annually. Samples are analyzed for VOCs. Data from annual sampling of the LFG flare as well as average flow rate data are used to calculate mass removal estimates for the LFG extraction system. Results are discussed in the Data Review section of this FYR.

Interim Long-Term Groundwater Monitoring

Between 2007 and 2014, WMDSPA conducted semi-annual sampling events in June and December of each year. In October 2014, WMDSPA prepared the Interim Long-Term Environmental Monitoring Plan, Addendum 1, which reduced the frequency of monitoring to an annual comprehensive sampling event in June of each year. In November 2014, EPA approved the changes to the sampling plan with the requirement that a final Long-Term Environmental Monitoring Plan will be developed and proposed during the design effort of the groundwater remedy.

The interim LTGM plan includes sampling of 14 monitoring wells and 3 Masonic Village supply wells (Table 5). In March 2017, EPA approved suspension of the interim LTGM plan while the GRC remedial design is underway. WMDSPA conducted additional groundwater sampling in August 2017 as part of Phase 1 of the pre-design investigation. Nine new and six existing monitoring wells were sampled during this effort.

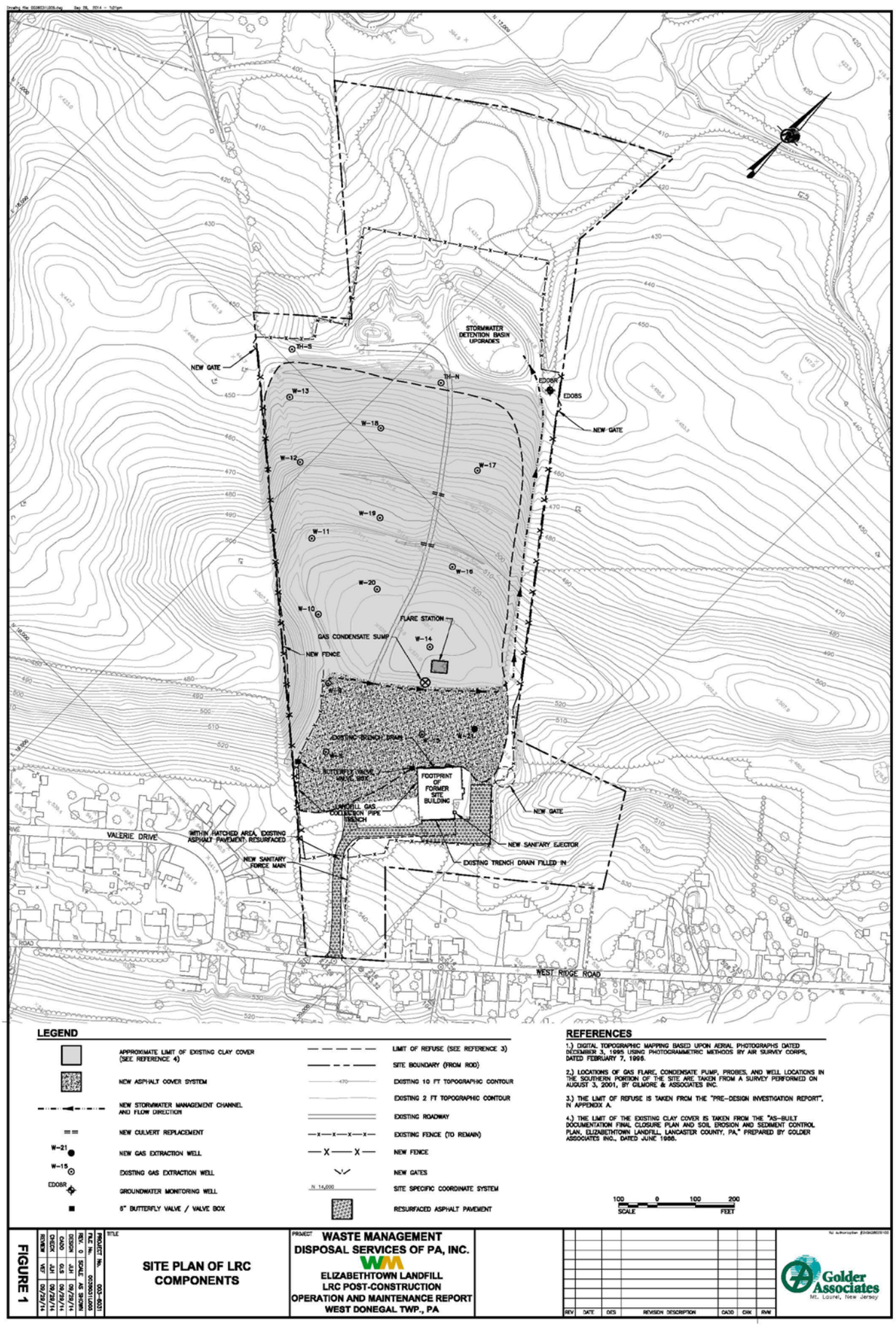
Table 5: Interim LTGM Plan

Well Type	Sample Point		Parameter
Groundwater monitoring wells	source depletion (landfill perimeter) wells	ED02R (shallow), ED05R (deep), ED08R (shallow), ED09R (deep), ED10IR (deep), ED11IR(shallow), ED18 (deep)	TCL VOCs SVOCs: bis(2-ethylhexyl)phthalate, BCEE, 2-chlorophenol inorganics: arsenic, barium, cyanide, lead, manganese, thallium
	plume stability wells	ED12DR (shallow), ED12IR (shallow), ED20 (shallow), ED23 (shallow), ED24 (shallow), ED30 (deep)	
	sentinel well	ED12ER (deep)	
Masonic Village potable wells	sentinel / potable wells	EM500, EM600, EM700	

The 1997 ROD also called for surface water, sediment and wetlands monitoring. Surface water and sediment monitoring during the baseline investigation and the GSC did not detect Site-related impacts to surface water or sediment quality in Conoy Creek above background concentrations. A Wetlands Delineation Report and a Conway Creek Macroinvertebrate Survey were completed in February 2008. No Site-related effects to aquatic habitats of Conoy Creek were identified. Therefore, EPA did not require further surface water, sediment or wetlands monitoring when it approved the Interim Long-term Environmental Monitoring Plan in 2008. Additional sampling of surface water, sediment and wetlands will be considered as part of the Final Long-term Monitoring Work Plan after the groundwater remedy is implemented.

Residential well sampling ceased after WMDSPA connected the affected properties to the public water supply shortly after the water line construction and dedication in July 2003. The residential wells were subsequently closed as a condition of the environmental covenants. Monitoring of the Masonic Village potable supply wells continues.

Figure 3: Landfill Components
(Source: Twelfth Year Operation and Maintenance Report, LRC, prepared by Golder Associates, Inc.)



III. PROGRESS SINCE THE PREVIOUS REVIEW

Table 6 includes the protectiveness determination and statement from the previous FYR. Table 7 summarizes the recommendations from the previous FYR and the current status of those recommendations.

Table 6: Protectiveness Determinations/Statements from the 2013 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Short-term Protective	The remedy is protective of human health and the environment in the short term. All exposure pathways that could result in unacceptable risks are being controlled. Institutional controls are in place to prohibit groundwater and surface water use in downgradient areas. However, in order for the remedy to be protective in the long term, a final groundwater remedy needs to be implemented and institutional controls are needed to prohibit the land uses that could harm the landfill or interfere with the existing gas extraction network.

Table 7: Status of Recommendations from the 2013 FYR

OU #	Issue	Recommendation	Current Status	Current Implementation Status Description	Completion Date (if applicable)
OU1	A final decision has not been made on whether the selected remedy, extraction and treatment of groundwater, should be modified.	Prepare and issue a proposed plan for the final groundwater remedy and issue a decision document to record the selected remedy.	Completed	In October 2015, EPA decided to implement groundwater extraction and treatment as the final remedy for the Site. A decision document may not be required unless additional remedy components, such as ISB, are incorporated into the final remedy. EPA approved a Remedial Design Work Plan on March 31, 2017. WMDSPA conducted Phase 1 pre-design fieldwork in July and August 2017. Phase 2 fieldwork is planned for 2018.	10/19/2015
OU1	There are inadequate institutional controls in place to protect the Site.	Put institutional controls in place to restrict groundwater at the landfill property and to prevent damage to the cap, the landfill gas extraction system and associated structures at the Site.	Completed	WMDSPA recorded an environmental covenant with the Lancaster County Recorder of Deeds, which sets forth restrictions for the landfill property. The environmental covenant prohibits activities that would interfere with or adversely affect the remedial components and prohibits the use of and withdrawal of groundwater from the property.	7/13/2013

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

EPA published a public notice in *The Elizabethtown Advocate* on 2/14/2018. It stated that the FYR was underway and invited the public to submit any comments to EPA. The results of the review and the report will be made available at the Site's information repository, West Donegal Township Building, located at One Municipal Drive in Elizabethtown, Pennsylvania and online at: https://www.epa.gov/superfund/search-superfund-five-year-reviews.

During the FYR process, EPA conducted interviews with local stakeholders to document any perceived problems or successes with the remedy that has been implemented to date**.** The results of these interviews are summarized below. All interviews were conducted in person on October 25, 2017.

EPA met with Gene Oldham, Township Manager, and Wayne Miller, Codes Enforcement/Zoning Officer, of West Donegal Township at the township office. The representatives indicated that they have a good relationship with WMDSPA. The representatives were not aware of any problems or complaints about the Site. West Donegal Township uses the asphalt cap area at the Site for its National Night Out event once a year. The representatives asked about maintenance of the surface water basins.

EPA met with Roni Ryan, Elizabethtown Borough Manager, at the borough office. Ms. Ryan had questions about treatment and discharge options for extracted groundwater if the groundwater extraction and treatment remedy moves forward. One of the options that WMDSPA may evaluate is whether extracted groundwater can be discharged to the publicly owned treatment works. Ms. Ryan clarified that Elizabethtown Borough owns the wastewater treatment plant that serves multiple municipalities, including West Donegal Township. She requested additional information about the Site, including groundwater sampling results and sampling schedule, so the borough officials could better understand water quality at the Site.

EPA met with representatives of the Masonic Village retirement community. The representatives indicated that they will need notification prior to any well installation on the pasture property adjacent to the Site so they have ample time to move the cattle. The representatives indicated that they are well-informed about the Site. EPA indicated that all three Masonic Village wells are sampled regularly and results have been non-detect for Site-related constituents.

EPA also met with a local business owner near the Site. The owner was not aware of any problems with the Site; however, she noted the presence of waste dumpers and hunters on the adjacent property.

Data Review

This data review evaluates groundwater monitoring data collected as part of the interim long-term monitoring requirements and presented in annual 2013 through 2016 interim long-term monitoring reports.[4] The data review also summarizes preliminary data from the August 2017 sampling event conducted as part of Phase 1 of the pre-design investigation. The pre-design investigation sampling event occurred in lieu of the 2017 annual interim LTGM sampling event. Appendix C includes the groundwater sampling results for 2013 through 2016.[5] Figure 4 presents sampling locations. Summaries of recent LFG well monitoring results and condensate tank and flare sampling results are also presented at the end of this section.

Site documents refer to groundwater monitoring wells at the Site as shallow-zone or deep-zone wells. The shallow-zone wells typically monitor the upper weathered bedrock/residual soil zone. The 2012 FFS indicated

[4] The 2013 Interim Long-Term Monitoring Report presents data from December 2012 and June 2013. The December 2012 data is not discussed in this FYR.

[5] The groundwater data tables report BCEE detections only in 2015 and 2016. The 2015 BCEE Technical Memorandum stated that it was recently discovered that the laboratory might have been inadvertently censoring J-flagged detections (below the reporting limit) from 2009 to 2014 due to an error arising from changes in its reporting software systems.

that the predominant direction of shallow groundwater flow is northwest, with a gradual change toward west-southwest downgradient from the landfill. Groundwater from the shallow zone is expected to discharge to Conoy Creek and its tributaries in the vicinity of the landfill. Groundwater flow from the landfill into the deeper bedrock groundwater system is influenced to a greater degree by the bedrock stratigraphy. Flow is predominantly along dipping bedding planes such that contamination migrates northwest.

For site COCs, detected concentrations are compared to cleanup goals from the 1997 ROD (Table 2). For those constituents that are not site COCs but are monitored as part of the Interim LTGM Plan, detected concentrations are compared to the Pennsylvania Act 2 used-aquifer medium-specific concentrations (MSCs) for groundwater.

Shallow-Zone Monitoring

Eight wells currently monitor shallow-zone contamination at the Site: ED02R, ED08R, ED11IR, ED12DR, ED12IR, ED20, ED23 and ED24. Between June 2013 and June 2016, chlorobenzene, BCEE and manganese were the primary COCs detected above their cleanup goals in shallow-zone wells. Benzene, arsenic, barium and lead were also detected above their cleanup goals in shallow-zone wells, but on a less frequent basis or in only one or two wells.

The annual reports identify chlorobenzene and manganese as pathfinder constituents to identify migration pathways in groundwater because these constituents persist in the anaerobic groundwater and are present at higher concentrations (compared to background) than other monitored parameters. Figures C-1 and C-2 in Appendix C present isoconcentration contours for chlorobenzene and manganese in shallow-zone wells in 2016.

As shown in Figure C-1, the highest concentrations of chlorobenzene in the shallow zone are reported in ED02R and ED12DR. Contamination extends to the west, off the landfill property, towards monitoring well ED24 and West Bainbridge Road. The downgradient extent of contamination is not fully defined. However, the Remedial Design Work Plan indicates that additional monitoring wells will be installed to horizontally and vertically delineate the downgradient plume based on the results from delineation efforts near the landfill as part of Phase 1 and 2 of the pre-design investigation.

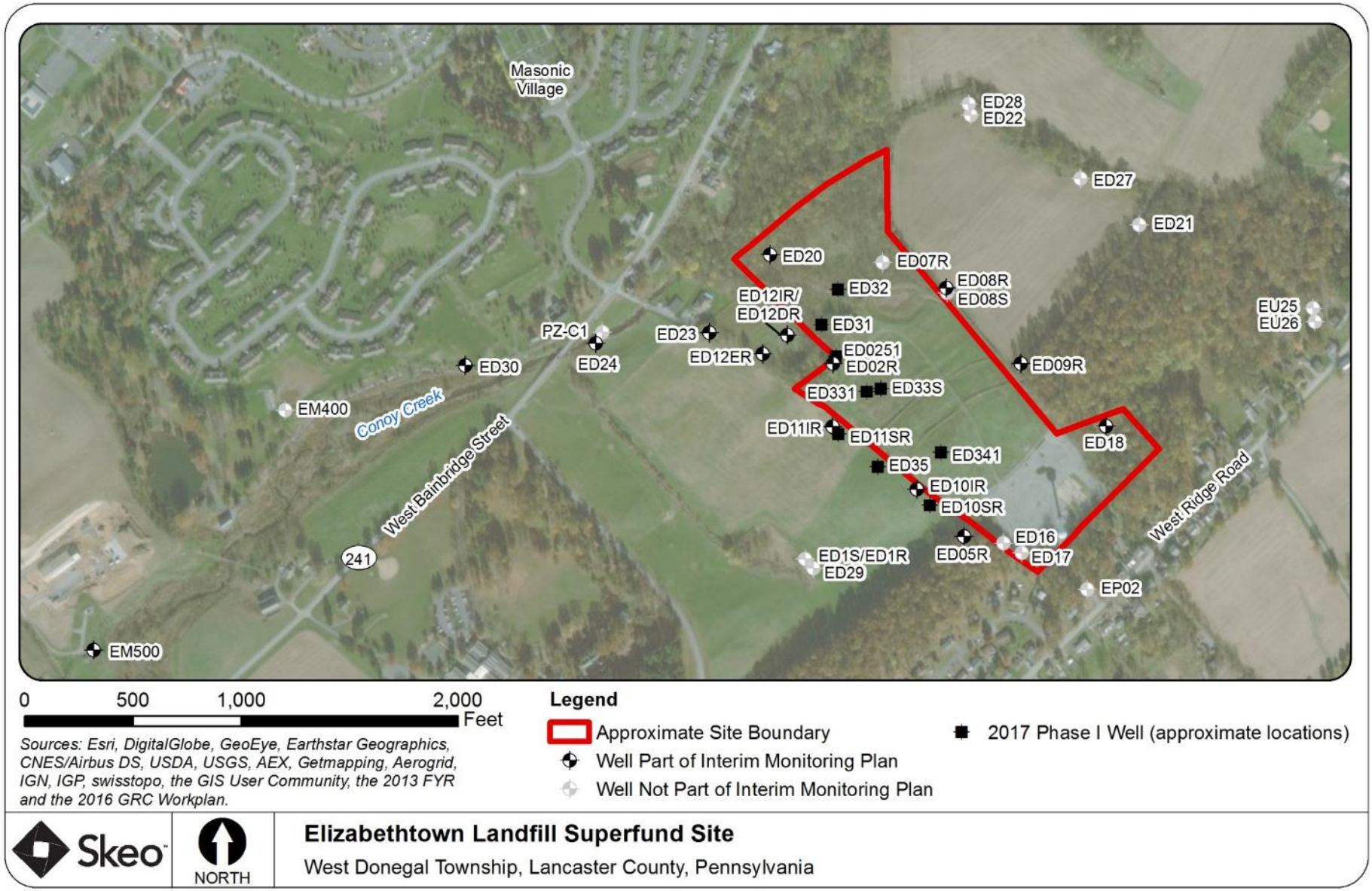
Chlorobenzene concentrations in wells ED02R, ED12DR and downgradient well ED24 have remained relatively stable during this FYR period, which is consistent with data collected since LRC construction, as presented in time-concentration graphs in Appendix C, Figures C-5 and C-7.

Figure C-2 shows the current extent of manganese contamination in the shallow zone. The contaminated area is similar to that of chlorobenzene, with highest concentrations reported in ED02R and ED12DR and extending west. Unlike chlorobenzene, manganese contamination also extends north toward ED08R.

Manganese concentrations during this FYR period in wells ED02R, ED12DR and ED08R as well as downgradient well ED24 show relatively stable or decreasing concentrations during this FYR period, which is consistent with historical results since LRC construction (Appendix C, Figures C-9 and C-11).

During the 2016 sampling event, all eight of the sampled shallow-zone monitoring wells reported BCEE concentrations above the cleanup goal of 0.0092 µg/L. Detected BCEE concentrations above the cleanup goal ranged from 0.13 µg/L in well ED11IR to 9.9 µg/L in ED12DR. Well ED12DR is a downgradient well, located outside the landfill property. BCEE isoconcentration maps were not prepared for the 2016 sampling event. The 2015 BCEE isoconcentration map shows the extent of BCEE contamination in the shallow zone at that time (Appendix C, Figure C-13). Time-concentration graphs were not prepared for BCEE because laboratory detection limits before 2015 were not low enough to assess the cleanup goal, which may skew any evaluation of trends.

Figure 4: Monitoring Well Locations



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

Deep-Zone Monitoring
Five wells – ED05R, ED09R, ED10IR, ED18 and ED30 – currently monitor deep-zone contamination at the Site. An additional deep well, ED12ER, monitors a much deeper interval (screened 374 to 384 feet below ground surface) than other deep-zone wells and is considered a sentinel well for the Masonic Village supply wells. Data from ED12ER are discussed in the Masonic Village well results section.

Between June 2013 and June 2016, arsenic, benzene, BCEE, bis(2-ethylhexyl)phthalate, chlorobenzene and manganese were detected above their cleanup goals in deep-zone monitoring wells. Cyanide was also detected in the field duplicate sample collected at ED05R in June 2016. The cyanide concentration (17 micrograms per liter, or µg/L) in ED05R is below the MCL of 200 µg/L. Cyanide is not a site COC.

Chlorobenzene, BCEE and manganese were the COCs most frequently detected above cleanup goals in deep-zone wells. Appendix C includes the groundwater sampling results for 2013 through 2016, as originally presented in annual long-term monitoring reports. Figures C-3 and C-4 in Appendix C present isoconcentration contours for pathfinder constituents chlorobenzene and manganese in deep-zone wells in 2016. Higher concentrations of chlorobenzene were observed in deep-zone groundwater compared to shallow-zone groundwater.

The highest concentrations of chlorobenzene in the deep zone were detected at ED10IR. ED10IR is located immediately southwest of the landfill on the adjacent pasture property. Contamination extends from this well about 2,000 feet west, across West Bainbridge Road, to well ED30. The Remedial Design Work Plan indicates that additional monitoring wells will be installed to horizontally and vertically delineate the downgradient plume based on the results from delineation efforts near the landfill as part of Phase 1 and 2 of the pre-design investigation.

Chlorobenzene concentrations in ED10IR and ED30 as well as in additional source depletion well ED05R have been relatively consistent over this FYR period. Time-concentration graphs that show longer-term trends in these wells are included in Appendix C, Figures C-6 and C-7. ED10IR has shown an overall decrease in concentrations since LRC construction in 2003, whereas concentrations in ED05R and ED30 have not changed substantially since 2003.

Manganese concentrations in ED10IR have decreased minimally over this FYR period, whereas manganese in ED05R appears relatively stable. Manganese has not been detected above its cleanup goal in downgradient well ED30 during any sampling event from this FYR period. These results are consistent with historical results since LRC construction (Appendix C, Figures C-10 and C-11).

BCEE was detected above its cleanup goal in two deep-zone wells – ED10IR and ED30 – at concentrations of 1.5 µg/L and 2.6 µg/L, respectively, during the 2016 sampling event. BCEE was not detected above laboratory detection limits in other deep wells. Figure C-14 in Appendix C presents the most recent BCEE isoconcentration map for the deep zone, prepared using 2015 data.

Masonic Village and Sentinel Well Monitoring
The interim LTGM includes sampling of Masonic Village potable supply wells EM500, EM600 and EM700 as well as sentinel well ED12ER. Chlorobenzene has not been detected above the cleanup goal in the Masonic Village wells or sentinel well ED12ER during this FYR period. This is consistent with historical results.

Manganese was detected above the cleanup goal in sentinel well ED12ER during all sampling between 2013 and 2016. Manganese concentrations ranged from 1,400 µg/L in 2013 to 1,800 µg/L in 2016. Based on a review of the time-concentration plot in Appendix C, Figure C-12, manganese concentrations in ED12ER have been increasing since 2008. BCEE was also detected above the cleanup goal in ED12ER in 2015 and 2016 at concentrations of 0.21 µg/L and 0.33 µg/L, respectively, compared to its cleanup goal of 0.0092 µg/L.

During this FYR period, Masonic Village well EM500 reported two cleanup goal exceedances: total lead at a concentration of 16 µg/L in 2016, compared to the cleanup goal of 5 µg/L, and manganese at a concentration of

64 µg/L in 2013, compared to the cleanup goal of 50 µg/L. A Masonic Village representative indicated that the three water supply wells at the facility are cycled daily, with two wells operating at a time. The representative stated that finished water quality at the facility has consistently met drinking water standards. PADEP's Drinking Water Reporting System also reports that the facility is in compliance.[6] Therefore, the sporadic exceedances of lead and manganese cleanup goals at EM500 do not affect current protectiveness of the remedy. However, more frequent sampling of EM500 is recommended.

Cyanide was detected in well EM700 at a concentration of 8.2 µg/L in 2016, below the MCL of 200 µg/L. Cyanide is not a site COC. All other COCs in the Masonic Village wells and sentinel well were either non-detect or were detected below cleanup goals during this FYR period.

2017 Pre-Design Investigation Sampling Results
WMDSPA sampled nine new and six pre-existing monitoring wells in August 2017 as part of Phase 1 of the pre-design investigation. The Masonic Village wells were not sampled as part of this effort. Figure C-15 in Appendix C shows the location of new and pre-existing wells.

Benzene, chlorobenzene, BCEE, arsenic, barium and manganese exceeded cleanup goals in one or more of the newly installed wells. All new wells reported manganese concentrations above the cleanup goal. Benzene, chlorobenzene, BCEE, arsenic and manganese exceeded cleanup goals in one or more of the existing wells during the 2017 sampling event. Results were generally consistent with previous detections.

LFG Well Monitoring
WMDSPA monitors landfill gas wells, two trench heads and the flare monthly for vacuum and percent methane, carbon dioxide and oxygen. During this FYR period, average methane at the flare has decreased from 49.8 percent during the eighth year of monitoring (October 2011 to September 2012) to 35.6 percent in the twelfth year of monitoring (October 2015 to September 2016). Similar declines were observed in the landfill gas wells and trench heads (refer to Appendix C of the 12th Year O&M Report for time-concentration charts). These decreases are expected as the landfill waste decomposition rate decreases with age.

LFG Condensate Tank and Flare Sampling and Analysis
Annual sampling of the LFG condensate tank in monitoring years 10, 11 and 12 did not detect any VOCs above laboratory method detection limits. Acetone was detected in the June 2013 sample collected during the ninth monitoring year but not during any subsequent sampling events.

Data from annual sampling of the LFG flare for VOCs as well as average flow rate data are used to calculate mass removal estimates for the LFG extraction system. Although mass removal estimates fluctuated during this FYR period, the estimated mass removal of monitored VOCs has declined overall during the 12 years of post-construction monitoring of the surface remedy (913 pounds removed during the second year, 633 pounds during the seventh year and 222 pounds during the 12th year). These declines are expected as the landfill waste decomposition process progresses with age and are consistent with lowered methane levels.

Site Inspection

The site inspection took place on October 25, 2017. In attendance were EPA RPM Frank Klanchar, EPA CIC Alexander Mandell, EPA hydrogeologist Ryan Bower, EPA toxicologist Jeff Tuttle, EPA biologist Katie Matta, PADEP representative Doug Cordelli, Glen Schultz and Tim Schneck from WMDSPA, Doug Sutton from HGL (PRP consultant), and Hagai Nassau and Jill Billus from Skeo (EPA FYR support contractor). The purpose of the site inspection was to assess the protectiveness of the remedy. Appendix D includes site inspection photographs.

Vegetation on the northern cap was well established, except for a small area on the northwestern slope of the landfill where vegetation was sparse. LFG collection wells were operational and appeared to be in good condition.

[6] Information obtained from PADEP's Drinking Water Reporting System, available at http://www.drinkingwater.state.pa.us/dwrs/HTM/Welcome.html, accessed May 16, 2018.

Numerous animal burrows were observed across the vegetated landfill but no waste was exposed. An 8-foot chain-link fence with a locked entrance gate surrounds the landfill property. Vegetation was observed growing on the fence on the eastern side of the Site. A fallen tree had also struck the fence.

The stormwater letdown channel, constructed of cable concrete, and the stormwater collection basin were in good condition. Vegetation was observed growing in the letdown channel; however, it did not appear to be substantial enough to impede flow. The collection basin was dry at the time of the inspection.

Monitoring wells around the vegetated cap area, including new wells installed in the summer of 2017, appeared to be in good condition; all but one of the wells were secured with locks. The representative from HGL locked the unsecured monitoring well during the site inspection.

Site inspection participants also accessed the western property adjacent to the Site to inspect monitoring wells installed on the property. Chain-link fence that surrounds monitoring well ED10IR on the adjacent property was unsecured. Additional wells were also found unsecured. EPA noted that the fences and wells should be locked to keep out cattle and to maintain the integrity of the monitoring wells.

Site inspection participants observed the asphalt cap area of the landfill. Patched areas of asphalt on the eastern side were beginning to show signs of stress. Cracks were observed around the perimeter of the patched areas; vegetation was growing in one of the cracks. Pooled water was also observed in two slightly depressed areas in the asphalt cap.

The LFG flare was in operation at the time of the inspection; it was in good condition and well maintained. Site inspection participants also observed the water tower installed outside the landfill cap. The tower, owned by the Elizabethtown Area Water Authority and installed prior to the 2013 FYR, is surrounded by a tall, locked fence to prevent tampering. Site inspection participants observed a frac tank on the asphalt cover. WMDSPA representatives indicated that the tank is storing development water from newly installed monitoring wells and will remain on Site until additional pump tests are conducted as part of the pre-design activities.

Following the site inspection, EPA observed a cow trapped within the fenced enclosure for monitoring well ED23, located on the adjacent property. EPA notified the property owner, Masonic Village, and a representative was able to release the cow from the enclosure. EPA notified WMDSPA of the need to keep all monitoring well enclosures locked and secured for the safety of the grazing cattle and to maintain the integrity of the Site's remedial components. WMDSPA has added locks to all gated enclosures.

Skeo staff members visited the local information repository for the Site, the West Donegal Township Building, located at One Municipal Drive in Elizabethtown, Pennsylvania. The repository was up to date with site documents.

V. TECHNICAL ASSESSMENT

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

Question A Summary:

Yes, the LRC phase of the remedy has been constructed in accordance with the 1997 ROD; the landfill cover system is functioning as intended. The GRC is currently in the remedial design phase and has not yet been implemented.

Landfill Remedial Component

The landfill cover system prevents direct exposure to landfill waste and minimizes the infiltration of rain water. In turn, this prevents leachate generation and minimizes the migration of residual contaminants from the landfill to groundwater. The landfill gas extraction system and surface water drainage controls are functioning as designed;

however, low points were observed in the drainage channels. WMDSPA inspects the Site quarterly and conducts maintenance and monitoring as required by the Site's O&M Plan.

The landfill's clay and asphalt covers and perimeter fencing are generally in good condition, with a few minor maintenance issues noted during the FYR site inspection. Vegetation on the clay cover is well established, except for a small area on the northwestern slope of the landfill where vegetation is sparse. Many animal burrows were observed across the vegetated landfill. Vegetation and a fallen tree were observed along the perimeter fence. Patched areas of asphalt on the eastern side of the asphalt cover were beginning to show signs of stress. Cracks were observed around the perimeter of the patched areas. These items require attention as part of routine O&M activities at the Site and will not affect the protectiveness of the remedy if promptly addressed.

An environmental covenant is in place for the landfill property to protect the integrity of the landfill cap, minimize exposure to landfill contents and prohibit use of groundwater.

Groundwater Remedial Component

The 1997 ROD called for groundwater extraction and treatment; it also required an extensive groundwater study prior to implementation. Following the 2008 GSC and 2012 FFS, EPA directed WMDSPA to move forward with design for the groundwater extraction and treatment remedy. The GRC is currently in the remedial design phase. WMDSPA completed the first phase of the pre-design investigation in the summer of 2017; the second phase is planned for 2018. As part of the pre-design investigation, WMDSPA plans to evaluate whether ISB and natural attenuation can be incorporated as components of the remedy. If ISB or MNA are selected as additional components of the remedy, a decision document may be needed to document the remedy modification.

In the interim, WMDSPA conducts regular groundwater monitoring to provide ongoing information about the contaminant distribution in groundwater. Chlorobenzene, manganese and BCEE are the primary COCs detected above cleanup goals. Most wells show relatively stable or decreasing COC concentrations during this FYR period. Manganese in sentinel well ED12ER has been increasing since 2008. This contamination will continue to be monitored and is expected to be addressed as part of the GRC.

WMDSPA regularly samples the Masonic Village water supply wells for Site-related COCs. Chlorobenzene has not been detected above the cleanup goal in the Masonic Village wells during this FYR period. Masonic Village well EM500 reported total lead and manganese concentrations above cleanup goals on separate occasions during this FYR period. Although EM500 reported sporadic detections above cleanup goals, Masonic Village's finished drinking water is in compliance with drinking water standards. WMDSPA currently samples the Masonic Village supply wells annually. Due to COC detections above cleanup goals in EM500, semi-annual sampling of EM500 is recommended.

Groundwater contamination extends off the landfill property to the northwest; however, there are no current human exposures to the contamination. Downgradient affected properties are connected to the municipal water supply. Although not required by the ROD, institutional controls are in place to prevent use of groundwater or installation of new wells in downgradient areas. The institutional control in place for parcel 1603751900000 includes restrictions set forth in a lease agreement between WMDSPA and a private party. Although the restrictions set forth in the environmental protection easements and restrictive covenants run with the land, current deeds for some downgradient properties affected by Site groundwater contamination do not reference the restrictions set forth in the original covenants.

Cattle graze in the pasture adjacent to the west side of the landfill property. According to the Director of Land Management at Masonic Village, the cattle drink from water troughs in a tributary (the western tributary), which is fed by a spring in the southern part of the pasture. The western tributary discharges into Conoy Creek. A declaration of restrictive covenants is in place for the pasture property. However, it does not restrict use of surface water. The western tributary was last sampled during the RI in 1993 which showed sporadic detections of COCs at low concentrations. Recent data should be collected from the tributary to determine current concentrations and to evaluate potential risks to the cattle ingesting the water and to people consuming beef from the cattle.

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

Question B Summary:

Yes, the exposure assumptions and RAOs used at the time of remedy selection are still valid. Toxicity data and ARAR values have changed since the ROD; however, these changes do not call into question the protectiveness of the remedy as presented below.

A comparison of the 1997 MCLs to current standards found that the MCL for arsenic has become more stringent. No other standards have changed. These results do not affect the protectiveness of the remedy because the most recent monitoring reports evaluate the data using the current arsenic MCL of 10 µg/L. In addition, there are no known current or future human exposures to contaminated groundwater. EPA may update the arsenic groundwater cleanup goal in a forthcoming decision document.

There are potentially complete current and future pathways for aquatic receptors in Conoy Creek, as groundwater discharges to Conoy Creek prior to dilution by surface water. Surface water and sediment monitoring during the baseline investigation and the GSC did not detect Site-related impacts to surface water or sediment quality in Conoy Creek above background concentrations. Because concentrations were below background, any potential exposures to aquatic receptors are not anticipated to affect the protectiveness of the remedy.

As stated above under Question A, there are potentially complete exposure pathways between cattle and spring water in the western tributary. Current sample data should be collected to determine if the western tributary is impacted by site contamination at levels that would pose potential concern for the cattle that ingest the water, and indirectly for humans who consume beef from the cattle.

A comparison of the 1997 water quality criteria to current Pennsylvania water quality criteria found that standards for four COCs (cyanide, chlorobenzene, 2-chlorophenol and endrin) have become less stringent, standards for five COCs (lead, PCE, methylene chloride, bis(2-ethylhexyl)phthalate and aldrin) have become more stringent and the standard for one COC (bis(2-chloroethyl)ether) has not changed.[7] Surface water monitoring during the baseline investigation and the GSC did not detect Site-related impacts to surface water quality in Conoy Creek above background concentrations; therefore, these changes do not affect the protectiveness of the remedy. Future surface water sampling results should be compared to current standards.

This FYR evaluated the protectiveness of the risk-based groundwater cleanup goal for BCEE using EPA's regional screening levels (RSLs). The cleanup goal for BCEE of 0.0092 µg/L remains protective. The BCEE cleanup goal is more stringent than the current tapwater RSL of 0.014 µg/L and the current Pennsylvania Act 2 standard of 0.15 µg/L.[8]

WMDSPA performed a vapor intrusion study in 2012 for the two residences immediately downgradient of the Site. Two shallow groundwater monitoring wells screened at the water table-unsaturated zone interface were installed near the chlorobenzene migration pathway to evaluate groundwater quality near each of the properties. VOCs were not detected in samples from either well. The data confirmed the presence of a fresh water lens in the downgradient area. These results verify that there is an incomplete vapor intrusion pathway between the Site and the downgradient neighboring properties. Therefore, vapor intrusion does not affect the protectiveness of the remedy. EPA approved the vapor intrusion assessment report in May 2012. Site conditions have not changed since 2012; therefore, the assessment findings remain valid.

[7] Comparison of 1997 ARAR to the lower value of the current fish and aquatic life or human health criteria, available at https://www.pacode.com/secure/data/025/chapter93/chap93toc.html, accessed 12/5/2017.

[8] The Pennsylvania Act 2 standard for BCEE is the medium-specific concentration for a residentially used aquifer with total dissolved solids less than or equal to 2,500 milligrams per liter (mg/L).

EPA considers 1,4-dioxane an emerging COC. 1,4-Dioxane is associated with certain chlorinated solvents (particularly 1,1,1-trichloroethane, or TCA) because of its widespread use as a stabilizer for chlorinated solvents. 1,1,1-TCA was not detected in site groundwater during this FYR period (2013-2017) and TCE results were mostly non-detect or found at very low concentrations (1 µg/L) during this period. The absence of these chlorinated solvents provides justification not to sample for 1,4-dioxane at this time.

The remedy is expected to make progress towards meeting RAOs once the groundwater remedy is fully implemented. In the interim, no unacceptable exposures to contaminated groundwater are occurring.

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

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

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the FYR:
None

Issues and Recommendations Identified in the FYR:

OU(s): OU1	**Issue Category: Monitoring**			
	Issue: Surface water in the tributary west of the landfill has not been sampled since the 1993 RI and is now used as a source of water for cattle in the pasture. At the time of the 1993 RI, COCs in the western tributary were detected sporadically and at low concentrations; however, no current samples have been collected. It is unclear if the spring water is affected by site contamination at levels that would pose potential concern for ecological and human receptors.			
	Recommendation: Sample the surface water of the western tributary for site COCs and determine if concentrations are adequately protective of ecological and human receptors.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP/EPA	EPA	6/19/2022

OU(s): OU1	Issue Category: Institutional Controls			
	Issue: The remedy selected in the 1997 ROD did not call for institutional controls for areas outside the landfill property. However, institutional controls are in place to prohibit use of groundwater and to restrict the installation of water wells at properties downgradient of the landfill. Although the institutional controls run with the land (except for the leased property), current landowners may not be aware of the restrictions on their properties.			
	Recommendation: Issue a decision document to ensure the CERCLA remedy includes the requirement for institutional controls for areas outside the landfill property affected by site contamination. Ensure property owners affected by site contamination are aware of the restrictions on their properties in a manner consistent with the requirements of the previously implemented environmental protection easements and restrictive covenants.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP/EPA	EPA	6/19/2022

OU(s): OU1	Issue Category: Monitoring			
	Issue: Masonic Village supply well EM500 reported sporadic detections of lead and manganese above cleanup goals during this FYR period. Masonic Village indicates that finished drinking water at the facility is in compliance with drinking water standards. WMDSPA currently samples the Masonic Village supply wells annually.			
	Recommendation: Sample Masonic Village supply well EM500 semi-annually for site COCs. Ensure that the Masonic Village receives a copy of the sampling results.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	6/19/2019

OTHER FINDINGS

In addition, the following recommendations were identified during the FYR. They will not affect current and/or future protectiveness if addressed in a timely manner:

- Repair cracks observed in the asphalt cap on the southern portion of the Site.
- Address animal burrows in the clay cap as soon as they are identified.
- Ensure that all monitoring wells and gated enclosures are locked and secured for the safety of the grazing cattle on the adjacent property and to maintain the integrity of the Site's remedial components.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement	
Operable Unit: OU1	*Protectiveness Determination:* Will be Protective
Protectiveness Statement: The Site's remedy is expected to be protective of human health and the environment upon completion. In the interim, exposure pathways that could result in unacceptable risks are being controlled and exposure pathways that have not been assessed recently (i.e., cattle exposure to spring water) will be evaluated. The landfill cover system prevents direct exposure to contaminated soil and landfill waste, institutional controls are in place to restrict current and future exposures at the landfill property, and an O&M and monitoring plan is in place to ensure the long-term integrity of the cover system. Institutional controls are also in place to prevent use of contaminated groundwater at downgradient properties.	

VIII. NEXT REVIEW

The next FYR Report for the Elizabethtown Landfill Superfund site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

2016 Interim Long-term Monitoring Report, Elizabethtown Landfill, West Donegal Township, Lancaster County, Pennsylvania. Golder Associates Inc. May 2017.

2015 Interim Long-term Monitoring Report, Elizabethtown Landfill, West Donegal Township, Lancaster County, Pennsylvania. Golder Associates Inc. March 2016.

2014 Interim Long-term Monitoring Report, Elizabethtown Landfill, West Donegal Township, Lancaster County, Pennsylvania. Golder Associates Inc. January 2015.

2013 Interim Long-term Monitoring Report, Elizabethtown Landfill, West Donegal Township, Lancaster County, Pennsylvania. Golder Associates Inc. January 2014.

Construction Completion Report, Elizabethtown Landfill Site, West Donegal Township, Lancaster County, Pennsylvania. Golder Associates Inc. July 2004.

Eleventh Year Operation and Maintenance Report, Landfill Remedial Components, October 2014 through September 2015, Elizabethtown Landfill, West Donegal Township, Pennsylvania. Golder Associates. September 2015.

Elizabethtown Landfill Remedial Investigation/Feasibility Study 1995 Residential Well Sampling Results Letter Report. Golder Associates Inc. June 1995.

First Five-Year Review Report, Elizabethtown Landfill. U.S. EPA Region 3. June 2008.

Groundwater Study Component Report, Elizabethtown Landfill, West Donegal Township, Pennsylvania. Golder Associates Inc. February 2008.

Groundwater Remedial Component Remedial Design Work Plan, Elizabethtown Landfill, West Donegal Township, Pennsylvania. HydroGeologic Inc. December 2016.

Interim Long-Term Environmental Monitoring Plan, Addendum 1, Elizabethtown Landfill Site, West Donegal Township, Pennsylvania. Geosyntec Consultants, Inc. October 6, 2014.

Ninth Year Operation and Maintenance Report, Landfill Remedial Components, October 2012 through September 2013, Elizabethtown Landfill, West Donegal Township, Pennsylvania. Golder Associates. October 2013.

Record of Decision, Elizabethtown Landfill Superfund Site, Lancaster County, Pennsylvania. U.S. EPA Region 3. October 1997.

Report on Vapor Intrusion Assessment, Elizabethtown Landfill Site, West Donegal Township, Pennsylvania. Geosyntec Consultants Inc. February 28, 2012.

Revised Groundwater Focused Feasibility Study Report, Elizabethtown Landfill, West Donegal Township, Pennsylvania. Geosyntec Consultants Inc. April 2012.

Second Five-Year Review Report for Elizabethtown Landfill Superfund Site, Lancaster County, Pennsylvania. U.S. EPA, Region 3. June 2013.

September 2017 Monthly Progress Report, Elizabethtown Landfill Site, Elizabethtown, Pennsylvania. HydroGeoLogic Inc. October 10, 2017.

Technical Memorandum for Bis(2-Chloroethyl) Ether (BCEE) Results of the June 2015 Interim Long-Term Monitoring Event at Elizabethtown Landfill Site, West Donegal Township, Pennsylvania. Geosyntec Consultants Inc. July 24, 2015.

Tenth Year Operation and Maintenance Report, Landfill Remedial Components, October 2013 through September 2014, Elizabethtown Landfill, West Donegal Township, Pennsylvania. Golder Associates. September 2014.

Twelfth Year Operation and Maintenance Report, Landfill Remedial Components, October 2015 through September 2016, Elizabethtown Landfill, West Donegal Township, Pennsylvania. Golder Associates. May 2017.

APPENDIX B – SITE CHRONOLOGY

Table B-1: Site Chronology

Event	Date
Sandstone quarry operated on site	1957-1961
UDI began unlicensed landfill operations on site	April 1961
Landfill operations ceased pursuant to a Consent Decree with the Pennsylvania Department of Environmental Resources	July 1973
SCA purchased the closed landfill	March 1976
EPA performed a preliminary assessment	March 1984
SCA began using the southern portion of the Site as the location of a trash hauling transfer station, maintenance facility and office building	1984
SCA placed a soil-based cover on about 12 acres of the northern portion of the landfill	1986-1987
EPA inspected the Site	August 1987
EPA listed the Site on the NPL	March 1989
EPA conducted a removal assessment	June 1990
SCA entered into an administrative order on consent with EPA to conduct an RI/FS; SCA began the RI/FS	September 1990
SCA closed its hauling operation and service garage	December 1991
EPA and PRP entered into a Consent Decree	February 1996
PRP completed the RI/FS; EPA issued the Site's ROD	October 1997
EPA and PRP signed an Administrative Order on Consent to begin the remedial design	June 1999
PRP began the remedial design	July 1999
EPA, PADEP and WMDSPA entered into a Consent Decree in which WMDSPA agreed to implement the remedial design and remedial action	October 1999
PRP completed the remedial design and began the remedial action	April 2002
EPA approved the 100 percent remedial design for the LRCs and the LRC construction contractor mobilized to the Site	June 2003
PRP completed LRC construction activities	December 2003
EPA performed the final site inspection	July 2004
PRP completed the landfill remedial action	September 2004
PRP completed the GSC Report, the Wetlands Delineation Report and the Conoy Creek Macroinvertebrate Survey	February 2008
EPA issued the Site's first FYR Report	June 2008
PRP completed a revised groundwater FFS Report	April 2012
EPA approved the vapor intrusion assessment	May 2012
EPA approved the revised groundwater FFS Report	October 2012
EPA issued the Site's second FYR Report	June 2013
EPA approved the Interim Long-Term Environmental Monitoring Plan, Addendum 1, to reduce interim groundwater monitoring frequency to annual monitoring	November 2014
EPA approved the GRC Remedial Design Work Plan	March 2017
PRP began field work for Phase 1 of the pre-design investigation component of the GRC remedial design	July 2017

APPENDIX C – DATA REVIEW SUPPORTING DOCUMENTATION

Table C-1: Groundwater Analytical Data – 2013

(Source: 2013 and 2014 Interim LTM reports, prepared by Golder Associates, Inc.)

Laboratory Analytical Data for Groundwater Samples - Source Depletion Wells
December 2013 Interim Long-Term Monitoring Event
Elizabethtown Landfill Interim Long-Term Monitoring Program
West Donegal Township, Pennsylvania

Parameter	Units	GWQC	Sample Location							
			ED02R	ED05R	ED08R	ED08R-FD	ED09R	ED10IR	ED11IR	ED18
VOCs										
Acetone	µg/l	3700	-	-	-	-	NS	-	NS	NS
Benzene	µg/l	**5**	-	8.1	-	-	NS	-	NS	NS
Chlorobenzene	µg/l	**100**	550	260	4.8	4.8	NS	1800	NS	NS
Chloroethane	µg/l	230	-	5.6	-	-	NS	-	NS	NS
Methylene Chloride	µg/l	**5**	-	-	-	-	NS	-	NS	NS
1,1 - Dichloroethane	µg/l	27	-	7.9	-	-	NS	-	NS	NS
1,2 - Dichloroethane	µg/l	5	-	-	-	-	NS	-	NS	NS
1,2 - Dichloroethene (Total)	µg/l	70	-	-	-	-	NS	-	NS	NS
Trichloroethene	µg/l	**5**	-	-	-	-	NS	-	NS	NS
Vinyl Chloride	µg/l	**2**	-	-	-	-	NS	-	NS	NS
SVOCs										
Bis(2-chloroethyl) ether	µg/l	**0.0092**	NS	NS	NS		NS	NS	NS	NS
Bis(2-ethylhexyl)phthalate	µg/l	**6**	NS	NS	NS		NS	NS	NS	NS
2 - Chlorophenol	µg/l	40	NS	NS	NS		NS	NS	NS	NS
Total Inorganics										
Arsenic - Total	µg/l	**50**	NS	NS	NS		NS	NS	NS	NS
Barium - Total	µg/l	**2000**	NS	NS	NS		NS	NS	NS	NS
Cyanide	µg/l	NNS	NS	NS	NS		NS	NS	NS	NS
Lead - Total	µg/l	**5**	NS	NS	NS		NS	NS	NS	NS
Manganese - Total	µg/l	**50***	9700	5000	3900	3900	NS	9700	NS	NS
Thallium - Total	µg/l	**0.5***	NS	NS	NS		NS	NS	NS	NS

Notes:

1) A "-" indicates a non-detect.
2) ROD Groundwater Cleanup Levels of the Ground Water Quality Criteria (GWQC) are shown in bold and underlined. All other GWQC values are from 25 PA Code Chapter 250.
3) Detects that are shaded indicate levels that are higher than the GWQC.
4) "NNS" indicates no numeric standard. "NS" indicates not sampled
5) * Indicates that ROD Cleanup Level is the value listed or the background concentration whichever is greater.
6) µg/l = micrograms per liter
7) VOC-Volatile Organic Compound
8) SVOC- Semi-Volatile Organic Compound

Laboratory Analytical Data for Groundwater Samples - Plume Stablity Wells
December 2013 Interim Long-Term Monitoring Event
Elizabethtown Landfill Interim Long-Term Monitoring Program
West Donegal Township, Pennsylvania

Parameter	Units	GWQC	Sample Locations					
			ED12IR	ED12DR	ED20	ED23	ED24	ED30
VOCs								
Acetone	µg/l	3700	NS	-	NS	NS	-	-
Benzene	µg/l	**5**	NS	-	NS	NS	-	-
Chlorobenzene	µg/l	**100**	NS	510	NS	NS	340	130
Methyl Ethyl Ketone	µg/l	2800	NS	-	NS	NS	-	-
Chloroethane	µg/l	230	NS	11	NS	NS	8	-
1,1 - Dichloroethane	µg/l	27	NS	-	NS	NS	-	2.6
1,2 - Dichloroethane	µg/l	5	NS	-	NS	NS	-	-
1,1 - Dichloroethene	µg/l	**7**	NS	-	NS	NS	-	-
1,2 - Dichloroethene (Total)	µg/l	70	NS	-	NS	NS	-	-
Trichloroethene	µg/l	**5**	NS	-	NS	NS	-	-
Tetrachloroethene	µg/l	**5**	NS	-	NS	NS	-	-
1,1,1 - Trichloroethane	µg/l	200	NS	-	NS	NS	-	-
Vinyl Chloride	µg/l	**2**	NS	-	NS	NS	-	-
SVOCs								
Bis(2-chloroethyl) ether	µg/l	**0.0092**	NS	NS	NS	NS	NS	NS
Bis(2-ethylhexyl)phthalate	µg/l	**6**	NS	NS	NS	NS	NS	NS
2 - Chlorophenol	µg/l	40	NS	NS	NS	NS	NS	NS
Total Inorganics								
Arsenic - Total	µg/l	**50**	NS	NS	NS	NS	NS	NS
Barium - Total	µg/l	**2000**	NS	NS	NS	NS	NS	NS
Cyanide	µg/l	NNS	NS	NS	NS	NS	NS	NS
Lead - Total	µg/l	**5**	NS	NS	NS	NS	NS	NS
Manganese - Total	µg/l	**50***	NS	10200	NS	NS	6500	-
Thallium - Total	µg/l	**5***	NS	NS	NS	NS	NS	NS

Notes:

1) A "-" indicates a non-detect.
2) ROD Groundwater Cleanup Levels of the Ground Water Quality Criteria (GWQC) are shown in bold and underlined. All other GWQC values are from 25 PA Code Chapter 250.
3) Detects that are shaded indicate levels that are higher than the GWQC.
4) "NNS" indicates no numeric standard. "NS" indicates not sampled.
5) * Indicates that ROD Cleanup Level is the value listed or the background concentration whichever is greater.
6) µg/l = micrograms per liter
7) VOC-Volatile Organic Compound
8) SVOC- Semi-Volatile Organic Compound

Laboratory Analytical Data for Groundwater Samples - Sentinel and Potable Supply Wells
December 2013 Interim Long-Term Monitoring Event
Elizabethtown Landfill Interim Long-Term Monitoring Program
West Donegal Township, Pennsylvania

Parameter	Units	GWQC	Sample Location			
			EM500	EM600	EM700	ED12ER
VOCs						
Acetone	µg/l	3700	-	-	NS	-
Chlorobenzene	µg/l	**100**	-	-	NS	17
Chloroethane	µg/l	230	-	-	NS	12
1,1 - Dichloroethane	µg/l	27	-	-	NS	-
1,2-Dichloroethene, Total	µg/l	70	-	-	NS	2.8
Methylene Chloride	µg/l	**5**	-	-	NS	-
Methyl Ethyl Ketone	µg/l	2800	-	-	NS	-
SVOCs						
Bis(2-chloroethyl)ether	µg/l	**0.0092**	NS	NS	NS	NS
Bis(2-ethylhexyl)phthalate	µg/l	**6**	NS	NS	NS	NS
2 - Chlorophenol	µg/l	40	NS	NS	NS	NS
Total Inorganics						
Arsenic - Total	µg/l	**50**	NS	NS	NS	NS
Barium - Total	µg/l	**2000**	NS	NS	NS	NS
Cyanide	µg/l	NNS	NS	NS	NS	NS
Lead - Total	µg/l	**15**	NS	NS	NS	NS
Manganese - Total	µg/l	**50**	21	-	NS	1500
Thallium - Total	µg/l	**2***	NS	NS	NS	NS

Notes:

1) A "-" indicates a non-detect.
2) ROD Groundwater Cleanup Levels of the Ground Water Quality Criteria (GWQC) are shown in bold and underlined. All other GWQC values are from 25 PA Code Chapter 250.
3) Detects that are shaded indicate levels that are higher that the GWQC.
4) "NNS" indicates no numeric standard. "NS" indicates not sampled.
5) * Indicates that ROD Cleanup Level is the value listed or the background concentration whichever is greater.
6) µg/l = micrograms per liter
7) VOC-Volatile Organic Compound
8) SVOC- Semi-Volatile Organic Compound

Laboratory Analytical Data for Groundwater Samples - Source Depletion Wells
June 2013 Interim Long-Term Monitoring Event (Expanded)
Elizabethtown Landfill Interim Long-Term Monitoring Program
West Donegal Township, Pennsylvania

Parameter	Units	GWQC	Sample Location							
			ED02R	ED05R	ED08R	ED09R	ED10IR	ED11IR	ED11IR-FD	ED18
VOCs										
Acetone	µg/l	3700	-	-	-	-	-	-	-	-
Benzene	µg/l	**5**	-	2.0	-	-	-	-	-	-
Chlorobenzene	µg/l	**100**	580	110	20	7.3	1700	-	-	10
Chloroethane	µg/l	230	-	-	-	-	-	-	-	2.2
Methylene Chloride	µg/l	**5**	-	-	-	-	-	-	-	-
1,1 - Dichloroethane	µg/l	27	-	5.7	-	2	-	3.8	3.7	7.4
1,2 - Dichloroethane	µg/l	5	-	-	-	-	-	-	-	-
1,2 - Dichloroethene (Total)	µg/l	70	-	-	-	-	-	-	-	3.6
Trichloroethene	µg/l	**5**	-	-	-	-	-	-	-	1.5
Vinyl Chloride	µg/l	**2**	-	-	-	-	-	-	-	-
SVOCs										
Bis(2-chloroethyl) ether	µg/l	**0.0092**	-	-	-	-	-	-	-	-
Bis(2-ethylhexyl)phthalate	µg/l	**6**	-	-	-	-	-	-	-	-
2 - Chlorophenol	µg/l	40	-	-	-	-	-	-	-	-
Total Inorganics										
Arsenic - Total	µg/l	**50**	-	46	-	-	23	-	-	6.9
Barium - Total	µg/l	**2000**	530	710	120	100	1500	350	350	240
Cyanide	µg/l	NNS	-	-	-	-	-	-	-	-
Lead - Total	µg/l	**5**	0.096	0.48	-	1	0.42	0.1	0.12	0.3
Manganese - Total	µg/l	**50***	13100	4000	5500	960	9600	4.1	4.8	2900
Thallium - Total	µg/l	**0.5***	-	-	-	0.12	-	-	-	-

Notes:

1) A "-" indicates a non-detect.
2) A "B" indicates blank contamination.
3) A "J" indicates an estimated result.
4) ROD Groundwater Cleanup Levels of the Ground Water Quality Criteria (GWQC) are shown in bold and underlined. All other GWQC values are from 25 PA Code Chapter 250.
5) Detects that are shaded indicate levels that are higher than the GWQC.
6) "NNS" indicates no numeric standard. "NS" indicates not sampled
7) * Indicates that ROD Cleanup Level is the value listed or the background concentration whichever is greater.
8) µg/l = micrograms per liter

Laboratory Analytical Data for Groundwater Samples - Plume Stablity Wells
June 2013 Interim Long-Term Monitoring Event (Expanded)
Elizabethtown Landfill Interim Long-Term Monitoring Program
West Donegal Township, Pennsylvania

Parameter	Units	GWQC	Sample Locations					
			ED12DR	ED12IR	ED20	ED23	ED24	ED30
VOCs								
Acetone	µg/l	3700	-	-	-	-	-	-
Benzene	µg/l	**5**	-	-	-	-	-	-
Chlorobenzene	µg/l	**100**	470	220	35	60	320	130
Methyl Ethyl Ketone	µg/l	2800	-	-	-	-	-	-
Chloroethane	µg/l	230	16	32		1.4	7.4	-
1,1 - Dichloroethane	µg/l	27	-	-	-	3.4	-	2.7
1,2 - Dichloroethane	µg/l	5	-	-	-	-	-	-
1,1 - Dichloroethene	µg/l	**7**	-	-	-	-	-	-
1,2 - Dichloroethene (Total)	µg/l	70	-	-	-	-	-	-
Trichloroethene	µg/l	**5**	-	-	-	-	-	-
Tetrachloroethene	µg/l	**5**	-	-	-	-	-	-
1,1,1 - Trichloroethane	µg/l	200	-	-	-	-	-	-
Vinyl Chloride	µg/l	**2**	-	-	-	-	-	-
SVOCs								
Bis(2-chloroethyl) ether	µg/l	**0.0092**	11	-	-	-	-	-
Bis(2-ethylhexyl)phthalate	µg/l	**6**	-	-	-	-	-	-
2 - Chlorophenol	µg/l	40	-	-	-	-	-	-
Total Inorganics								
Arsenic - Total	µg/l	**50**	6.2	-	-	-	12	-
Barium - Total	µg/l	**2000**	2000	680	340	820	2800	93
Cyanide	µg/l	NNS	-	-	-	-	-	-
Lead - Total	µg/l	**5**	0.078	0.26	4.9	-	2	-
Manganese - Total	µg/l	**50***	9600	2300	710	1300	6600	1.1
Thallium - Total	µg/l	**5***	0.091	0.21	0.098	0.14	-	-

Notes:

1) A "-" indicates a non-detect.
2) ROD Groundwater Cleanup Levels of the Ground Water Quality Criteria (GWQC) are shown in bold and underlined. All other GWQC values are from 25 PA Code Chapter 250.
3) Detects that are shaded indicate levels that are higher than the GWQC.
4) "NNS" indicates no numeric standard.
5) * Indicates that ROD Cleanup Level is the value listed or the background concentration whichever is greater.
6) µg/l = micrograms per liter

Laboratory Analytical Data for Groundwater Samples - Sentinel and Potable Supply Wells
June 2013 Interim Long-Term Monitoring Event (Expanded)
Elizabethtown Landfill Interim Long-Term Monitoring Program
West Donegal Township, Pennsylvania

Parameter	Units	GWQC	Sample Location			
			EM500	EM600	EM700	ED12ER
VOCs						
Acetone	µg/l	3700	-	-	-	-
Chlorobenzene	µg/l	**100**	-	-	-	17
Chloroethane	µg/l	230	-	-	-	13
1,1 - Dichloroethane	µg/l	27	-	-	-	-
1,2-Dichloroethene, Total	µg/l	70	-	-	-	2.4
Methylene Chloride	µg/l	**5**	-	-	-	-
Methyl Ethyl Ketone	µg/l	2800	-	-	8.9	-
SVOCs						
Bis(2-chloroethyl)ether	µg/l	**0.0092**	-	-	-	-
Bis(2-ethylhexyl)phthalate	µg/l	**6**	-	-	-	-
2 - Chlorophenol	µg/l	40	-	-	-	-
Total Inorganics						
Arsenic - Total	µg/l	**50**	-	-	-	-
Barium - Total	µg/l	**2000**	230	190	180	900
Cyanide	µg/l	NNS	-	-	-	-
Lead - Total	µg/l	**15**	0.19	0.4	2.4	0.086
Manganese - Total	µg/l	**50**	64	1.6	14	1400
Thallium - Total	µg/l	**2***	-	-	-	-

Notes:
1) A "-" indicates a non-detect.
2) ROD Groundwater Cleanup Levels of the Ground Water Quality Criteria (GWQC) are shown in bold and underlined. All other GWQC values are from 25 PA Code Chapter 250.
3) Detects that are shaded indicate levels that are higher than the GWQC.
4) "NNS" indicates no numeric standard.
5) * Indicates that ROD Cleanup Level is the value listed or the background concentration whichever is greater.

Table C-2: Groundwater Analytical Data – 2014

(Source: 2014 Interim LTM Report, prepared by Golder Associates, Inc.)

Laboratory Analytical Data for Groundwater Samples - Source Depletion Wells
June 2014 Interim Long-Term Monitoring Event (Expanded)
Elizabethtown Landfill Interim Long-Term Monitoring Program
West Donegal Township, Pennsylvania

Parameter	Units	GWQC	Sample Location						
			ED02R	ED05R	ED08R	ED09R	ED10IR	ED11IR	ED18
VOCs									
Acetone	µg/l	3700	-	-	-	-	-	-	-
Benzene	µg/l	**5**	-	-	2.2	-	-	-	-
Chlorobenzene	µg/l	**100**	560	170	89	2.4	1500	-	11
Chloroethane	µg/l	230	-	-	-	-	-	-	1.6
Methylene Chloride	µg/l	**5**	-	-	-	-	-	-	-
1,1 - Dichloroethane	µg/l	27	-	5.3	-	4.7	-	3.3	6
1,2 - Dichloroethane	µg/l	5	-	-	-	-	-	-	-
1,2 - Dichloroethene (Total)	µg/l	70	-	-	-	-	-	-	3.1
Trichloroethene	µg/l	**5**	-	-	-	-	-	-	1.1
Vinyl Chloride	µg/l	**2**	-	-	-	-	-	-	-
SVOCs									
Bis(2-chloroethyl) ether	µg/l	**0.0092**	-	-	-	-	-	-	-
Bis(2-ethylhexyl)phthalate	µg/l	**6**	-	-	-	-	-	-	-
2 - Chlorophenol	µg/l	40	-	-	-	-	-	-	-
Total Inorganics									
Arsenic - Total	µg/l	**50**	-	47	12	-	24	-	-
Barium - Total	µg/l	**2000**	490	700	430	120	1400	350	290
Cyanide	µg/l	NNS	-	-	-	-	-	-	-
Lead - Total	µg/l	**5**	0.21	0.35	0.27	0.88	0.72	0.089	0.26
Manganese - Total	µg/l	**50***	9500	4200	5600	620	8100	5	3800
Thallium - Total	µg/l	**0.5***	-	-	0.15	0.2	0.14	-	-

Notes:

1) A "-" indicates a non-detect.
2) ROD Groundwater Cleanup Levels of the Ground Water Quality Criteria (GWQC) are shown in bold and underlined. All other GWQC values are from 25 PA Code Chapter 250.
3) Detects that are shaded indicate levels that are higher than the GWQC.
4) "NNS" indicates no numeric standard. "NS" indicates not sampled
5) * Indicates that ROD Cleanup Level is the value listed or the background concentration whichever is greater.
6) µg/l = micrograms per liter
7) VOC-Volatile Organic Compound
8) SVOC- Semi-Volatile Organic Compound

Laboratory Analytical Data for Groundwater Samples - Plume Stablity Wells
June 2014 Interim Long-Term Monitoring Event (Expanded)
Elizabethtown Landfill Interim Long-Term Monitoring Program
West Donegal Township, Pennsylvania

Parameter	Units	GWQC	Sample Locations						
			ED12DR	ED12IR	ED20	ED23	ED23-FD	ED24	ED30
VOCs									
Acetone	µg/l	3700	-	-	-	-	-	-	-
Benzene	µg/l	**5**	-	-	-	-	-	-	-
Chlorobenzene	µg/l	**100**	470	260	44	52	54	350	130
Methyl Ethyl Ketone	µg/l	2800	-	-	-	-	-	-	-
Chloroethane	µg/l	230	12	25	-	1.4	1.5	8.3	-
1,1 - Dichloroethane	µg/l	27	-	-	-	3.7	4.1	-	2.7
1,2 - Dichloroethane	µg/l	5	-	-	-	-	-	-	-
1,1 - Dichloroethene	µg/l	**7**	-	-	-	-	-	-	-
1,2 - Dichloroethene (Total)	µg/l	70	-	-	-	-	-	-	-
Trichloroethene	µg/l	**5**	-	-	-	-	-	-	-
Tetrachloroethene	µg/l	**5**	-	-	-	-	-	-	-
1,1,1 - Trichloroethane	µg/l	200	-	-	-	-	-	-	-
Vinyl Chloride	µg/l	**2**	-	-	-	-	-	-	-
SVOCs									
Bis(2-chloroethyl) ether	µg/l	**0.0092**	-	-	-	-	-	-	-
Bis(2-ethylhexyl)phthalate	µg/l	**6**	-	-	-	-	-	-	-
2 - Chlorophenol	µg/l	40	-	-	-	-	-	-	-
Total Inorganics									
Arsenic - Total	µg/l	**50**	6.5	-	-	-	-	7.9	-
Barium - Total	µg/l	**2000**	2000	700	270	800	790	2900	99
Cyanide	µg/l	NNS	-	-	-	-		-	-
Lead - Total	µg/l	**5**	0.53	0.19	0.99	-	0.13	1.3	-
Manganese - Total	µg/l	**50***	7900	2100	320	1000	1100	5900	-
Thallium - Total	µg/l	**5***	0.11	0.097	-	0.16	0.21	-	-

Notes:

1) A "-" indicates a non-detect.
2) ROD Groundwater Cleanup Levels of the Ground Water Quality Criteria (GWQC) are shown in bold and underlined. All other GWQC values are from 25 PA Code Chapter 250.
3) Detects that are shaded indicate levels that are higher than the GWQC.
4) "NNS" indicates no numeric standard.
5) * Indicates that ROD Cleanup Level is the value listed or the background concentration whichever is greater.
6) µg/l = micrograms per liter
7) VOC-Volatile Organic Compound
8) SVOC- Semi-Volatile Organic Compound

Laboratory Analytical Data for Groundwater Samples - Sentinel and Potable Supply Wells
June 2014 Interim Long-Term Monitoring Event (Expanded)
Elizabethtown Landfill Interim Long-Term Monitoring Program
West Donegal Township, Pennsylvania

Parameter	Units	GWQC	Sample Location			
			EM500	EM600	EM700	ED12ER
VOCs						
Acetone	µg/l	3700	-	-	NS	-
Chlorobenzene	µg/l	**100**	-	-	NS	15
Chloroethane	µg/l	230	-	-	NS	11
1,1 - Dichloroethane	µg/l	27	-	-	NS	-
1,2-Dichloroethene, Total	µg/l	70	-	-	NS	2.7
Methylene Chloride	µg/l	**5**	-	-	NS	-
Methyl Ethyl Ketone	µg/l	2800	-	-	NS	-
SVOCs						
Bis(2-chloroethyl)ether	µg/l	**0.0092**	-	-	NS	-
Bis(2-ethylhexyl)phthalate	µg/l	**6**	-	-	NS	-
2 - Chlorophenol	µg/l	40	-	-	NS	-
Total Inorganics						
Arsenic - Total	µg/l	**50**	-	-	NS	-
Barium - Total	µg/l	**2000**	210	200	NS	950
Cyanide	µg/l	NNS	-	-	NS	-
Lead - Total	µg/l	**15**	0.24	0.75	NS	-
Manganese - Total	µg/l	**50**	11	-	NS	1500
Thallium - Total	µg/l	**2***	-	-	NS	-

Notes:

1) A "-" indicates a non-detect.
2) ROD Groundwater Cleanup Levels of the Ground Water Quality Criteria (GWQC) are shown in bold and underlined. All other GWQC values are from 25 PA Code Chapter 250.
3) Detects that are shaded indicate levels that are higher than the GWQC.
4) "NNS" indicates no numeric standard.
5) * Indicates that ROD Cleanup Level is the value listed or the background concentration whichever is greater.
6) µg/l = micrograms per liter
7) VOC-Volatile Organic Compound
8) SVOC- Semi-Volatile Organic Compound

Table C-3: Groundwater Analytical Data – 2015

(Source: 2015 Interim LTM Report, prepared by Golder Associates, Inc.)

Laboratory Analytical Data for Groundwater Samples - Source Depletion Wells
June 2015 Interim Long-Term Monitoring Event
Elizabethtown Landfill Interim Long-Term Monitoring Program
West Donegal Township, Pennsylvania

Parameter	Units	GWQC	Sample Location						
			ED02R	ED05R	ED08R	ED09R	ED10IR	ED11IR	ED18
Zone			Shallow	Deep	Shallow	Deep	Deep	Shallow	Deep
VOCs									
Acetone	µg/l	3700	-	-	-	-	-	-	-
Benzene	µg/l	**5**	-	4.9	-	-	-	-	-
Chlorobenzene	µg/l	**100**	500	210	3	-	1600	-	8.3
Chloroethane	µg/l	230	-	-	-	-	-	-	-
Methylene Chloride	µg/l	**5**	-	-	-	-	-	-	-
1,1 - Dichloroethane	µg/l	27	-	6.3	-	2.4	-	4.7	6
1,2 - Dichloroethane	µg/l	5	-	-	-	-	-	-	-
1,2 - Dichloroethene (Total)	µg/l	70	-	-	-	-	-	-	3.1
Trichloroethene	µg/l	**5**	-	-	-	-	-	-	1.3
Vinyl Chloride	µg/l	**2**	-	-	-	-	-	-	-
SVOCs									
Bis(2-chloroethyl) ether	µg/l	**0.0092**	3.6	0.012	0.32	0.047	1.6	0.093	-
Bis(2-ethylhexyl)phthalate	µg/l	**6**	-	-	-	-	-	-	-
2 - Chlorophenol	µg/l	40	-	-	-	-	-	-	-
Total Inorganics									
Arsenic - Total	µg/l	**50**	-	24	-	-	22	-	-
Barium - Total	µg/l	**2000**	360	630	72	110	1300	340	260
Cyanide	µg/l	NNS	-	-	-	-	-	-	-
Lead - Total	µg/l	**5**	0.075	0.39	0.072	1.1	0.54	-	0.26
Manganese - Total	µg/l	**50***	8900	5100	3400	310	8700	1.2	3400
Thallium - Total	µg/l	**0.5***	-	-	-	0.1	-	-	-

Notes:

1) A "-" indicates a non-detect.
2) ROD Groundwater Cleanup Levels of the Ground Water Quality Criteria (GWQC) are shown in bold and underlined. All other GWQC values are from 25 PA Code Chapter 250.
3) Detects that are shaded indicate levels that are higher than the GWQC.
4) "NNS" indicates no numeric standard. "NS" indicates not sampled
5) * Indicates that ROD Cleanup Level is the value listed or the background concentration whichever is greater.
6) µg/l = micrograms per liter
7) VOC-Volatile Organic Compound
8) SVOC- Semi-Volatile Organic Compound

Laboratory Analytical Data for Groundwater Samples - Plume Stablity Wells
June 2015 Interim Long-Term Monitoring Event
Elizabethtown Landfill Interim Long-Term Monitoring Program
West Donegal Township, Pennsylvania

Parameter	Units	GWQC	Sample Locations						
			ED12DR	ED12IR	ED20	ED23	ED23-FD	ED24	ED30
Zone			Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Deep
VOCs									
Acetone	µg/l	3700	-	-	-	-	-	-	-
Benzene	µg/l	**5**	-	-	-	-	-	-	-
Chlorobenzene	µg/l	**100**	450	230	35	49	51	340	130
Methyl Ethyl Ketone	µg/l	2800	-	-	-	-	-	-	-
Chloroethane	µg/l	230	11 J	24 J	-	1	1.2	9.3	-
1,1 - Dichloroethane	µg/l	27	-	-	-	3.5	3.7	-	3.2
1,2 - Dichloroethane	µg/l	5	-	-	-	-	-	-	-
1,1 - Dichloroethene	µg/l	**7**	-	-	-	-	-	-	-
1,2 - Dichloroethene (Total)	µg/l	70	-	-	-	-	-	-	-
Trichloroethene	µg/l	**5**	-	-	-	-	-	-	-
Tetrachloroethene	µg/l	**5**	-	-	-	-	-	-	-
1,1,1 - Trichloroethane	µg/l	200	-	-	-	-	-	-	-
Vinyl Chloride	µg/l	**2**	-	-	-	-	-	-	-
SVOCs									
Bis(2-chloroethyl) ether	µg/l	**0.0092**	11	7	0.63	0.92	0.94	6.6	1.3
Bis(2-ethylhexyl)phthalate	µg/l	**6**	-	-	-	-	-	-	-
2 - Chlorophenol	µg/l	40	-	-	-	-	-	-	-
Total Inorganics									
Arsenic - Total	µg/l	**50**	-	-	-	-	-	-	-
Barium - Total	µg/l	**2000**	1800	680	320	760	760	2700	98
Cyanide	µg/l	NNS	-	-	-	-	10	-	-
Lead - Total	µg/l	**5**	0.24	0.21	6.4	-	-	0.86	-
Manganese - Total	µg/l	**50***	8200	2100	1000	1100	1100	6200	-
Thallium - Total	µg/l	**5***	0.098	-	0.1	0.13	0.13	-	-

Notes:

1) A "-" indicates a non-detect.
2) ROD Groundwater Cleanup Levels of the Ground Water Quality Criteria (GWQC) are shown in bold and underlined. All other GWQC values are from 25 PA Code Chapter 250.
3) Detects that are shaded indicate levels that are higher than the GWQC.
4) "NNS" indicates no numeric standard.
5) * Indicates that ROD Cleanup Level is the value listed or the background concentration whichever is greater.
6) µg/l = micrograms per liter
7) VOC-Volatile Organic Compound
8) SVOC- Semi-Volatile Organic Compound

Laboratory Analytical Data for Groundwater Samples - Sentinel and Potable Supply Wells
June 2015 Interim Long-Term Monitoring Event
Elizabethtown Landfill Interim Long-Term Monitoring Program
West Donegal Township, Pennsylvania

Parameter	Units	GWQC	Sample Location			
			EM500	EM600	EM700	ED12ER
Zone			Deep	Deep	Deep	Deep
VOCs						
Acetone	µg/l	3700	-	-	-	-
Chlorobenzene	µg/l	**100**	-	-	-	14
Chloroethane	µg/l	230	-	-	-	11 J
1,1 - Dichloroethane	µg/l	27	-	-	-	-
1,2-Dichloroethene, Total	µg/l	70	-	-	-	2.8
Methylene Chloride	µg/l	**5**	-	-	-	-
Methyl Ethyl Ketone	µg/l	2800	-	-	-	-
SVOCs						
Bis(2-chloroethyl)ether	µg/l	**0.0092**	-	-	-	0.21
Bis(2-ethylhexyl)phthalate	µg/l	**6**	-	-	-	-
2 - Chlorophenol	µg/l	40	-	-	-	-
Total Inorganics						
Arsenic - Total	µg/l	**50**	-	-	-	-
Barium - Total	µg/l	**2000**	210	200	150	920
Cyanide	µg/l	NNS	-	-	-	-
Lead - Total	µg/l	**15**	0.11	0.17	0.9	0.21
Manganese - Total	µg/l	**50**	12	1.2	3.5	1600
Thallium - Total	µg/l	**2***	-	-	-	-

Notes:

1) A "-" indicates a non-detect.
2) ROD Groundwater Cleanup Levels of the Ground Water Quality Criteria (GWQC) are shown in bold and underlined. All other GWQC values are from 25 PA Code Chapter 250.
3) Detects that are shaded indicate levels that are higher than the GWQC.
4) "NNS" indicates no numeric standard.
5) * Indicates that ROD Cleanup Level is the value listed or the background concentration whichever is greater.
6) µg/l = micrograms per liter
7) VOC-Volatile Organic Compound
8) SVOC- Semi-Volatile Organic Compound

Table C-4: Groundwater Analytical Data – 2016

(Source: 2016 Interim LTM Report, prepared by Golder Associates, Inc.)

Laboratory Analytical Data for Groundwater Samples - Source Depletion Wells
June 2016 Interim Long-Term Monitoring Event
Elizabethtown Landfill Interim Long-Term Monitoring Program
West Donegal Township, Pennsylvania

Parameter	Units	GWQC	Sample Location							
			ED02R	ED05R	ED05R-FD	ED08R	ED09R	ED10IR	ED11IR	ED18
Zone			Shallow	Deep	Deep	Shallow	Deep	Deep	Shallow	Deep
VOCs										
Benzene	µg/l	5	7.8	2.6	2.5	-	-	15	-	-
Chlorobenzene	µg/l	100	520	150	140	5.4	-	1500	-	12
Chloroethane	µg/l	230	-	-	1.2	-	-	-	-	-
1,1 - Dichloroethane	µg/l	27	-	4.1	3.9	-	3.5	-	3.5	5.2
1,2 - Dichloroethane	µg/l	5	-	-	0.3	-	0.55	-	0.27	-
1,2 - Dichloroethene (Total)	µg/l	70	-	3.5	3	-	1.1	-	1.1	2.8
Tetrachloroethene	µg/l	5	-	-	-	-	0.8	-	-	0.58
Trichloroethene	µg/l	5	-	-	0.61	-	0.66	-	-	0.84
SVOCs										
Bis(2-chloroethyl) ether	µg/l	0.0092	5.3	-	-	0.36	-	1.5	0.13	-
Bis(2-ethylhexyl)phthalate	µg/l	6	-	-	-	-	49	-	-	-
2 - Chlorophenol	µg/l	40	-	-	0.89	-	-	2.7	-	-
Total Inorganics										
Arsenic - Total	µg/l	10	-	49	49	-	-	16	-	-
Barium - Total	µg/l	2000	390	620	600	70	100	1200	350	240
Cyanide	µg/l	NNS	-	-	17	-	-	-	-	-
Lead - Total	µg/l	5	-	0.42	0.49	-	0.53	1.7	-	0.3
Manganese - Total	µg/l	50*	8900	4000	3900	4400	160	8100	1.9	3500
Thallium - Total	µg/l	2*	-	-	-	0.025	0.12	0.021	-	-

Notes:

1) A "-" indicates a non-detect.
2) ROD Groundwater Cleanup Levels of the Ground Water Quality Criteria (GWQC) are shown in bold and underlined. All other GWQC values are from 25 PA Code Chapter 250.
3) Detects that are shaded indicate levels that are higher than the GWQC.
4) "NNS" indicates no numeric standard. "NS" indicates not sampled
5) * Indicates that ROD Cleanup Level is the value listed or the background concentration whichever is greater.
6) µg/l = micrograms per liter
7) VOC-Volatile Organic Compound
8) SVOC- Semi-Volatile Organic Compound

Laboratory Analytical Data for Groundwater Samples - Plume Stablity Wells
June 2016 Interim Long-Term Monitoring Event
Elizabethtown Landfill Interim Long-Term Monitoring Program
West Donegal Township, Pennsylvania

Parameter	Units	GWQC	Sample Locations					
			ED12DR	ED12IR	ED20	ED23	ED24	ED30
Zone			Shallow	Shallow	Shallow	Shallow	Shallow	Deep
VOCs								
Benzene	µg/l	5	2.5	-	0.52	-	-	1
Chlorobenzene	µg/l	100	430	210	32	38	330	150
Chloroethane	µg/l	230	11	21	-	1.1	6.5	-
1,1 - Dichloroethane	µg/l	27	-	-	-	3.2	-	2.5
1,2 - Dichloroethane	µg/l	5	-	-	-	0.39	-	-
1,1 - Dichloroethene	µg/l	7	-	-	-	0.67	-	-
1,2 - Dichloroethene (Total)	µg/l	70	-	-	-	1.6	-	-
Trichloroethene	µg/l	5	-	-	-	0.58	-	-
Tetrachloroethene	µg/l	5	-	-	-	0.54	-	-
SVOCs								
Bis(2-chloroethyl) ether	µg/l	0.0092	9.9	4.8	0.99	1.3	6.9	2.6
2 - Chlorophenol	µg/l	40	-	-	-	-	1	-
Total Inorganics								
Arsenic - Total	µg/l	10	-	-	-	-	12	-
Barium - Total	µg/l	2000	1700	640	260	660	2800	130
Lead - Total	µg/l	5	0.32	0.31	2.1	-	14	-
Manganese - Total	µg/l	50*	8200	2000	570	760	5900	7.1
Thallium - Total	µg/l	2*	0.13	0.18	0.068	0.1	0.11	0.09

Notes:

1) A "-" indicates a non-detect.
2) ROD Groundwater Cleanup Levels of the Ground Water Quality Criteria (GWQC) are shown in bold and underlined. All other GWQC values are from 25 PA Code Chapter 250.
3) Detects that are shaded indicate levels that are higher than the GWQC.
4) "NNS" indicates no numeric standard.
5) * Indicates that ROD Cleanup Level is the value listed or the background concentration whichever is greater.
6) µg/l = micrograms per liter
7) VOC-Volatile Organic Compound
8) SVOC- Semi-Volatile Organic Compound

Laboratory Analytical Data for Groundwater Samples - Sentinel and Potable Supply Wells
June 2016 Interim Long-Term Monitoring Event
Elizabethtown Landfill Interim Long-Term Monitoring Program
West Donegal Township, Pennsylvania

Parameter	Units	GWQC	Sample Location			
			EM500	EM600	EM700	ED12ER
Zone			Deep	Deep	Deep	Deep
VOCs						
Chlorobenzene	µg/l	100	-	-	-	13
Chloroethane	µg/l	230	-	-	-	13
1,1 - Dichloroethene	µg/l	7	-	-	-	0.53
1,2-Dichloroethene, Total	µg/l	70	-	-	-	3
SVOCs						
Bis(2-chloroethyl)ether	µg/l	0.0092	-	-	-	0.33
Total Inorganics						
Barium - Total	µg/l	2000	180	200	210	910
Cyanide	µg/l	NNS	-	-	8.2	-
Lead - Total	µg/l	15	16	0.37	0.4	0.18
Manganese - Total	µg/l	50*	6.4	0.84	1	1800

Notes:

1) A "-" indicates a non-detect.
2) ROD Groundwater Cleanup Levels of the Ground Water Quality Criteria (GWQC) are shown in bold and underlined. All other GWQC values are from 25 PA Code Chapter 250.
3) Detects that are shaded indicate levels that are higher than the GWQC.
4) "NNS" indicates no numeric standard.
5) * Indicates that ROD Cleanup Level is the value listed or the background concentration whichever is greater.
6) µg/l = micrograms per liter
7) VOC-Volatile Organic Compound
8) SVOC- Semi-Volatile Organic Compound

Figure C-1: 2016 Chlorobenzene Isoconcentration Contours – Shallow Zone

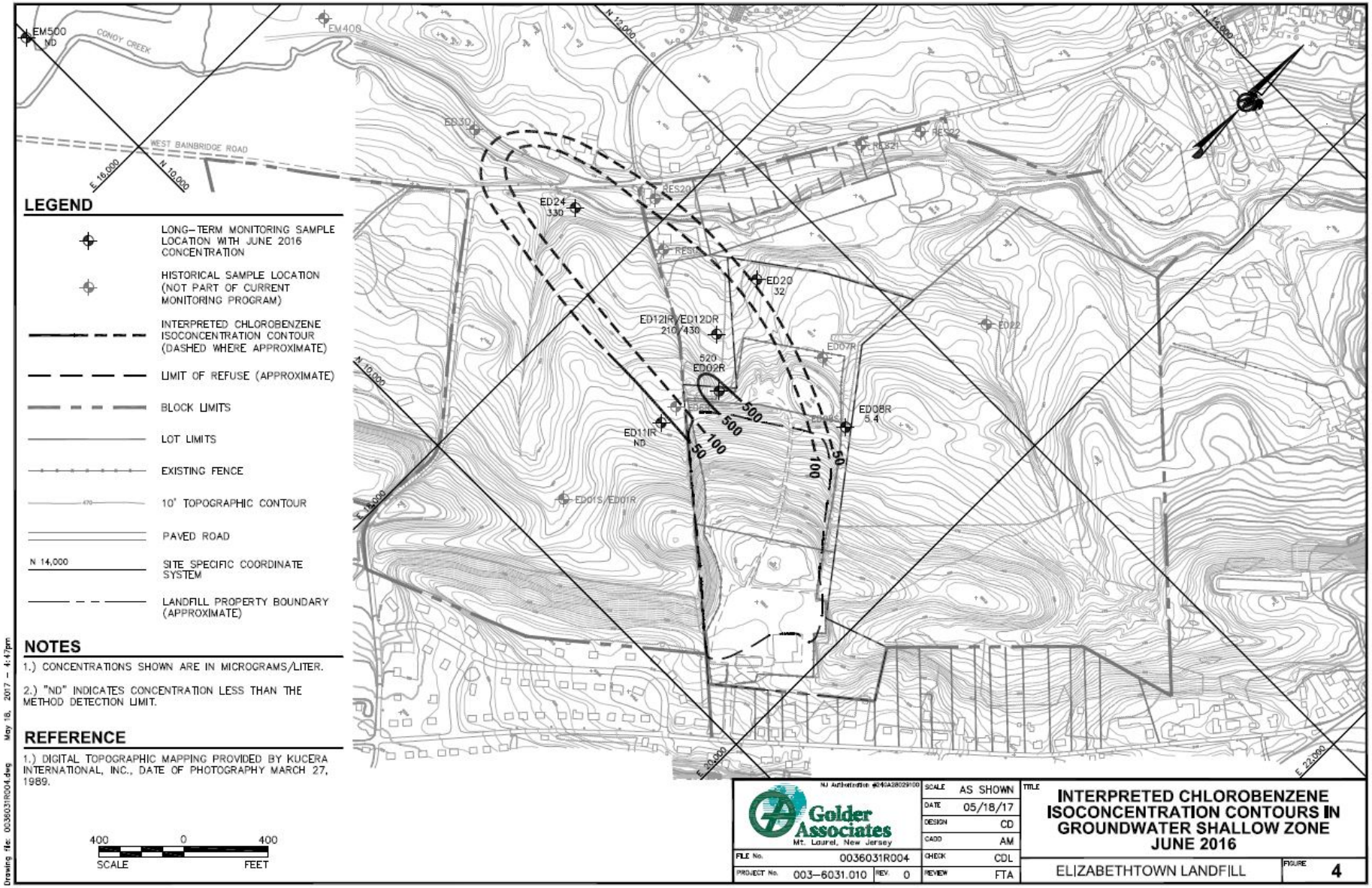


Figure C-2: 2016 Manganese Isoconcentration Contours – Shallow Zone

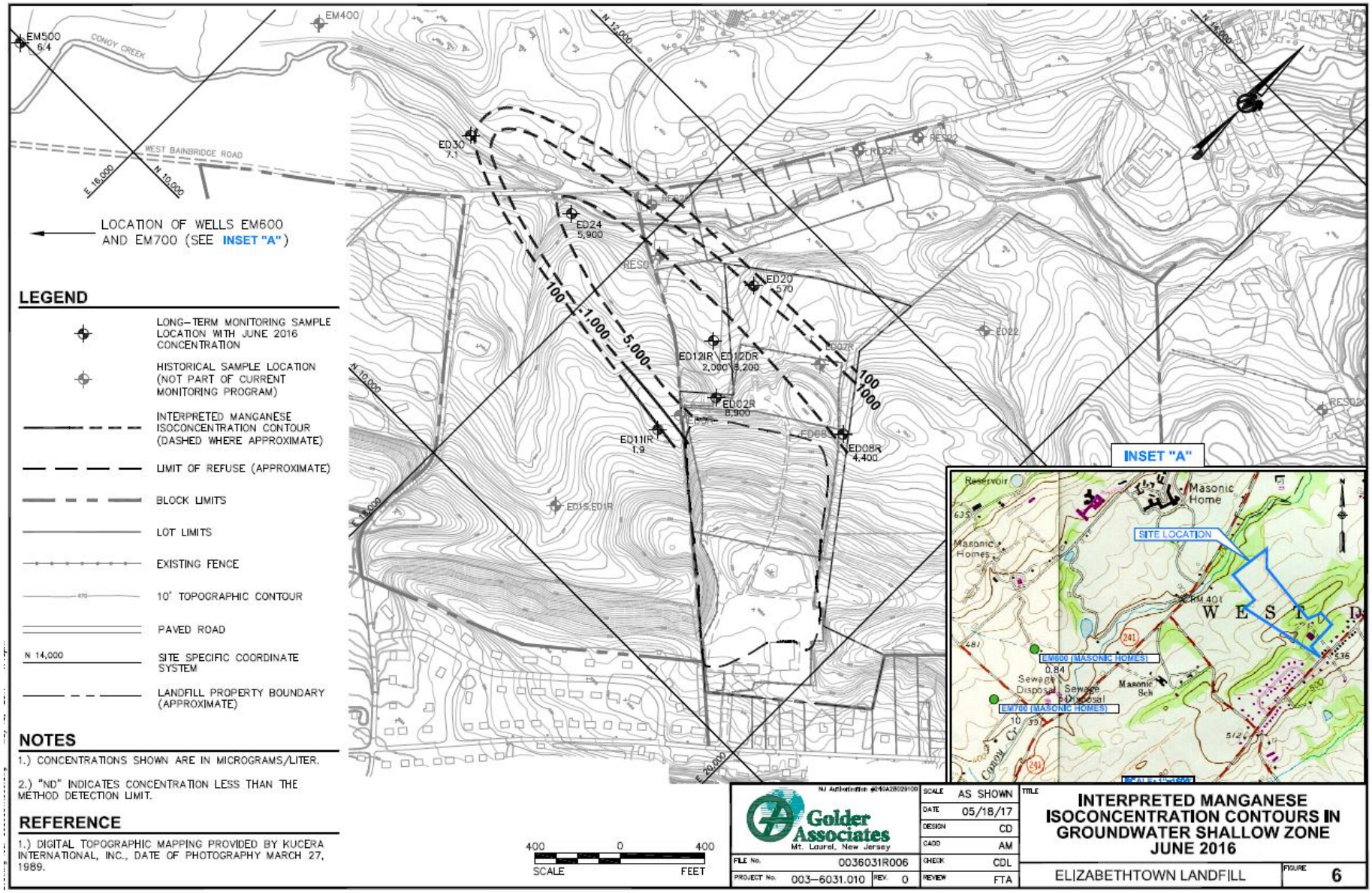


Figure C-3: 2016 Chlorobenzene Isoconcentration Contours – Deep Zone

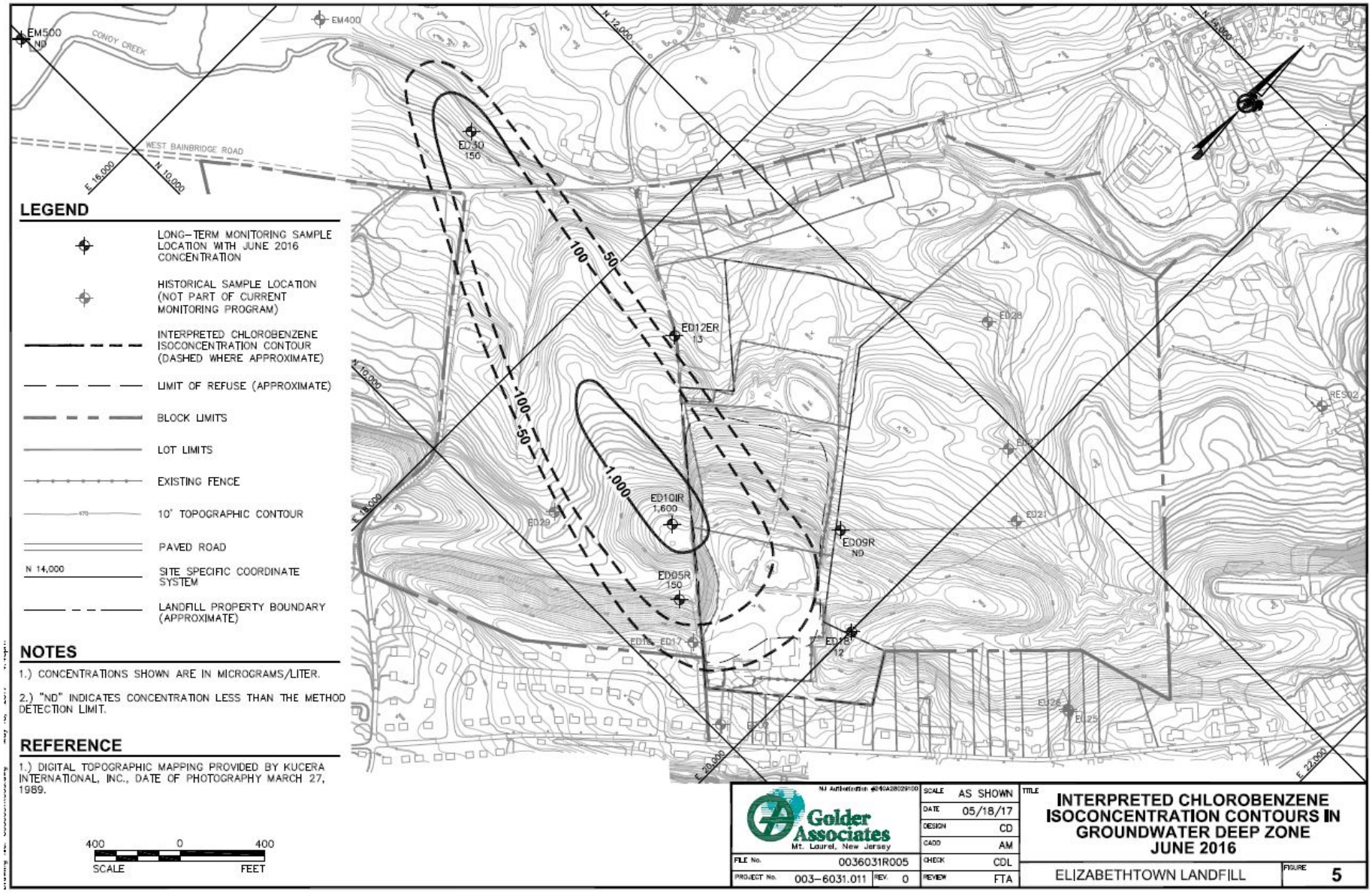


Figure C-4: 2016 Manganese Isoconcentration Contours – Deep Zone

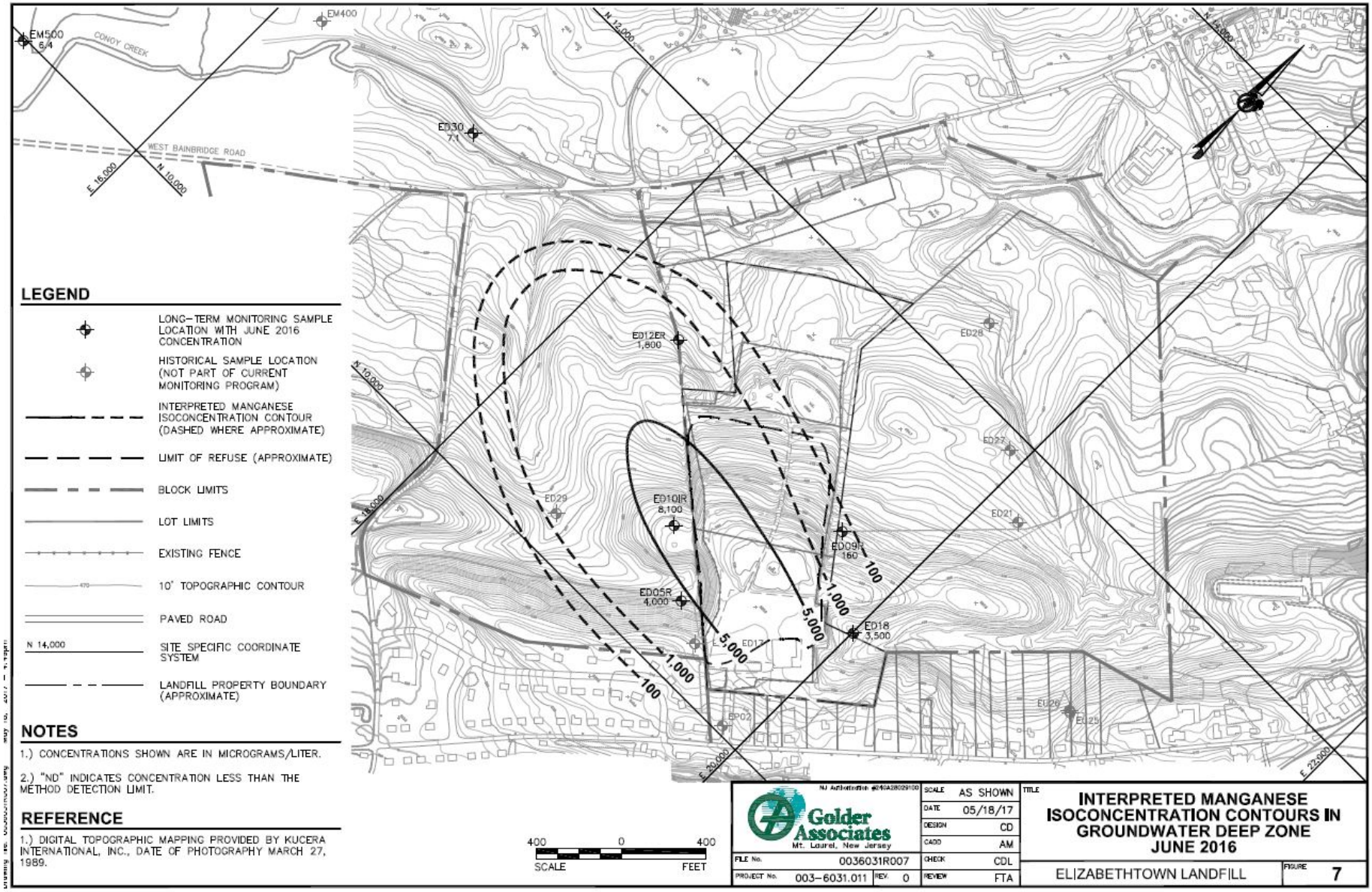


Figure C-5: Concentration of Chlorobenzene Versus Time, Shallow Zone – Source Depletion Wells

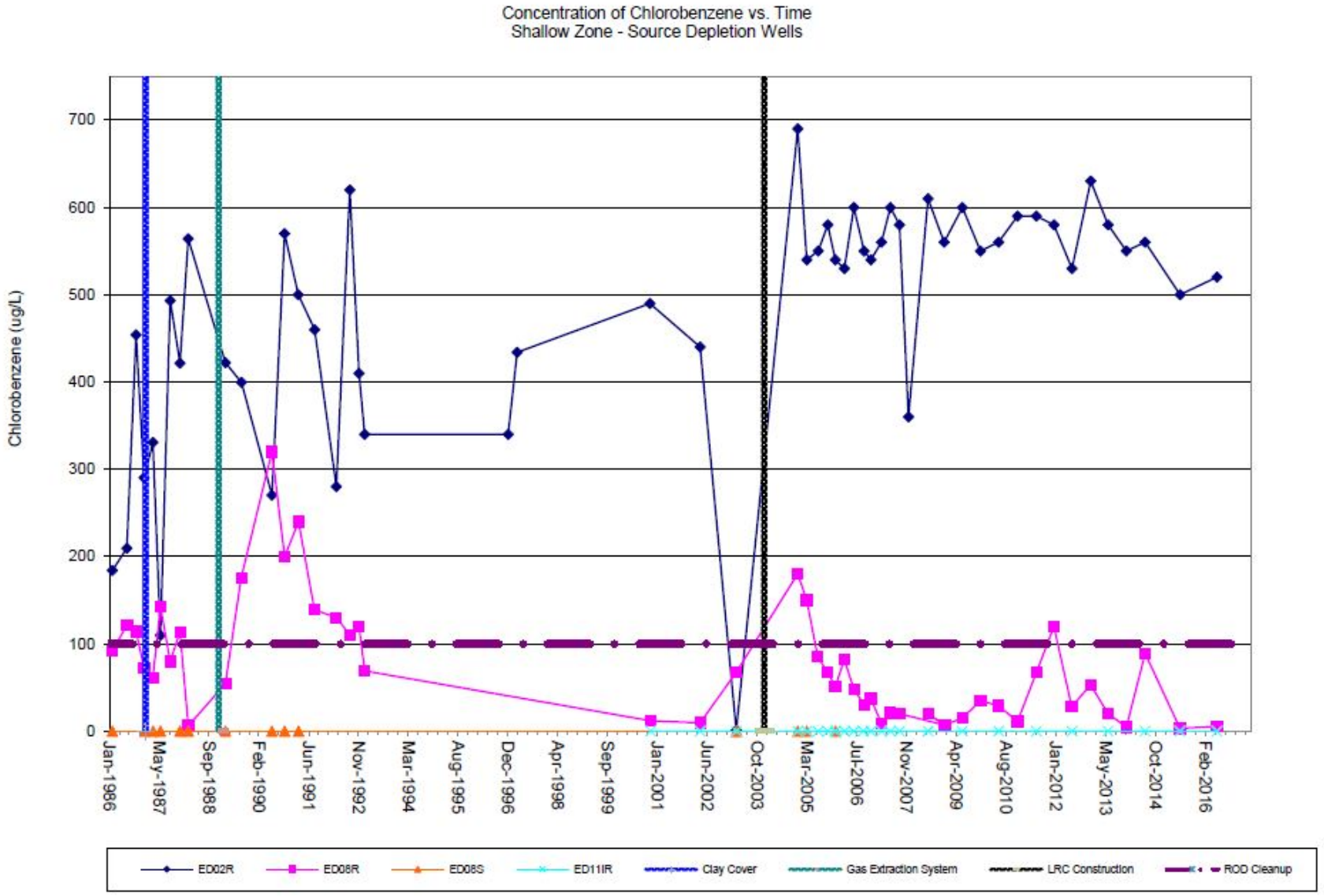


Figure C-6: Concentration of Chlorobenzene Versus Time, Deep Zone – Source Depletion Wells

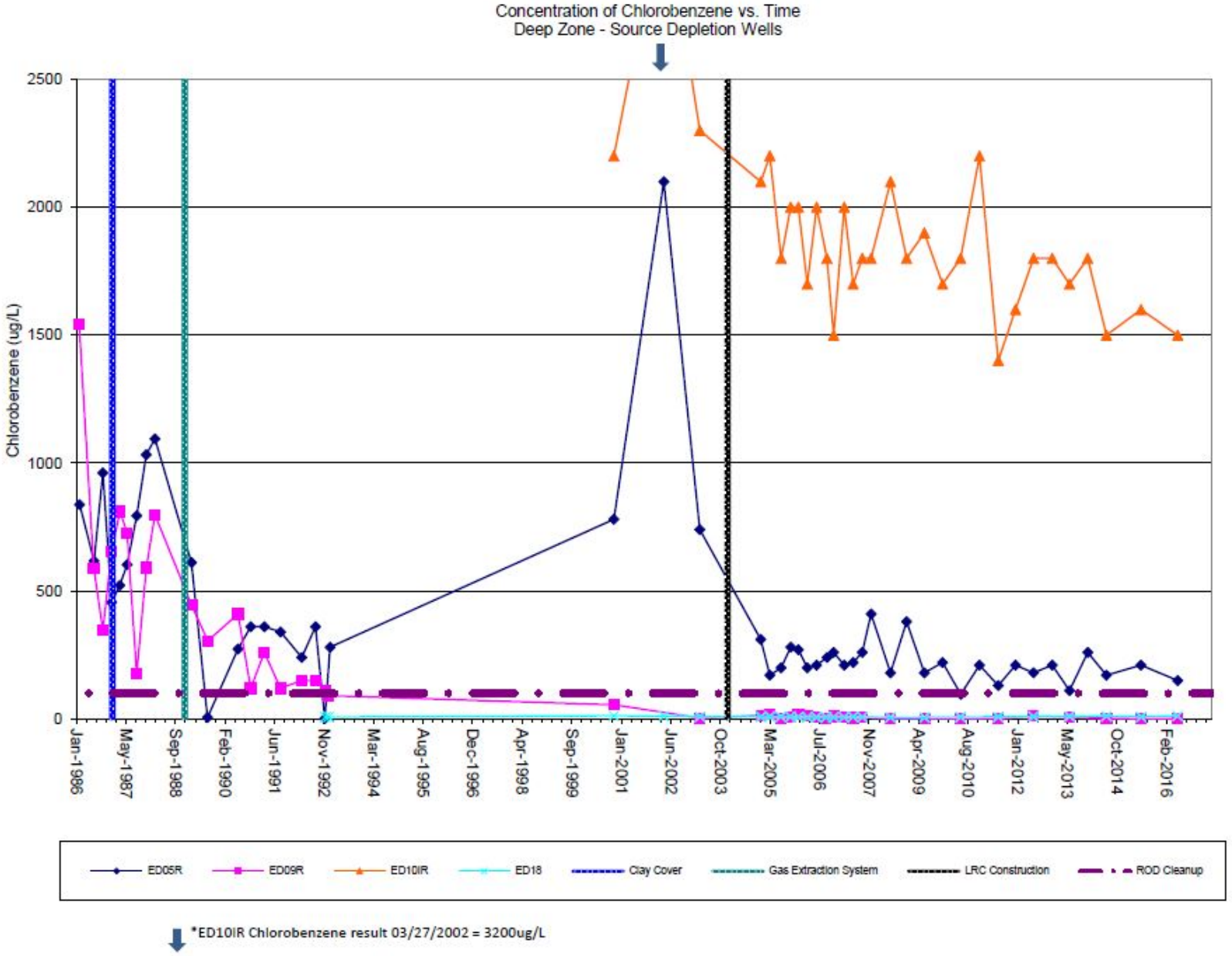


Figure C-7: Concentration of Chlorobenzene Versus Time, Plume Stability Wells

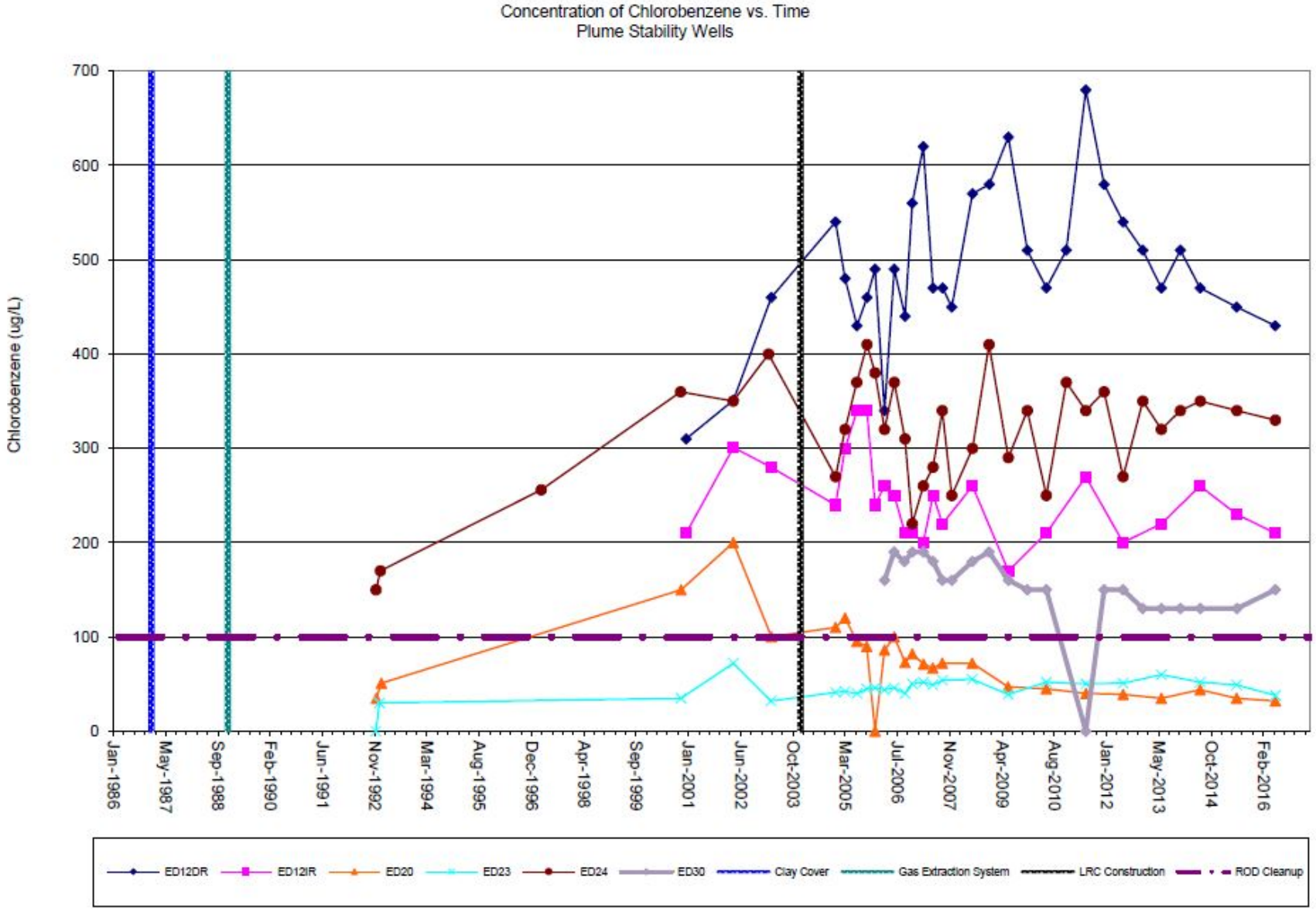


Figure C-8: Concentration of Chlorobenzene Versus Time, Sentinel and Water Supply Wells

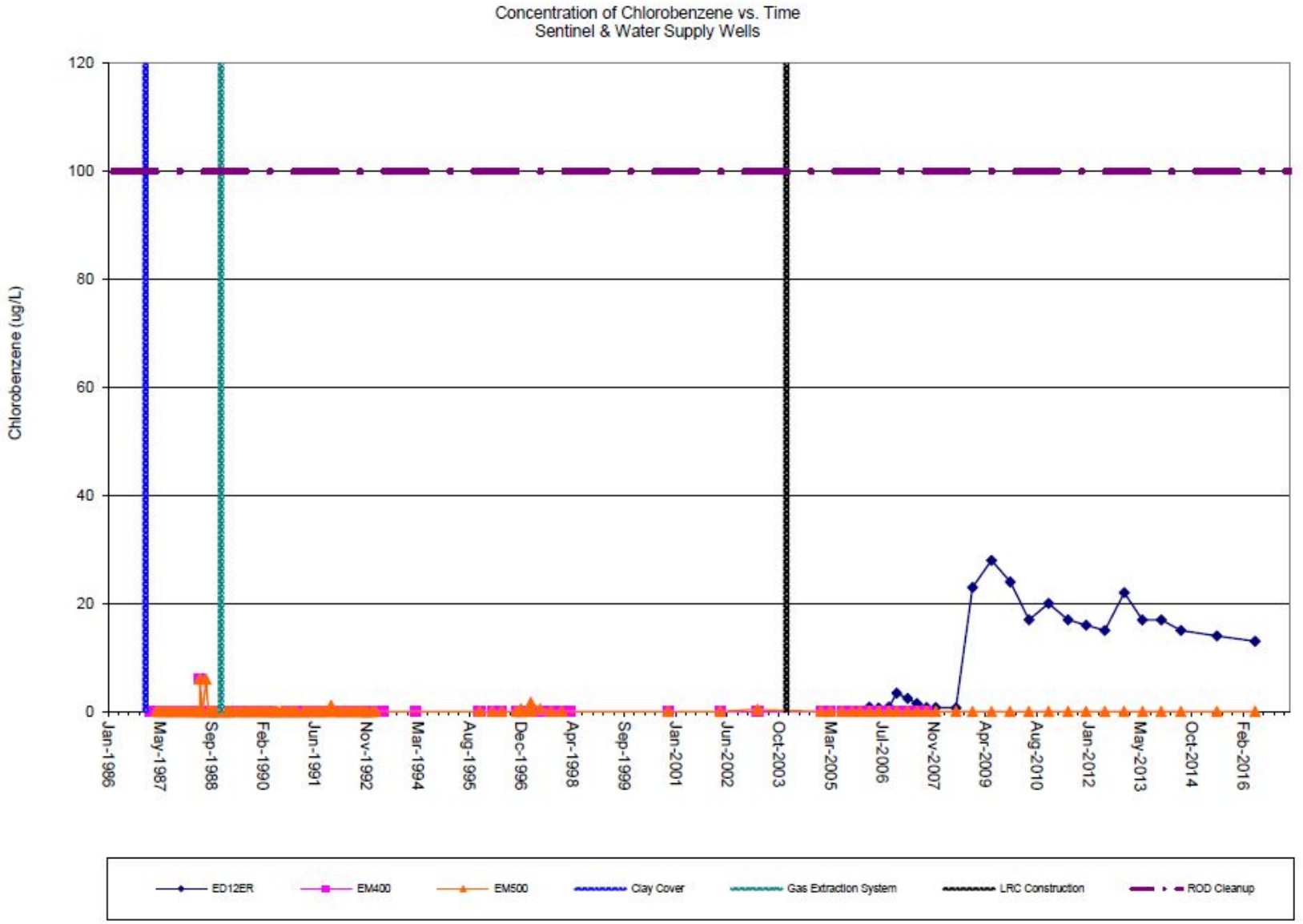


Figure C-9: Concentration of Manganese Versus Time, Shallow Zone – Source Depletion Wells

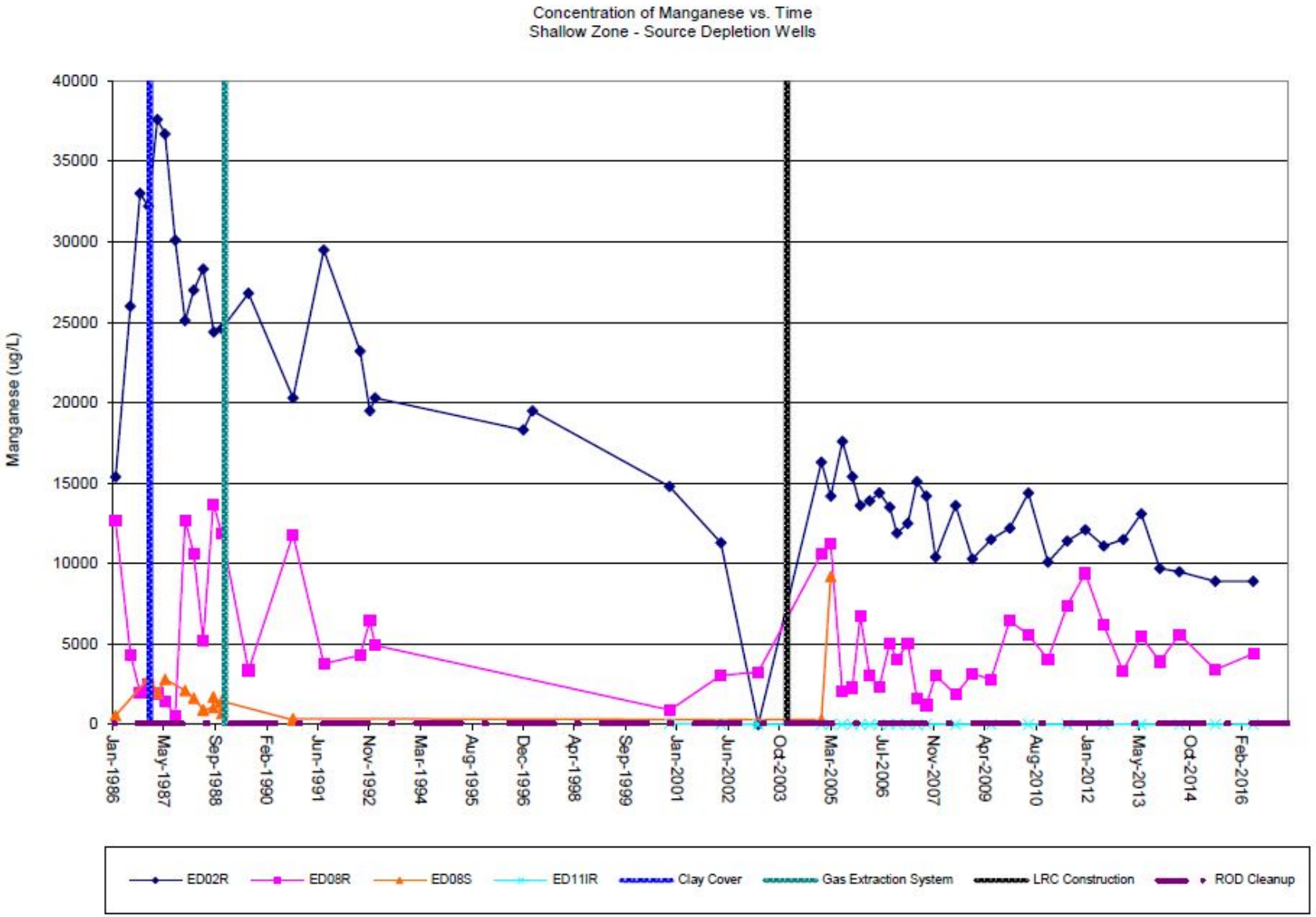


Figure C-10: Concentration of Manganese Versus Time, Deep Zone – Source Depletion Wells

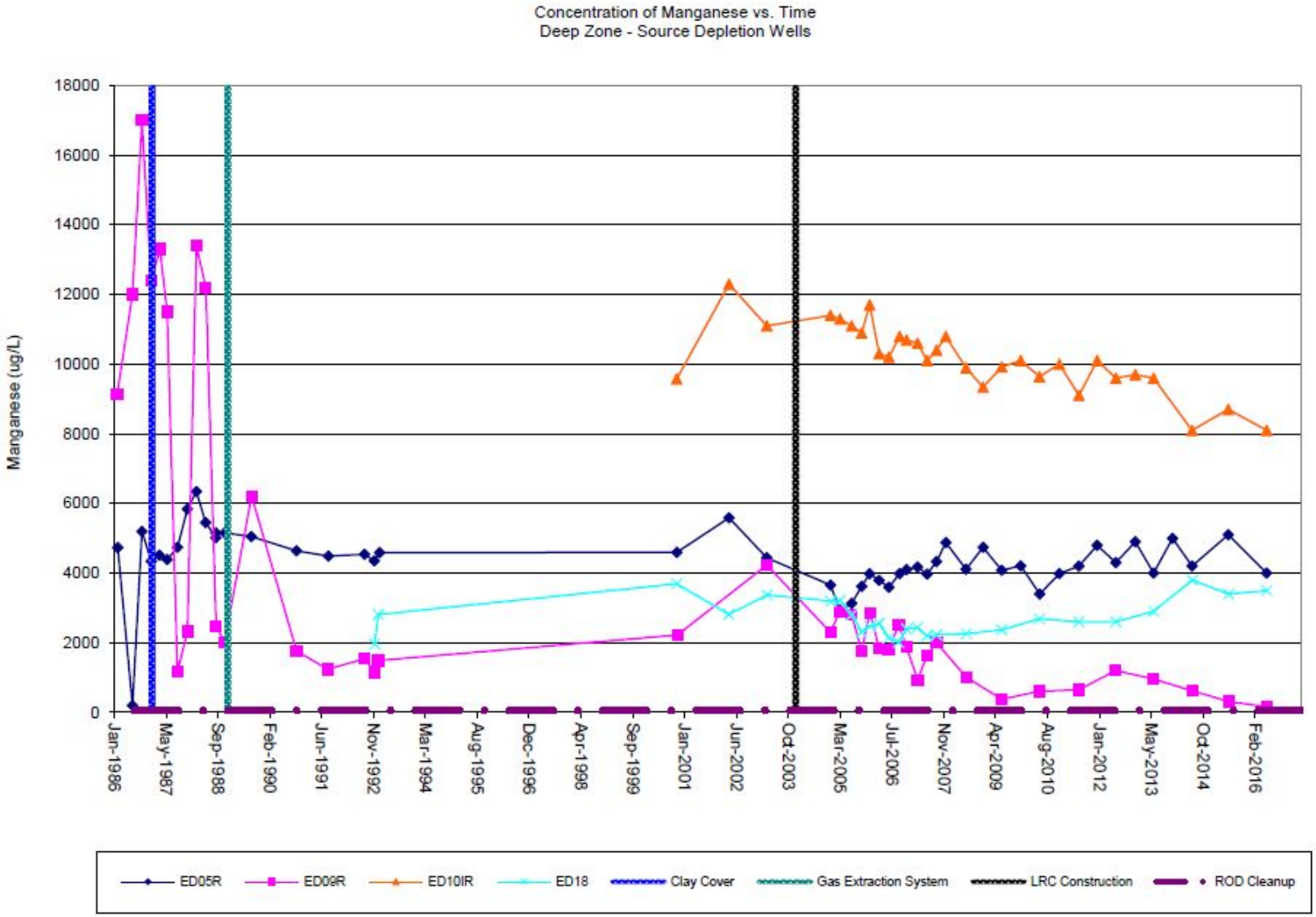


Figure C-11: Concentration of Manganese Versus Time, Plume Stability Wells

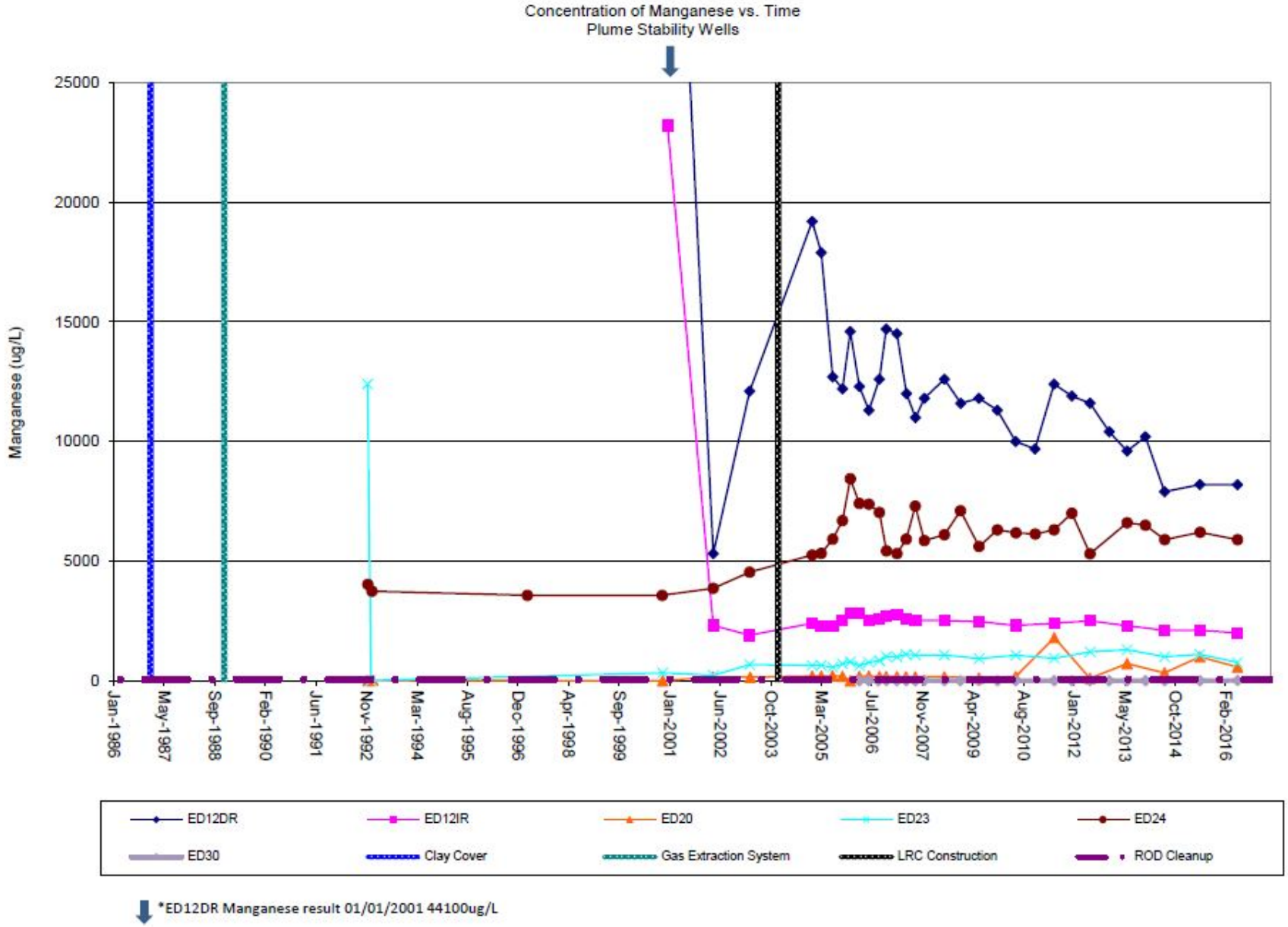


Figure C-12: Concentration of Manganese Versus Time, Sentinel and Water Supply Wells

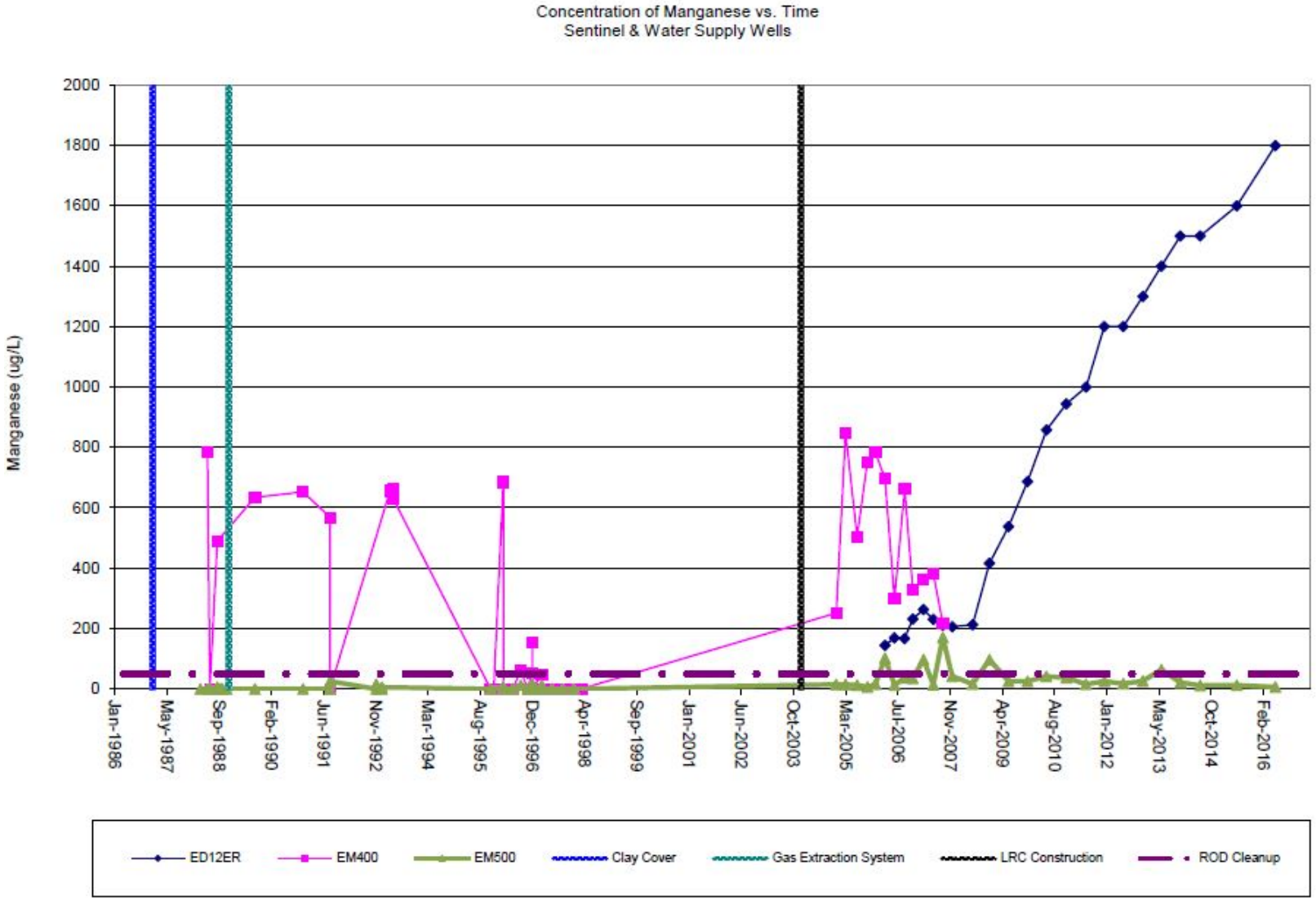


Figure C-13: 2015 BCEE Isoconcentration Contours – Shallow Zone

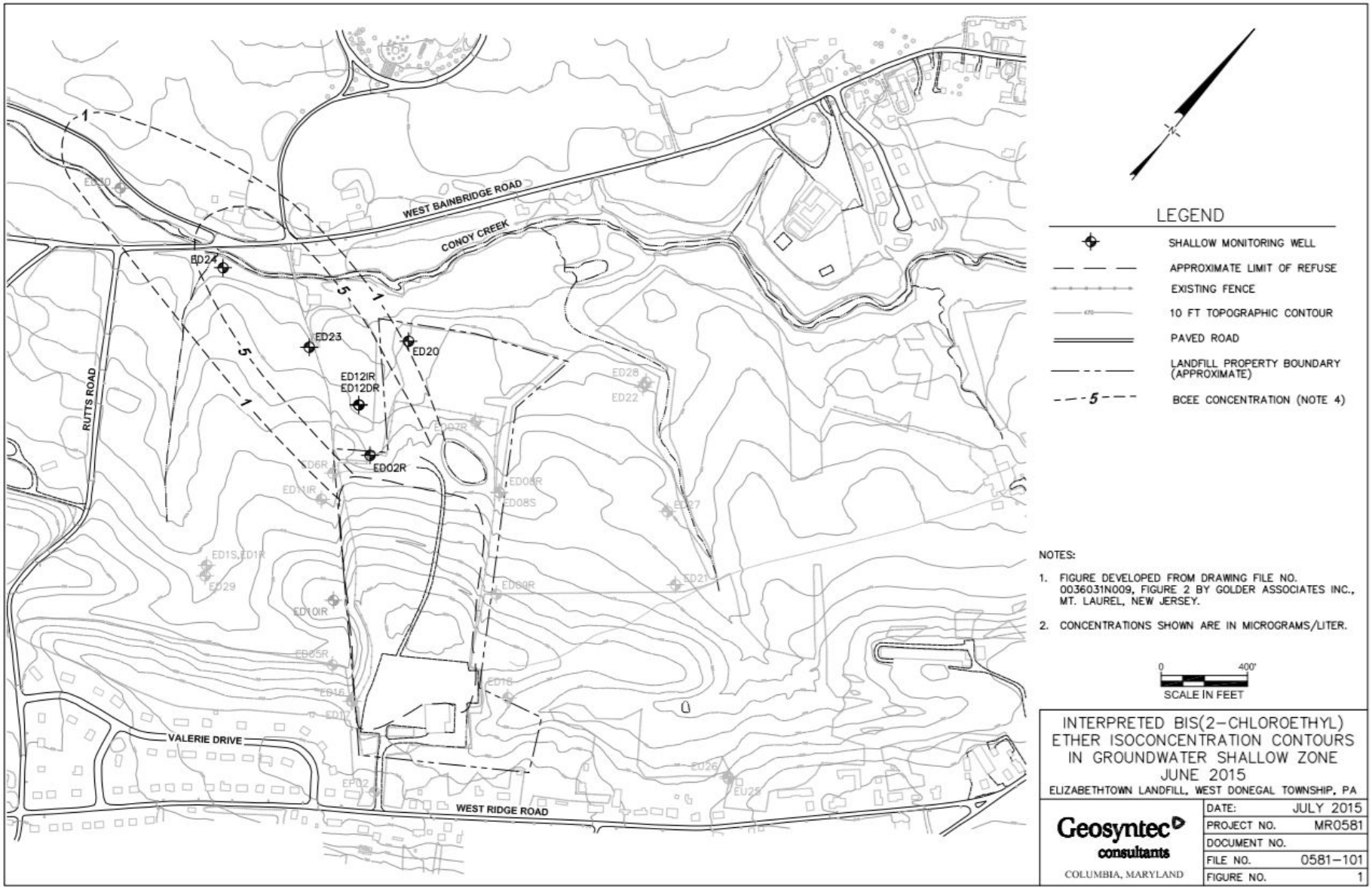


Figure C-14: 2015 BCEE Isoconcentration Contours – Deep Zone

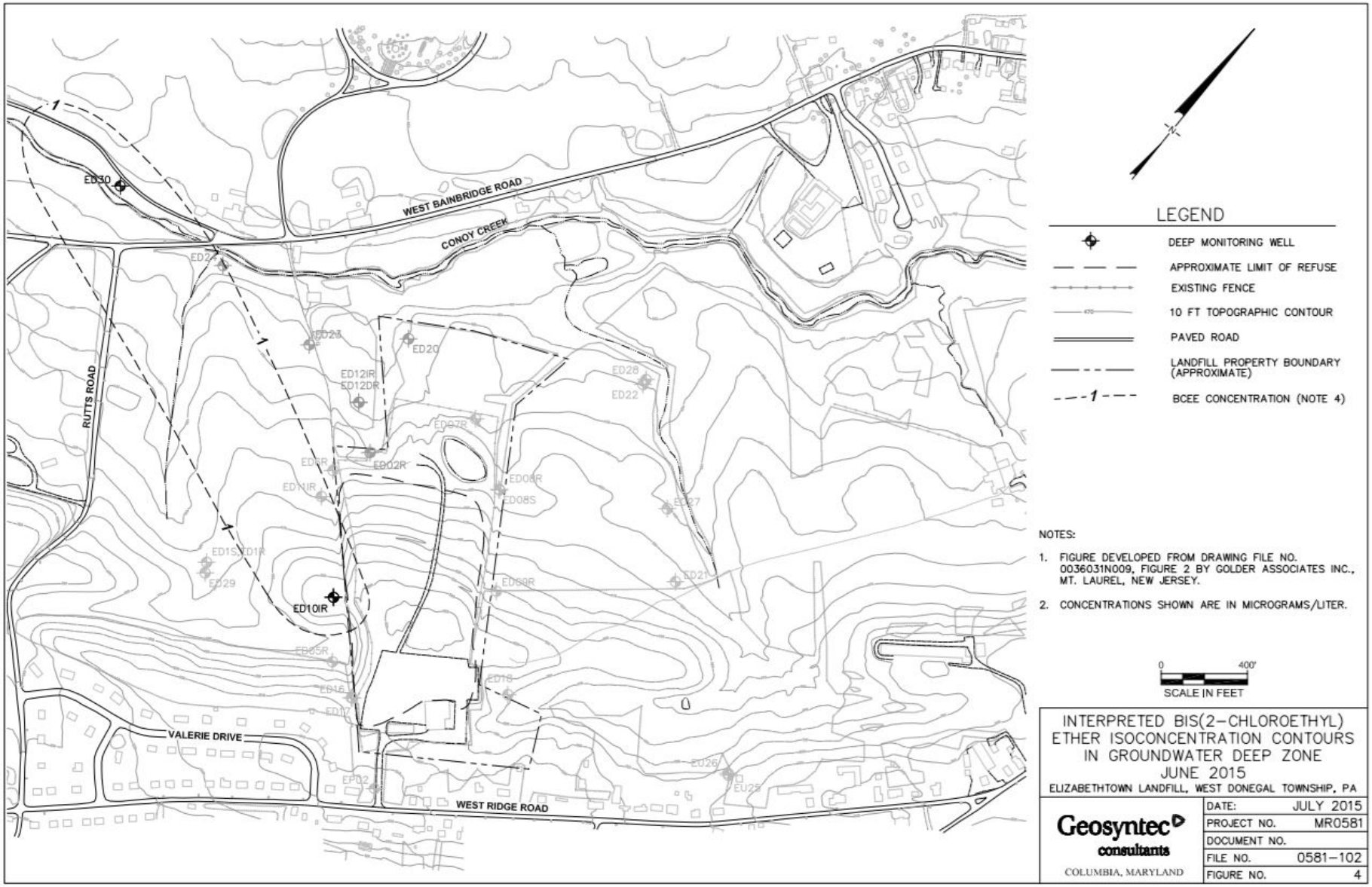


Figure C-15: 2018 Existing and Newly Installed Wells

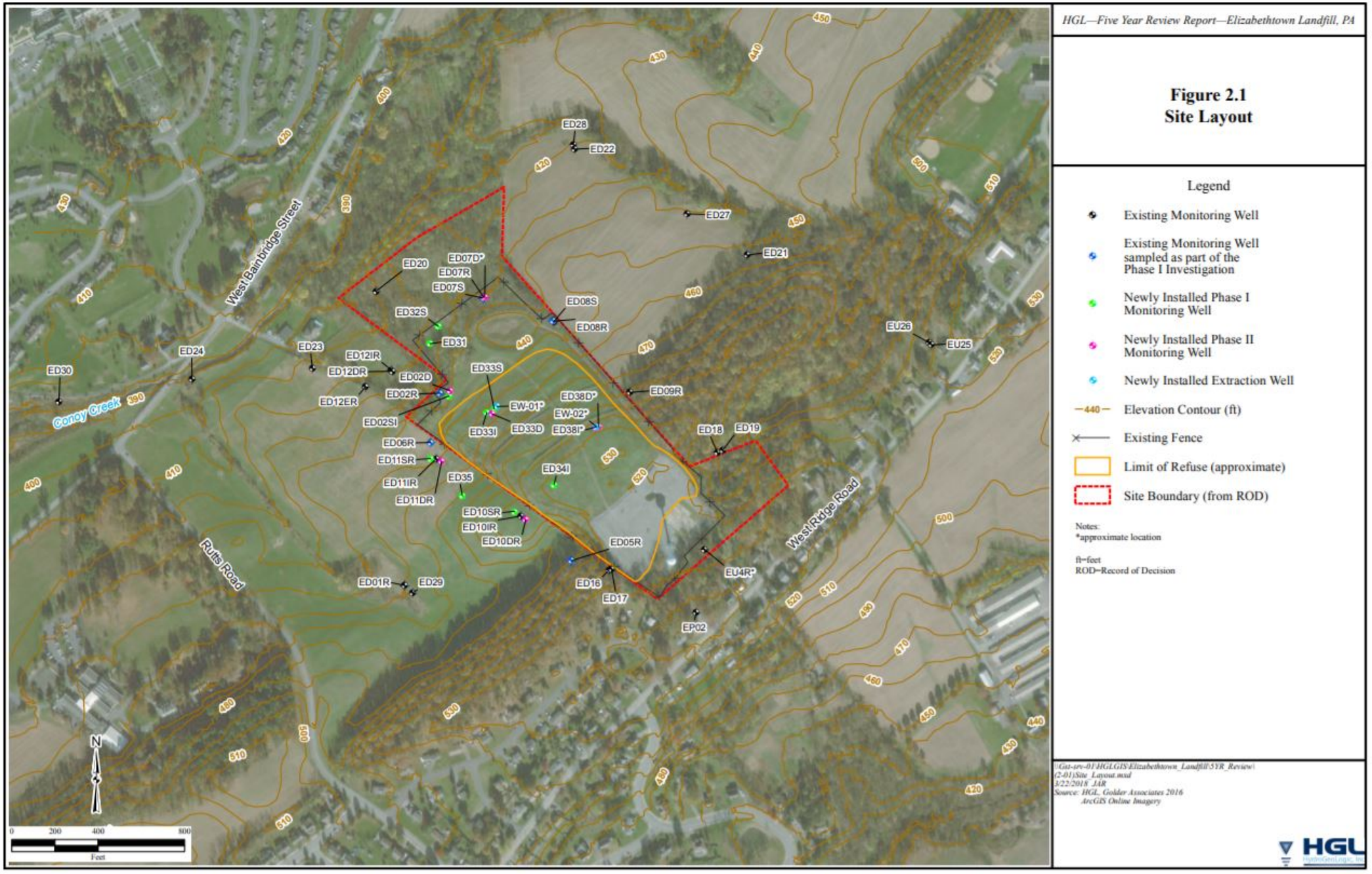


Figure 2.1
Site Layout

Legend

- Existing Monitoring Well
- Existing Monitoring Well sampled as part of the Phase I Investigation
- Newly Installed Phase I Monitoring Well
- Newly Installed Phase II Monitoring Well
- Newly Installed Extraction Well
- 440 Elevation Contour (ft)
- Existing Fence
- Limit of Refuse (approximate)
- Site Boundary (from ROD)

Notes:
*approximate location

ft=feet
ROD=Record of Decision

\\Gis-srv-01\HGLGIS\Elizabethtown_Landfill\5YR_Review\
(2-01)Site_Layout.mxd
3/22/2018 JAR
Source: HGL, Golder Associates 2016
ArcGIS Online Imagery

HGL HydroGeoLogic, Inc.

APPENDIX D – SITE INSPECTION PHOTOS

Asphalt cap and water tower on site property. Gas flare is at right.

Cracks in previously repaired area of asphalt cap.

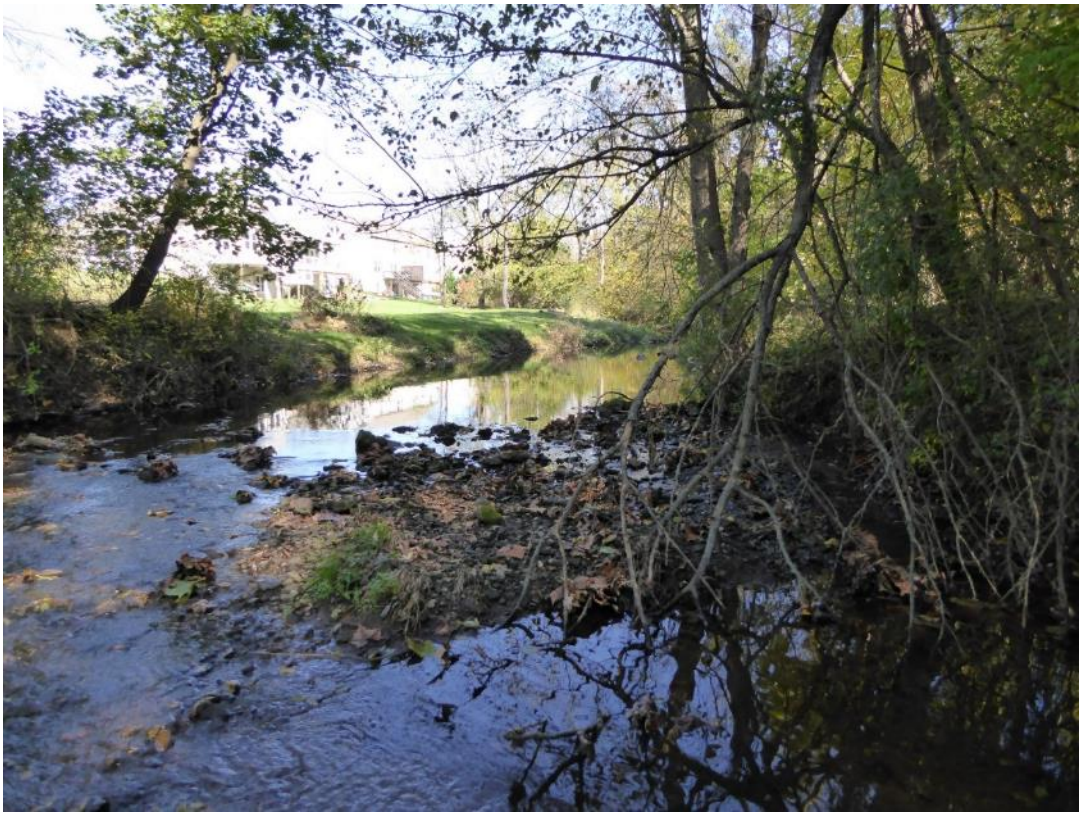
Ponded water on asphalt cap.

Surface water runoff collection ditch.

Surface water retention pond.

Landfill gas flare (in operation).

Landfill gas collection well.



Conoy Creek, adjacent to site.

Monitoring well EP02, near entrance to site property. Gate is not locked.

Monitoring well ED11IR in cow pasture. Gate is not locked.

Steer trapped in fence surrounding monitoring well ED23. Gate is not locked. Cap knocked off well.

One of several animal burrows in clay cap.

Down tree and vegetation on site fence near monitoring well ED08R.

Vegetation on site fence.

Monitoring well (missing cap).