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**FIFTH FIVE-YEAR REVIEW REPORT FOR
MILLCREEK DUMP SUPERFUND SITE
MILLCREEK TOWNSHIP, PENNSYLVANIA**

ORIGINAL



Prepared by

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Date

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LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
BTAG	Biological and Technical Assistance Group
COC	Contaminant of Concern
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
GMP	Gas Monitoring Point
GPRA	Government Performance and Results Act
ICs	Institutional Controls
LEL	Lower Explosive Limit
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
NPL	National Priorities List
OU	Operable Unit
O&M	Operation and Maintenance
PADEP	Pennsylvania Department of Environmental Protection
PRP	Potentially Responsible Party
RA	Remedial Action
RAO	Remedial Action Objectives
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SDWA	Safe Drinking Water Act
SWRAU	Site Wide Ready for Anticipated Use
TVOC	Total Volatile Organic Compounds
UU/UE	Unlimited Use and Unrestricted Exposure
VI	Vapor Intrusion
VOC	Volatile Organic Compound

I. INTRODUCTION

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review 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 five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fifth FYR for the Millcreek Dump Superfund Site. The triggering action for this policy review is the previous FYR dated September 21, 2011. The FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

The Site consists of two Operable Units (OUs), both of which will be addressed in this FYR. OU1 includes the extraction and treatment of the contaminated groundwater at the Site and OU2 includes the capping of the source material at the Site and the installation of a flood retention basin (FRB) for surface water management.

The Millcreek Dump Superfund Site Five-Year Review was conducted by an EPA team including James Feeney, Remedial Project Manager; Mindi Snoparsky, Hydrogeologist; Linda Watson, Toxicologist; Carrie Deitzel, Community Involvement Coordinator, and Ben Cohan, Attorney. Support from the Pennsylvania Department of Environmental Protection (PADEP) included John Morettini, Project Manager. The review began on August 12, 2015 with a conference call between EPA and PADEP project managers, and the review of relevant documents.

Site Background

The Millcreek Dump Site (the Site) is located in Millcreek Township, Erie County, Pennsylvania near the intersection of W. 17th Street and Harper Drive (Figure 1). The Site is bounded to the east by a stream, Marshalls Run, which discharges to Lake Erie 1.2 miles downstream from the Site. The Erie International Airport is located adjacent to and west of the Site. Industrial and residential properties surround the Site towards the east and north. An estimated 2,000 people work or live within 2,500 feet of the Site.

The Site includes a capped landfill, freshwater wetland and flood retention basin, and a groundwater treatment plant. The capped landfill was constructed to be part of a township-owned golf course, however, in 2001 a portion of the golf course was used by the Erie International Airport to support a runway expansion, forcing the golf course to close. The Township is hoping to reconfigure and reopen the golf course in 2017.

The Millcreek Dump Site was a former freshwater wetland that was used as a dump for foundry sands, solvents, waste oils, and other industrial and municipal wastes, resulting in the contamination of the soils, sediments and underlying groundwater.

GPRA MEASURE REVIEW

As part of this Five-year Review the GPRA Measures have also been reviewed. The GPRA Measures and their status are provided as follows:

Environmental Indicators

Human Health: HEUC - Human Exposure Under Control

Groundwater Migration: GMNC - Groundwater Migration is Not Under Control

Sitewide Ready for Anticipated Use (SWRAU): Planned 9/30/2017

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Millcreek Dump		
EPA ID: PAD980231690		
Region: 3	State: PA	City/County: Millcreek Township/ Erie County
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	Has the site achieved construction completion? Yes; September 26, 2001	
REVIEW STATUS		
Lead agency: United States Environmental Protection Agency		
Author name (Federal Remedial Project Manager): James Feeney		
Author affiliation: United States Environmental Protection Agency, Region 3		
Review period: August 2015 to September 2016		
Date of site inspection: June 8, 2016		
Type of review: Policy Review		
Review number: 5		
Triggering action date: September 21, 2011		
Due date: September 21, 2016		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

Past operations at the Site resulted in groundwater, soil, sediment, and surface water contamination. The following are the primary Site contaminants that continue to be addressed in the groundwater by the extraction and treatment system.

- Vinyl Chloride (VC)
- Trichloroethylene (TCE)
- Cis- 1,2-Dichloroethylene (DCE)
- 1,1,1-Trichloroethane (TCA)
- Arsenic
- Copper
- Iron
- Manganese

Response Actions

Initial Response

Initial removal actions started in 1983. EPA built fences and gates across access roads, demolished sheds on site, crushed 600 clean, empty drums and sent them to a metals recycling facility, removed 75 drums of hazardous liquids, and stored 364 drums filled with nonhazardous material in the northeastern corner of the Site. In December 1983 EPA began a Remedial Investigation/Feasibility Study (RI/FS) at Millcreek leading to the selection of a Site remedy in a Record of Decision (ROD).

1986 Record of Decision

EPA issued a ROD on May 7, 1986 identifying the following Remedial Action Objectives (RAOs) (designated in the ROD as Public Health and Environmental Remediation Objectives):

- Prevent onsite air dispersal of particles containing potentially hazardous substances,
- Prevent direct dermal contact with potentially hazardous substances,
- Prevent offsite transport of contaminated soil and sediment via erosion or storm transport,
- Remediate offsite groundwater contamination to groundwater protection goals,
- Remediate soil contamination to safe soil levels capable of preventing future groundwater contamination, and
- Remediate sediment contamination capable of causing an impact on aquatic life or wildlife in the wetlands or Marshall's Run.

The ROD selected a remedy (Remedy) for consolidation and capping of the landfill and the cleanup of contaminated groundwater. EPA has also issued three Explanations of Significant Differences (ESDs) which modify the Remedy. The first ESD issued in April 1997 revised the requirements for the cap. The second ESD, issued in May 1999, added 44.8 acres to the Site and required the creation of a wetland. Institutional Controls (ICs) were required by the third ESD issued in July 2011.

The Remedy selected in the ROD as modified by the three ESDs includes:

- Covering the landfill and areas of soil contamination with a warning sheet (geotextile fabric) and 12-inch soil cover;
- Sampling of drums found during excavation and consolidating them under the cap or disposing off site;
- Grading and revegetating soil and cap area to support the development of a golf course;
- Constructing surface water management basins and a flood retention basin (FRB);
- Constructing a seven acre wetland;
- Constructing a treatment plant for contaminated groundwater;
- Pumping and treating contaminated groundwater and discharge of treated groundwater to a local stream;
- Installing additional monitoring wells around the site to detect potential future releases;
- ICs to prevent installation of new wells or use of contaminated groundwater for potable use;
- ICs to prevent residential use of Site property; and
- ICs to restrict activities on the Site property that adversely affect the soil cover, wells and treatment plant.

The pump and treat system is to continue operating until groundwater protection goals are reached:

Table 1: Groundwater Protection Goals from 1986 ROD

Constituent Name	Groundwater Protection Goals (µg/l)	Basis for Goals
VC	0.015	Based on 1×10^{-6} UCR from Risk Assessment
TCE	1.8	Adjusted 1×10^{-6} UCR from Risk Assessment
1,2-DCE (total)	70	Adjusted 1×10^{-6} UCR from Risk Assessment
1,2-DCA	0.95	Based on 1×10^{-6} UCR from Risk Assessment
1,1,1-TCA	22	Health Advisory Level
1,1-DCE	0.24	Based on 1×10^{-6} UCR from Risk Assessment
Chloroform	0.19	Based on 1×10^{-6} UCR from Risk Assessment
Benzene	0.7	Based on 1×10^{-6} UCR from Risk Assessment
Toluene	2,000	Health Advisory Level
Ethylbenzene	680	Health Advisory Level
Xylene	440	Health Advisory Level
Phenols	300	Taste
Phthalates	3	Toxicity to Aquatic Life
Lead	11	Toxicity to Aquatic Life
Copper	27	Toxicity to Aquatic Life
Arsenic	50	Health Advisory Level
Cadmium	3	Toxicity to Aquatic Life
Chromium III	341	Toxicity to Aquatic Life
Chromium VI	11	Toxicity to Aquatic Life
Mercury	0.012	Toxicity to Aquatic Life
Zinc	710	Toxicity to Aquatic Life
Nickel	150	Health Advisory Level
Iron	300	Taste
Manganese	50	Taste
Cyanide	5	Toxicity to Aquatic Life
Ammonia	128	Toxicity to Aquatic Life

UCR: unit cancer risk

Bolded entries indicate contaminants that currently have a more conservative MCL

Status of Implementation

Operable Unit 1

Extraction and treatment of the groundwater includes the following processes. Groundwater was originally collected by five trenches (Figure 2). Four of the trenches produced flow rates as designed, but the flow rate in Trench 3 gradually declined. In 2015 DEP determined that the recovery line in Trench 3 had collapsed and was no longer functioning as intended. DEP proposed replacing Trench 3 with a pair of wells configured to produce a larger groundwater capture zone than the original trench. Trench 3 was taken out of service in September 2015 and the new wells were installed in July 2016. Work to connect the new wells to the treatment plant is expected to be completed by September 2016.

The extracted groundwater is pumped to the treatment plant, where potassium permanganate is added to oxidize the iron and manganese, and polymer is added to flocculate the metals, which are precipitated in an inclined plate clarifier (IPC). The clarified water then passes through an air stripping process to remove VOCs. Effluent is discharged to Marshalls Run, but can be pumped to a holding pond, to be used as irrigation water for the golf course. Although currently closed, the township has announced plans to reopen the golf course in 2017.

Operable Unit 2

On March 8, 1999, EPA approved revised plans for the cap and golf course construction and wetlands mitigation. Wetlands delineation was approved in September 1999. Construction of a cap, graded and landscaped as part of a golf course, seven acres of wetlands, and a FRB began in the spring of 2000 and was completed in September 2001. The golf course was operated until 2010 when it was shut down to allow for the runway extension of the adjacent Erie International Airport. Although not currently operating, the Township continues to maintain the grass and structures of the golf course.

Institutional Controls

For the ICs on groundwater use restrictions required by the 2011 ESD, EPA identified Millcreek Subdivision and Land Development Ordinance 2006-9, Sections 9.03.1G and 1.8 which requires that public water service be provided to all developments, including the development of any lot, tract or parcel of land. The area around the Site is already serviced by public water, and there are no known private groundwater wells. Therefore, no current human health threat is associated with current or anticipated future consumptive uses of the Site-related contaminated groundwater. While Millcreek Township is responsible for enforcement of this ordinance, EPA and PADEP will conduct oversight of the Site to ensure that the ICs remain in place. EPA will continue to rely on ICs, as necessary, to prevent potential future consumptive use of the groundwater until groundwater is restored to drinking water standards.

The 2011 ESD also requires ICs at the Site to restrict residential use of the property and any activities that would adversely affect or interfere with the integrity and protectiveness of the 12-inch soil cover and the efficacy and function of the Millcreek Treatment Plant. The 2011 ESD further requires that no new wells be installed in the Site property and that subsequent purchasers of the Site property be informed of the environmental conditions at the Site and of EPA's selected remedy for the Site. These requirements are addressed and implemented by the August 13, 2010 Consent Order and Agreement among DEP, Millcreek Township and the Erie Regional Airport Authority (2010 Agreement). The 2010 Agreement requires the Township to "operate and maintain the Township-owned parcels within the Site for public recreation and public benefit in perpetuity." The township cannot revise its inspection and maintenance obligations "except under express, prior written approval by the Department".

IC Summary Table

Table 2: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Groundwater	Yes. ICs have been implemented	Yes. ICs are required by 2011 ESD	Groundwater underlying the Site	Ensure that contaminated groundwater is not used for potable purposes.	Millcreek Subdivision and Land Development Ordinance 2006-9. Enacted July 11, 2006
Landfill cap	Yes. ICs have been implemented	Yes. ICs are required by 2011 ESD	Landfill cap	Restrict activities that adversely affect the integrity and protectiveness of the 12-inch soil cover ("cap").	Consent Order and Agreement among DEP, Millcreek Township and the Erie Regional Airport Authority, August 13, 2010
Treatment plant	Yes. ICs have been implemented	Yes. ICs are required by 2011 ESD	Treatment plant	Restrict activities that adversely affect the efficacy and function of the Millcreek Treatment Plant	Consent Order and Agreement among DEP, Millcreek Township and the Erie Regional Airport Authority, August 13, 2010

Systems Operations/Operation & Maintenance

PADEP has been responsible for O&M activities at the site since 2007 including groundwater extraction and treatment, maintenance of the landfill cap, and groundwater and process monitoring. The groundwater extraction and treatment system of OU1 is monitored and maintained daily by URS treatment plant personnel on behalf of PADEP. Inspections of the cap are conducted by treatment plant personnel during the annual groundwater sampling events. Cap inspections include observations of any deficiencies in the cover. Millcreek Township addresses any issues with the soil cover during the normal maintenance of the golf course. The monitoring program is described in detail below.

Ground Water Monitoring

URS, the PADEP O&M contractor at the Site, collects groundwater samples annually from the forty-three wells for VOCs and metals analysis. Until 2012, a complete round of groundwater samples was collected in the Spring and a subset of wells was sampled in the Fall. In response to the 2010 EPA optimization evaluation the Fall sampling was discontinued. Tables 3 and 4 in Appendix B lists the wells with their physical characteristics and sampling parameters for the current annual monitoring program. Well locations are shown in Figure 3 through 6.

Process Monitoring

Treatment system process monitoring is conducted daily, weekly, and monthly. Samples are collected monthly from IPC influent (1-B) and IPC effluent (2-B). The effluent to Marshall's creek is subject to the National Pollutant Discharge Elimination System (NPDES) permit equivalents detailed in Table 5 below. In addition to the process monitoring sample locations, the filter press feed sludge and the filter press cake solids are sampled monthly.

Table 5
NPDES Permit Equivalency Standards

Parameter	Average Monthly (mg/l)	Max. Daily (mg/l)	Instant Max. (mg/l)
Flow	Monitoring only		
COD	Monitoring Only		
Conductivity	Monitoring Only		
TOC	Monitoring Only		
TSS	30	60	75
Oil and Gas	15	--	30
Iron (dissolved)	0.3	0.6	0.7
Iron (total)	1.5	3	3.7
Manganese	1	2	2.5
Arsenic	0.05	0.1	0.13
Cadmium	0.01	0.02	0.03
Chromium, Total	0.05	0.1	0.13
Copper	0.01	0.02	0.025
Lead	0.05	0.1	0.13
Mercury	0.002	0.004	0.005
Nickel	0.322	0.64	0.8
Zinc	0.04	0.08	0.1
10A Phenol	0.005	0.010	0.012
VC	0.002	0.004	0.005
Cyanide (free)	0.005	0.01	0.013
TCE	0.005	0.01	0.013
1,1-DCE	0.007	0.014	0.02
1,1,1-TCA	0.2	0.4	0.5

TOC: total organic carbon, TSS: total suspended solids, COD: chemical oxidation demand

Pump and Treatment System Evaluation

In 2009, as part of EPA's "Action Plan for Groundwater Remedy Optimization", a consultant for EPA conducted an evaluation of the ongoing pump and treat system at the Millcreek Site. The February 2010 report of that evaluation (Optimization Report) presented 32 recommendations to further evaluate the extent of contamination at the Site and the capture zone of the trench system; and improve the overall efficiency of the pump and treat system. Among the major recommendations were sampling for 1,4-dioxane, adding groundwater sampling locations off the property for determining the full extent of the plume, vapor intrusion sampling, evaluation of the air emissions from the treatment system, and a capture zone analysis for the existing groundwater extraction trenches. The following paragraphs discuss the results of the studies conducted at the Site in response to these recommendations.

EPA has become aware that sites with VOCs may also be contaminated with 1,4-dioxane, because of its use as a solvent stabilizer. Therefore, the site wells were sampled for 1,4 dioxane during three consecutive groundwater sampling events in 2007 and 2008. 1,4-dioxane was detected in only one of the three sampling events. In October 2008, 1,4-dioxane was detected at 28.1 µg/l in well MW-23A, and at 4.4 µg/l in well MW-46A (these wells are in the most contaminated area of the site). Because 1,4-dioxane was detected in only two samples from one event, and undetected in all wells in two other events, EPA believes it is not a widespread problem at this Site and sampling for 1,4-dioxane was discontinued.

To assess the potential for vapor intrusion at the Site, two vapor intrusion sampling events were conducted in 2008 and 2010. Eight residences adjacent to the Site property were sampled. The results indicated that although some contaminants were detected in the residences, the detected contaminants did not correlate with Site-related contaminants. Therefore EPA determined that the presence of these compounds was not due to vapor intrusion from the site-related groundwater plume.

To further delineate the groundwater plume a Direct Push Technology (DPT) groundwater sampling event was conducted in August 2010 focusing on new locations off the Site property. The results of the sampling event indicated that the contaminants extended past the northeast boundary of the property indicating that Trench 3 was not functioning as intended to keep the plume contained on-Site. Additionally, sampling showed an area of shallow groundwater contaminated with vinyl chloride east of the site that may be associated with the Site or may be a separate source.

Also in 2010, a capture zone analysis for the extraction trenches was conducted. In general, the capture zone analysis indicated effective capture of most of the contaminated groundwater moving through the Site property in both the shallow and deep groundwater zones except for the contamination north of the retention pond, and the low-level contamination that is present to the west of Trench 5. However, the capture zone analysis was based on water level readings from the wells and trenches, and the water level readings in trench 3 were later found to be inaccurate, skewing the results.

EPA conducted an assessment of the air stripper for the treatment system in 2010. The EPA screening air dispersion model SCREEN3 was used to calculate the annual average ambient air concentrations downwind of the air stripper. The maximum concentrations were estimated to occur at 67 meters (220 feet) away from the air stripper, and were determined to be well below EPA's threshold levels of concern.

Additionally, the Optimization Report recommended a number of suggestions to reduce the expense of the Remedy's operation and maintenance. Among the major recommendations that were implemented were the reduction of the semi-annual groundwater monitoring to annual, and the reduction of the amount of lime used to condition the treatment sludge.

III. PROGRESS SINCE THE LAST REVIEW

The protectiveness statements from the fourth Five-Year Review, signed September 21, 2011, are reproduced below:

OU1- Groundwater

Based on currently available data, the remedies in place for OU1 are protective of human health and the environment. The selected remedy for the site groundwater includes a groundwater extraction and treatment system. Additionally, ICs are in place to prevent the use of the contaminated groundwater as a drinking water supply. Except for levels of iron and manganese that are believed to be related to background, effluent from the treatment system meets the discharge limitations required by the NPDES permit equivalencies for discharge to Marshalls Run. Recent analytical results indicate that some remedial goals for groundwater have not been met; however, the groundwater capture zone analysis

indicates that the majority of the contamination is captured by the treatment system. Although some contamination remains beyond the capture zone of the treatment system, the groundwater is not used as a drinking water source. Furthermore, a vapor intrusion investigation and risk assessment was conducted at residences near the Site, and vapor intrusion was ruled out as a concern for the Site under the current conditions.

OU2- Cap, Wetlands and Flood Retention Basin

Based on currently available data, the remedies constructed for OU2 are protective of human health and the environment. The constructed remedies for OU2 include a cap, wetlands, and a Flood Retention Basin. These remedies prevent direct contact with, or ingestion of, contaminants.

OVERALL PROTECTIVENESS

“Based on currently available data, the remedies constructed for the site remain protective of human health and the environment in the short term. The remedies are functioning as intended, and no complete exposure pathways are known to exist.

To ensure long-term protectiveness, EPA will investigate the source and extent of contamination that is beyond the capture zone of the Site and consider remediation alternatives if appropriate. EPA will ensure that the new monitoring wells are added to the routine monitoring program and ensure that the transducers are checked manually to confirm their accuracy. EPA will update the remedy to include protective MCLs [Maximum Contaminant Levels] and reconsider other remedial goals including the treated groundwater discharge requirements for iron and manganese. Extraction and treatment of groundwater, with the associated sampling and monitoring is planned to continue until cleanup standards are met.”

Table 6: Protectiveness Determinations/Statements from the 2011 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Short-term Protective	See full text quoted above
2	Protective	See full text quoted above
Sitewide	Short-term Protective	See full text quoted above

Table 7: Status of Recommendations from the 2011 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1	Newly installed monitoring wells are not included in monitoring program	Monitoring program should be revised to include new wells to monitor deeper contamination.	Completed	New wells MW-11A, MW-11B, MW-12A, MW-31A, MW35A and MW-42C were incorporated into annual monitoring program.	August 2012

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1	Groundwater contamination east and north of the site is not well delineated.	Contamination identified during the 2010 DPT sampling event should be further delineated, and if determined to be Site-related, the GW extraction system should be optimized to address these areas.	Ongoing	Trenches 1, 2 and 5 were optimized to increase capture. Trench 3, decommissioned in 2015, is being replaced by DEP with a well pair installed in July 2016. Work to connect the new wells to the treatment plant is expected to be completed by September 2016. Following installation, EPA is planning additional sampling to delineate contamination.	
1	Several MCLs have changed such that ROD remedial goals are no longer protective.	EPA will update the remedy to include protective MCLs and reconsider other remedial goals.	Considered But Not Implemented	Because MCLs and health-based standards are revised over time, a risk assessment will be completed when required remedial goals are achieved to determine if updates to the remedy are necessary.	
1	Iron and manganese levels in treated discharge are consistently above remedial goals and permit equivalents.	EPA will reevaluate the discharge requirements and treatment process, and revise as necessary to be protective.	Ongoing	Samples from nearby groundwater sources indicate that high iron and manganese represent natural background conditions in the area.	
1	Transducer data in some trench wells may be inaccurate and could affect the results of the capture zone analysis.	The water levels should be checked manually during the groundwater sampling events to ensure that the transducers are operating correctly.	Completed	Accurate gauging data for the trenches indicated that trench 3 was not functioning. Downhole camera inspection of the trench confirmed this.	August 2012
1,2	All required Institutional Controls are not in place.	EPA will implement institutional controls to ensure the continued integrity of the remedy components.	Completed	EPA has recognized that 2 legal agreements have implemented the required ICs. The 2010 Consent Order and Agreement among DEP, Millcreek Township and the Erie Regional Airport Authority assures maintenance of the cap. The Millcreek Subdivision and Land Development Ordinance 2006-9. Enacted July 11, 2006 Millcreek Subdivision and Land Development Ordinance 2006-9, Sections 9.03.1G and 1.8 requires that public water service be provided to all developments.	September 2016

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

On May 26, 2016, EPA Community Involvement Coordinator Carrie Deitzel contacted Brian McGrath, Vice Chairman of the Board of Supervisors and asked him if he or any residents had any questions or concerns about the Mill Creek Superfund site, since the last five-year review was conducted in 2011. Mr. McGrath stated that he and the Township Engineer Rick Morris regularly inspect the Site, and that they did not have any questions or concerns about the site. Furthermore, he had not received any calls from residents who had questions or concerns about the site.

A public notice was published in the Erie Times on Friday, May 27, 2016. The notice stated that EPA was conducting a five-year review for the Millcreek Dump Superfund Site and invited the public to ask questions or provide Site information to EPA. No response to this notice was received.

Data Review

Groundwater data has been monitored at the site since 1992 through a system of monitoring wells located on and off the Site. This section presents a review of the current data from the Annual Groundwater Monitoring Reports, 2011 through 2015. URS, the PADEP O&M contractor at the Site, collects groundwater samples annually from the existing wells. Samples are collected for VOCs and metals analysis. Sampling for semivolatile organic compounds (SVOCs) was discontinued in 2008 due to consistently low levels. Currently, VOCs are the contaminants of most concern at the site, and the bulk of contamination at the site is from cis-1,2-DCE and VC. Discussion of the groundwater sampling and treatment data is presented below.

Chloride and Cis-1, 2-Dichloroethylene

In the past five years VC concentrations have remained relatively stable across the site with the highest concentrations appearing in the deep well MW-42A (724 µg/l) just south of Trench 3 and MW-11A (528 µg/l) north of Trench 3. The highest concentration in the shallow zone is in the Trench 3 sump (118 µg/l) and in well MW-42B (78.2 µg/l) just south of Trench 3. The MCL for vinyl chloride is 2 µg/l. The concentration contours of VC in the deep and shallow zones are shown in Figures 3 and 4.

The concentration contours of cis-1, 2-DCE are shown in Figures 5 and 6, with the highest concentrations appearing in the deep zone wells MW-11B (4590 µg/l) and MW-11A (3280 µg/l) north of Trench 3. The highest concentration in the shallow zone is in the Trench 2 sump (97.5 µg/l) and in well MW-42B (37.6 µg/l). The MCL for cis-1,2-DCE is 70 µg/l.

The combined extents of cis-1, 2-DCE and VC are indicative of the total VOC contaminant plume. As shown by these figures, the downgradient limit of volatile organic contamination lies outside the property boundaries of the Site. This is believed to be due to the failure of Trench 3, which does not capture the contaminated groundwater but has been replaced by two new extraction wells. Also, the continued presence of cis-1, 2-DCE in MW-37A (9.7 µg/l) shows the potential that low-level volatiles in the deep zone may be escaping the capture zone west of Trench 5 although these concentrations do not exceed either the groundwater cleanup goal or the MCL for cis-1,2-DCE.

Inorganic constituent levels have also remained fairly consistent over the last five years. Notable results from the 2015 sampling event are discussed.

Arsenic

Historically, arsenic has been detected above its current MCL of 10 µg/l in numerous wells both on and off the site. The remedial goal for arsenic required by the 1986 ROD is the previous MCL (50 µg/l) and the current MCL

is 10 µg/l. In 2015, arsenic was detected above the current MCL in 15 samples ranging from 12.5 µg/l to 126 µg/l. Two of these wells, MW-7 (32.2 µg/l and MW-12 (42.7 µg/l) are just outside the Site.

Copper

Copper has exceeded the ROD remedial goal (27 µg/l) in only a few wells each year. In 2015, copper was detected in five wells above the remedial goal: MW-11A (73 µg/l), MW-12(60 µg/l), MW-38B (51 µg/l), MW-41B (155 µg/l), and MW-42B (65 µg/l). In contrast, the MCL for copper is 1300 µg/l, but the remedial goal was based on risk to aquatic life.

Iron and Manganese

Iron has been detected above its ROD remedial goal (300 µg/l) in the majority of Site wells in every year reviewed. In 2015, iron levels ranged from 20 µg/l in MW28A to a high of 44,300 µg/l in MW-41A. Manganese has also been detected above its ROD remedial goal (50 µg/l) in the majority of wells. In 2015 manganese levels ranged from non-detect in MW-44A to 1856 µg/l in MW-42-A. These two metals are widespread across the monitoring wells, which suggests that these metals may be naturally elevated throughout the area and may not be specifically site related.

Additional information supports the suggestion that iron and manganese levels in Site groundwater are related to background. A 1987 report entitled Groundwater Resources of Erie County, Pennsylvania, issued by the Pennsylvania Department of Environmental Resources, in cooperation with the U.S. Geological Survey indicated that the Site lies in a high iron area of the Lake Plain physiographic division of Erie County. In that report, groundwater wells sampled in the area displayed iron concentrations in the 1,000 to 5,000 µg/l range. Additionally, PADEP's Safe Drinking Water Program reported a sample result from an upgradient residential well that showed a manganese level of 257 µg/l.

Lead

The remedial goal for lead is 11 µg/l and the MCL is 15 µg/l. In the past, low levels of lead have been relatively widespread at the Site, with exceedances of the remedial goal in up to nine wells per year. In the last five years, however, exceedances have been reduced to 3 or 4 per year. In 2015, only 3 exceedances were noted, well MW-11A (28.4 µg/l) and MW-12 (27.8 µg/l) and MW-38B (11.4 µg/l).

Zinc

The ROD remedial goal for zinc is 710 µg/l and is based on risk to aquatic life. Zinc has been detected at low levels across the Site but only a few exceedances of the ROD remedial goal. In 2014 there were only exceedances in two wells, both at 736 µg/l. In 2015 there were three wells that exceeded the remedial goal, well MW-38B (1509 µg/l), MW-39A (2766 µg/l) and MW-41B (1533 µg/l).

Treatment System Performance

PADEP's O&M contractor, URS, collects influent and effluent samples to compare to the NPDES permit equivalency requirements. The permit equivalents are shown in Table 5, above. The operation of the GWTP and associated recovery trenches are evaluated on a daily basis by the on-site plant operators and include the completion of preventative operation and maintenance (O&M) activities as well as system repairs and maintenance.

The annual reports for treatment plant effluent samples were reviewed. Overall, the treatment successfully removes site contaminants except for iron and manganese which were consistently detected in the effluent above the permit equivalency values. The use of potassium permanganate to oxidize the high iron content groundwater may also contribute to the elevated manganese results. Operators adjust dosage rates to address exceedances based upon weekly evaluation of on-site laboratory results.

Over the past five years operation of the GWTP has remained relatively consistent but has shown reduction over time in the volume of recovered groundwater and a corresponding reduction in the mass of VOCs removed. This is shown graphically in Figure 7. In 2011 the recovery system extracted 53,229,400 gallons of groundwater and an estimated 53.9 pounds of VOCs were removed from the groundwater. In 2012, 50,270,500 gallons were extracted and 45.1 pounds removed. In 2013, 44,144,500 gallons extracted and 40.1 pounds removed. In 2014, 37,775,902 gallons extracted and 29.4 pounds removed. And in 2015, 31,513,212 gallons of groundwater were extracted and an estimated total 20.6 pounds of VOCs were removed. Along with the failure of Trench 3, several other factors have contributed to the loss of volume for the recovery system including loss of pump efficiency with age and increasing downtime for maintenance issues. Additionally, the individual flows from the trenches are adjusted to maximize the recovery of contaminants. Part of this operation included minimizing the volume pumped from trench 4, the least contaminated trench.

In 2015 the plant suffered a number of major equipment failures, including the wet well mixer in August, and the auto dialer and automation controllers in September. Due to the malfunctioning controllers, operation of the GWTP was temporarily reduced to day-time only. Full time operation was resumed in November following installation and successful testing of replacements. Additional repairs and major activities completed in 2015 included furnace repair, overhead lighting repair, replacement of the sludge hopper, clarifier influent pump repair, and magnetic flow transmitter replacements.

Due to the reduced recovery volumes noted in previous years, PADEP directed URS to perform a critical assessment of Recovery Trench 3. Video surveys were conducted on the trench pipelines and concluded that the recovery line was impassable due to multiple collapses which also led to the discharge line being clogged with sediment. Subsequently, recovery from Trench 3 was ceased on September 1, 2015. PADEP evaluated replacement of the trench and concluded that replacement with two vertical extraction wells represented the most viable solution. The replacement wells were installed in July 2016. Work to connect the new wells to the treatment plant is expected to be completed by September 2016.

Site Inspection

The inspection of the Site was conducted on Wednesday June 8, 2016. In attendance were James Feeney, RPM; Mindi Snoparski, Hydrogeologist; John Morettini, PADEP Project Manager; and Fred Coll and Eric Gadley, URS, contractors for PADEP. The purpose of the inspection was to assess the conditions of the Site and the integrity of the remedy.

Currently, URS maintains the treatment building, system, and grounds. The cap is maintained as part of the currently inactive Millcreek Township Golf Course. The Site inspection included walking the golf course and airport fence line to document cap integrity and a visual inspection of the FRB and its various components. Overall, conditions of the cap in the golf course portion of the Site were very good. There were no signs of burrowing animals or erosion and the marker mat was not exposed. Grass has been mowed even though the course is currently not in use. Paved cart paths were intact. An ephemeral swale/stormwater channel which essentially bisects the course was fully vegetated with mowed grass and showed no signs of erosion. Tie down stakes used as support for large posts & netting associated with the former driving range location were left in place to avoid soil disturbance.

Overall cap condition for the airport portion of the site was very good. Fence posts were intact and firmly anchored to the ground. No evidence of burrowing animals was found. Vegetation appears to be continually maintained. No stormwater erosion was evident. Runway approach lights, as well as associated fencing and limestone base, appeared stable. Marker mat was not visible anywhere.

The FRB appears to be functioning as intended. No visible defects were noted. No depressions or erosion was evident. There was no accumulation of storm water debris and fresh chainsaw cuts of fallen timbers immediately adjacent to the FRB indicated recent maintenance and removal of debris. FRB embankments were recently mowed. The FRB outlet/outfall was also inspected. No cracks were evident in the concrete and no undercutting of

the foundation was observed. There was no accumulation of debris or excessive sediment immediately downstream of the outfall.

Past inspections of the wetland mitigation areas had determined that the wetlands had been well established, and during this site inspection, the wetland mitigation areas were observed to be thriving with thick vegetation and areas of standing water.

The GWTP appeared to be in relatively good shape and functional, with all of the recent repairs and replaced equipment in operation.

V. TECHNICAL ASSESSMENT

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

No. The cap is functioning as intended by the decision documents and prevents ingestion and dermal contact with hazardous substances and exposure to contaminated dusts and particulates. But due to the failure of Trench 3, there is not sufficient capture of the groundwater to prevent the off-Site migration of contaminants, as shown by Figures 3 through 6.

Replacement of Trench 3 with the planned well pair, and subsequent optimization of the extraction system is expected to enhance the performance of the remedy and return it to its intended function.

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

No. Although the exposure assumptions and remedial action objectives are still valid, toxicity data and risk-supporting information for some individual contaminants have changed since the ROD. These changes could result in increases or decreases in calculated potential risk. Therefore, a risk assessment incorporating updated toxicity data and risk assessment methodology will be completed when the ROD-required remedial goals are achieved to determine if updates to the remedy are necessary.

Changes in Standards and TBCs

The remedial goals specified in the ROD (reproduced in Table 1 above) were compared to current MCLs. Most of the remedial goals are more conservative than their corresponding MCLs. However, the current MCLs for the following three contaminants are more conservative than the original goals.

- The MCL for arsenic is 10 µg/l, and the original remedial goal is 50 µg/l.
- The MCL for toluene is 1000 µg/l, and the original remedial goal is 2000 µg/l.
- The MCL for chromium (total) is 100 µg/l, and the original remedial goal is 341 µg/l.

A decrease in the MCL relative to the remedial goal suggests that the remedial goal may not be sufficiently protective with respect to human health in the long term. To ensure that the remedy remains protective of human health in the long-term, once the groundwater cleanup levels are achieved for all Site contaminants, a risk assessment is recommended to confirm that no receptors would be exposed to groundwater that would result in a cumulative excess carcinogenic risk within EPA's acceptable range (10^{-6} to 10^{-4}) and a cumulative excess non-carcinogenic HI of less than or equal to 1.

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

No. 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 Five-Year Review:				
OU2				
Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 1	Issue Category: Remedy Performance			
	Issue: Due to the failure of Trench 3, there is not sufficient capture of the groundwater to prevent the off-Site migration of contaminants.			
	Recommendation: Install replacement wells, as planned by PADEP, to enhance capture.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	State	EPA	12/30/2016
OU(s): 1	Issue Category: Remedy Performance			
	Issue: Off-Site migration of contaminated groundwater has not been fully delineated.			
	Recommendation: Conduct additional sampling and develop plume maps to delineate contamination for all COCs.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	EPA	EPA	12/30/2016
OU(s): 1	Issue Category: Remedy Performance			
	Issue: Iron and manganese levels in treated discharge are consistently above remedial goals and permit equivalent requirements.			
	Recommendation: EPA will reevaluate the iron and manganese levels to determine if they are due to background contamination. Upon completion of this evaluation, it will be determined if the discharge requirements and/or the treatment process requires modification.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	State	EPA	12/30/2016

OTHER FINDINGS

In addition, the following are observations that were identified during the FYR and should be followed in the future. With the aging of the trenches and treatment plant, maintenance issues have been and will be more frequent and more costly as the equipment gets older. Addressing iron fouling of the equipment, which is prevalent in this environment may also add significantly to the maintenance costs. There may be a point when a cost-effective decision should be made to replace the trenches with wells as is currently being done with Trench 3. In consideration of the ongoing operation and maintenance program, this observation does not affect current and/or future protectiveness.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)		
<i>Operable Unit:</i> 1	<i>Protectiveness Determination:</i> Short-term Protective	<i>Planned Addendum Completion Date:</i> Click here to enter a date
Protectiveness Statement: Based on currently available data, the remedies in place for OU1 are protective of human health and the environment in the short term. Although the groundwater extraction and treatment system is currently functioning at a decreased capacity due to the failure of Trench 3, ICs are in place to prevent the use of contaminated groundwater as a drinking water supply, and plans are underway to replace the trench with two extraction wells. Except for levels of iron and manganese, which are believed to be related to background, effluent from the treatment system meets the discharge limitations required by the NPDES permit equivalencies for discharge to Marshalls Run. To be protective in the long-term, the extraction and treatment system will be repaired to demonstrate effective capture of the contaminated groundwater, and the plume of groundwater contaminated will be fully delineated. The effluent of the treatment plant will be reevaluated to determine if iron and manganese are background conditions. Based on this evaluation the discharge requirements and treatment will be revised as necessary to be protective.		

Protectiveness Statement(s)		
<i>Operable Unit:</i> 2	<i>Protectiveness Determination:</i> Protective	<i>Planned Addendum Completion Date:</i> Click here to enter a date
Protectiveness Statement: Based on currently available data, the remedies constructed for OU2 are protective of human health and the environment. The constructed remedies for OU2 include a cap, wetlands, and a Flood Retention Basin. These remedies prevent direct contact with, or ingestion of, contaminants, and ICs are in place to maintain the integrity of remedy.		

Sitewide Protectiveness Statement

Protectiveness Determination:
Short-term Protective

*Planned Addendum
Completion Date:*
[Click here to enter a date](#)

Protectiveness Statement: Based on currently available data, the remedies constructed for the Site remain protective of human health and the environment in the short term. The cap prevents direct contact with, or ingestion of, contaminated soil. ICs are in place to prevent the use of contaminated groundwater as a drinking water supply and to maintain the integrity of the cap and the treatment system. The groundwater extraction and treatment remedy is currently not functioning as intended, but repairs are underway, and no complete human exposure pathways are known.

To be protective in the long-term, the extraction and treatment system will be repaired to demonstrate effective capture of the contaminated groundwater, and the plume of contaminated groundwater will be fully delineated. The effluent of the treatment plant will be reevaluated to determine if iron and manganese are background conditions. Based upon this evaluation, the discharge requirements and treatment will be revised as necessary to be protective.

VIII. NEXT REVIEW

The next five-year review report for the Millcreek Dump Superfund Site is required five years from the completion date of this review.

APPENDICES

Table 3
Monitoring Well Annual Sampling Schedule

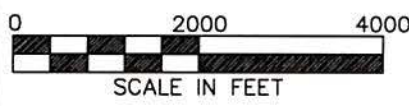
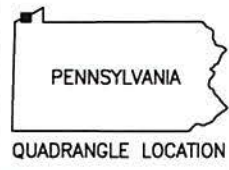
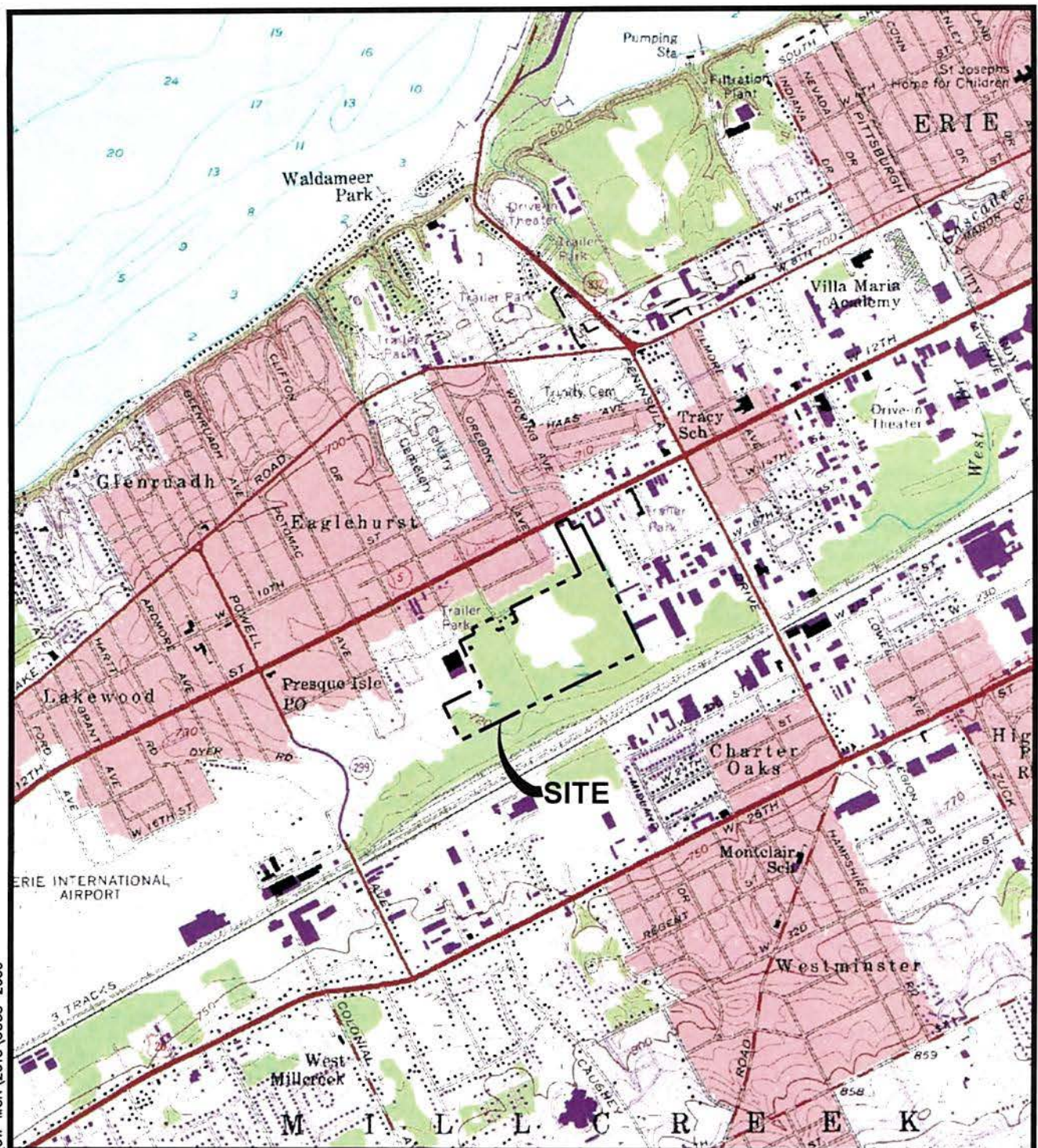
Well Identification	Gauging	Field Instrument Temp/DO/ORP/pH/Cond	VOCs/Total Metals/General Chemistry
MW-7	X	X	X
MW-11	X	X	X
MW-11A	X	X	X
MW-11B	X	X	X
MW-12	X	X	X
MW-12A	X	X	X
MW-23A	X	X	X
MW-23B	X	X	X
MW-25A	X	X	X
MW-25B	X	X	X
MW-28A	X	X	X
MW-28B	X	X	X
MW-29	X	X	X
MW-31	X	X	X
MW-31A	X	X	X
MW-32	X	X	X
MW-33A	X	X	X
MW-33B	X	X	X
MW-35	X	X	X
MW-35A	X	X	X
MW-37A	X	X	X
MW-37B	X	X	X
MW-38A	X	X	X
MW-38B	X	X	X
MW-39A	X	X	X
MW-39B	X	X	X
MW-40A	X	X	X
MW-40B	X	X	X
MW-41A	X	X	X
MW-41B	X	X	X
MW-42A	X	X	X
MW-42B	X	X	X
MW-42C	X	X	X
MW-43A	X	X	X
MW-43B	X	X	X
MW-44A	X	X	X
MW-44B	X	X	X
MW-45A	X	X	X
MW-45B	X	X	X
MW-46A	X	X	X
MW-46B	X	X	X
MW-47A	X	X	X
MW-47B	X	X	X

Table 4. Monitoring Network - Summary Detail.
2015 Annual Groundwater Monitoring Report
Millcreek Dump NPL Site - Erie, PA

Monitoring Well ID	Northing	Easting	Casing Elevation	Ground Surface Elevation	Measured Depth (Feet)	Elevation - Top of Screened Interval (ft- msl)	Elevation - Bottom of Screened Interval (ft- msl)
Shallow Zone Wells							
MW-7	711713.75	1317304.17	711.49	709.82	17.10	n/a	694.39
MW-11	712163.62	1316841.56	714.06	714.84	18.25	707.05	697.05
MW-12	711584.16	1316420.82	713.60	712.07	15.21	706.99	696.99
MW-23B	711709.37	1317054.04	713.18	713.53	21.39	703.03	693.03
MW-25B	712841.52	1316377.40	715.68	713.87	21.53	705.24	695.24
MW-28B	711159.10	1316678.38	713.68	713.99	13.56	711.51	701.51
MW-29	711938.77	1316295.28	713.61	713.85	19.90	704.51	694.51
MW-31	712019.54	1317969.66	710.07	710.38	17.20	702.10	692.10
MW-32	712993.87	1317786.48	709.94	710.24	19.75	700.91	690.91
MW-33B	711140.42	1317236.23	715.28	715.57	14.83	704.26	699.26
MW-35	712445.82	1317423.83	709.68	710.05	12.87	702.40	697.40
MW-37B	711296.39	1315974.27	713.62	710.62	19.38	705.72	695.72
MW-38B	711427.67	1316227.75	711.37	711.72	14.89	708.20	698.20
MW-39B	711614.97	1316631.61	711.73	712.03	13.61	708.94	698.94
MW-40B	711744.36	1316915.35	712.58	712.78	16.45	707.74	697.74
MW-41B	711977.18	1316977.67	715.14	712.29	19.98	706.35	696.35
MW-42B	711907.35	1317156.86	715.99	713.51	19.36	708.17	698.17
MW-43B	711659.90	1317268.20	713.18	713.34	17.23	707.37	697.37
MW-44B	711501.29	1317339.64	712.87	713.13	17.20	707.00	697.00
MW-45B	711294.06	1317435.65	713.24	713.62	15.89	708.65	698.65
MW-46B	711464.93	1316831.56	714.01	714.37	17.00	708.08	698.08
MW-47B	711388.80	1317138.17	713.74	714.05	16.48	708.99	698.99
Deep Zone Wells							
MW-11A	712154.23	1316834.52	717.53	714.85	38.35	689.85	679.85
MW-11B	712183.30	1317028.36	715.68	712.86	37.50	687.86	677.86
MW-12A	711581.12	1316429.00	711.58	711.81	45.10	676.81	666.81
MW-23A	711704.90	1317075.52	713.39	713.62	45.48	672.96	662.96
MW-25A	712843.12	1316384.20	715.51	713.77	56.45	658.96	653.96
MW-28A	711164.29	1316669.95	713.67	714.06	47.40	677.94	667.94
MW-31A	711972.58	1317915.03	710.02	710.35	34.20	685.35	675.35
MW-33A	711141.33	1317245.21	715.49	715.81	42.13	683.97	673.97
MW-35A	712397.75	1317420.13	710.07	710.37	39.93	680.37	670.37
MW-37A	711292.75	1315970.64	713.69	710.78	28.70	696.12	686.12
MW-38A	711423.71	1316218.22	711.69	712.00	24.94	698.09	688.09
MW-39A	711611.83	1316622.58	711.44	711.93	22.13	699.60	689.60
MW-40A	711743.61	1316909.28	712.47	712.84	26.39	698.02	688.02
MW-41A	711979.07	1316981.53	715.09	712.31	28.85	697.40	687.40
MW-42A	711913.59	1317162.11	715.71	713.20	29.33	697.60	687.60
MW-42C	711912.67	1317153.66	716.06	713.45	53.65	673.45	663.45
MW-43A	711664.59	1317267.38	712.80	712.99	25.94	697.75	687.75
MW-44A	711508.15	1317339.28	712.32	712.65	25.40	698.23	688.23
MW-45A	711296.63	1317437.79	713.17	713.48	25.23	699.23	689.23
MW-46A	711460.91	1316825.69	714.89	715.37	29.12	697.05	687.05
MW-47A	711384.69	1317137.97	713.85	714.16	26.71	697.73	687.73
Trench Sump							
T-1	711594.43	1316763.03	713.88	-	27.42	n/a	686.46
T-2	711735.42	1317156.53	715.24	-	25.13	n/a	690.11
T-3	711963.26	1317105.09	712.91	-	29.03	n/a	683.88
T-4	711370.51	1317322.79	715.21	-	22.10	n/a	693.11
T-5	711409.14	1316354.04	713.21	-	23.15	n/a	690.06
Trench Wells (Piezometers Mid-trench)							
TMP-49 (T-1)	711551.82	1316662.60	712.19	712.55	18.78	n/a	693.41
TMP-51 (T-2)	711634.52	1317202.64	713.75	714.05	22.19	n/a	691.56
TMP-50 (T-3)	711918.79	1317001.82	715.86	713.52	20.90	n/a	694.96
TMP-52 (T-4)	711267.41	1317367.74	714.76	715.12	18.20	n/a	696.56
TMP-48 (T-5)	711364.67	1316251.01	714.30	712.60	16.20	n/a	698.10

Notes:

- 1) All survey results reported by URS' September 2011 survey of monitoring well network and trench / sump locations. State plane coordinates for northings and easting; elevations in feet above MSL. Wells MW-38B and MW-39A re-surveyed Oct-2012 following damage repairs.
- 2) Monitoring wells MW-38B and MW-39A re-surveyed for elevation of top of casing in October 2012 following well repairs. Revised survey data presented.
- 3) Screened Intervals for monitoring well network reported from 1997 spreadsheet furnished by M. Baker on behalf of DEP to URS in 2007; data for 2010 installed monitoring wells MW-11A, -11B, 12A, -31A, -35A, and -42C obtained from 2011 HGL, Inc. Report.
- 4) n/a indicates data not available; reported bottom elevation of piezometers derived via total measured depths.
- 5) Monitoring well construction and survey data for monitoring well MW-7 based upon gauging data (total depth) and survey data provided in 2011 HGL, Inc. Report.



REFERENCE:
 BASE MAP IS A PORTION OF THE U.S.G.S. 7.5 MINUTE TOPOGRAPHIC SERIES SWANVILLE, PA QUADRANGLE. DATED: 1957, PHOTOREVISED 1990
 SCALE: 1" = 2000', CONTOUR INTERVAL IS 10 FEET, NGVD 1929.

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PITTSBURGH, PENNSYLVANIA

2015 ANNUAL GROUNDWATER MONITORING REPORT SITE LOCATION MAP

MILLCREEK DUMP NPL SITE ERIE, PA

CLIENT: PA DEPT. OF ENVIRONMENTAL PROTECTION JOB No.: 2499.MILLCREEKD

SCALE: AS SHOWN

FIGURE
 NUMBER

Figure 1

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Figure 2
Mill Creek Dump Site

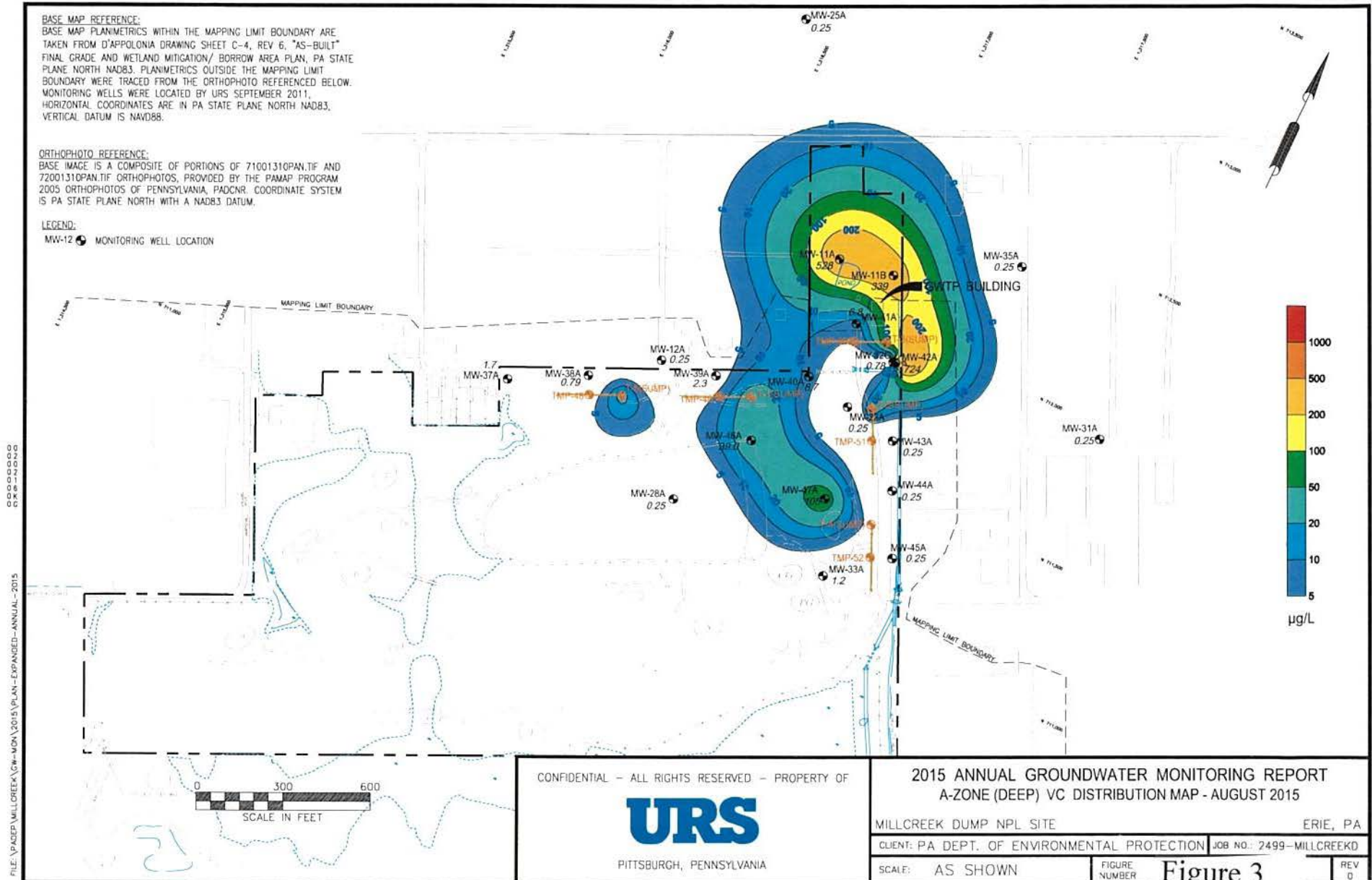
Legend

- Groundwater Extraction Trench
- Site Boundary

X: EPA010 Mill Creek Maps Five-Year Review
(1) Site Boundary.mxd
4/20/2011 PJ
Source: 2009, GeoTrans - Remediation System Evaluation,
HGL GIS, ESRI, pascapssu.edu

BASE MAP PLANIMETRICS WITHIN THE MAPPING LIMIT BOUNDARY ARE TAKEN FROM D'APPOLONIA DRAWING SHEET C-4, REV 6, "AS-BUILT" FINAL GRADE AND WETLAND MITIGATION/ BORROW AREA PLAN, PA STATE PLANE NORTH NAD83. PLANIMETRICS OUTSIDE THE MAPPING LIMIT BOUNDARY WERE TRACED FROM THE ORTHOPHOTO REFERENCED BELOW. MONITORING WELLS WERE LOCATED BY URS SEPTEMBER 2011. HORIZONTAL COORDINATES ARE IN PA STATE PLANE NORTH NAD83, VERTICAL DATUM IS NAVD88.

BASE IMAGE IS A COMPOSITE OF PORTIONS OF 71001310PAN.TIF AND 72001310PAN.TIF ORTHOPHOTOS, PROVIDED BY THE PAMAP PROGRAM 2005 ORTHOPHOTOS OF PENNSYLVANIA, PADCNR. COORDINATE SYSTEM IS PA STATE PLANE NORTH WITH A NAD83 DATUM.

MW-12  MONITORING WELL LOCATION

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PITTSBURGH, PENNSYLVANIA

2015 ANNUAL GROUNDWATER MONITORING REPORT
A-ZONE (DEEP) VC DISTRIBUTION MAP - AUGUST 2015

MILLCREEK DUMP NPL SITE

ERIE, PA

CLIENT: PA DEPT. OF ENVIRONMENTAL PROTECTION	JOB NO.: 2499-MILLCREEKD
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SCALE: AS SHOWN

FIGURE
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Figure 3

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BASE MAP REFERENCE:

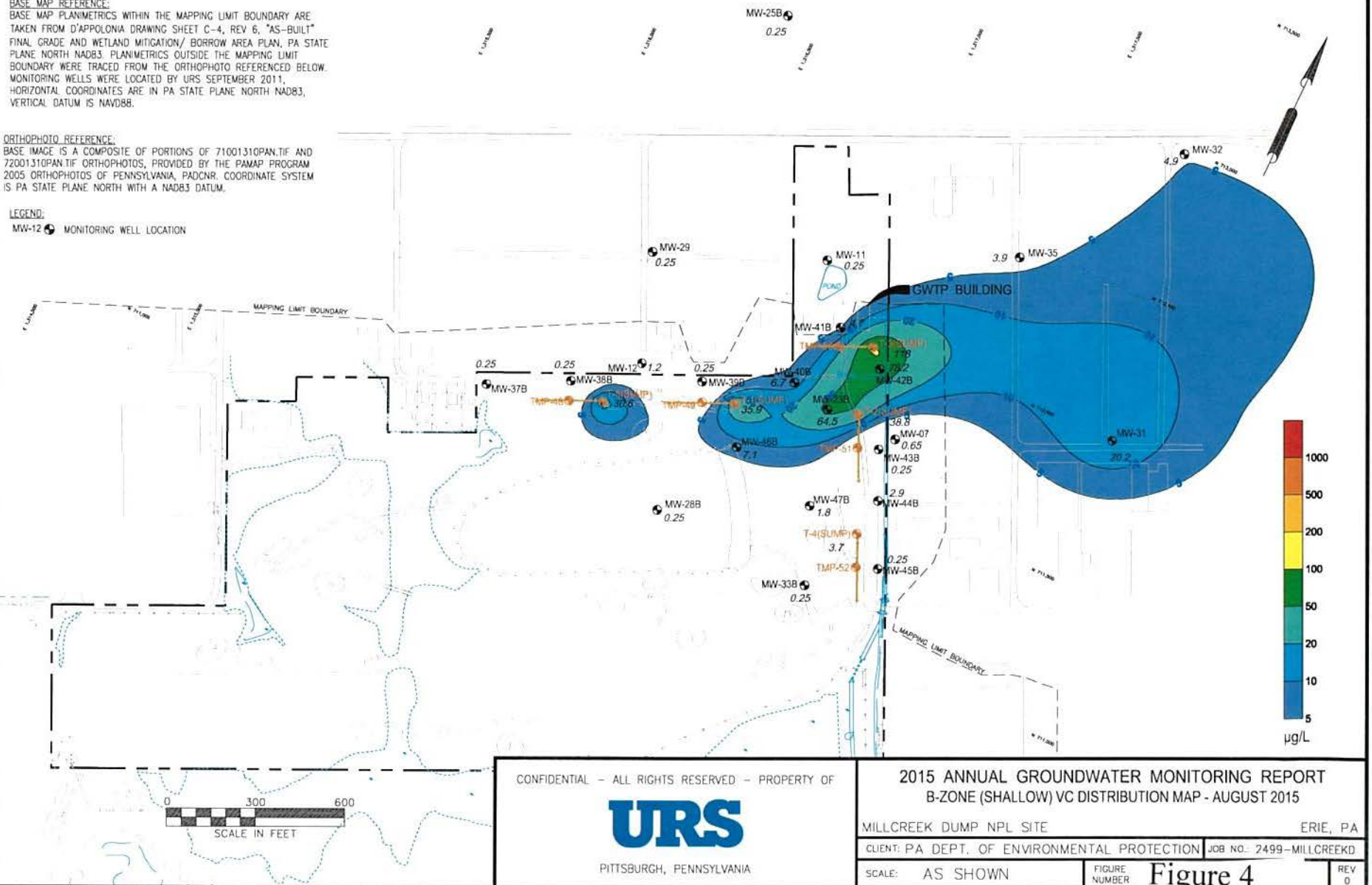
BASE MAP PLANIMETRICS WITHIN THE MAPPING LIMIT BOUNDARY ARE TAKEN FROM D'APPOLONIA DRAWING SHEET C-4, REV 6, "AS-BUILT" FINAL GRADE AND WETLAND MITIGATION/ BORROW AREA PLAN, PA STATE PLANE NORTH NAD83. PLANIMETRICS OUTSIDE THE MAPPING LIMIT BOUNDARY WERE TRACED FROM THE ORTHOPHOTO REFERENCED BELOW. MONITORING WELLS WERE LOCATED BY URS SEPTEMBER 2011. HORIZONTAL COORDINATES ARE IN PA STATE PLANE NORTH NAD83, VERTICAL DATUM IS NAVD88.

ORTHOPHOTO REFERENCE:

BASE IMAGE IS A COMPOSITE OF PORTIONS OF 71001310PANTIF AND 72001310PANTIF ORTHOPHOTOS, PROVIDED BY THE PAMAP PROGRAM 2005 ORTHOPHOTOS OF PENNSYLVANIA, PADCN. COORDINATE SYSTEM IS PA STATE PLANE NORTH WITH A NAD83 DATUM.

LEGEND:

MW-12  MONITORING WELL LOCATION



BASE MAP REFERENCE:

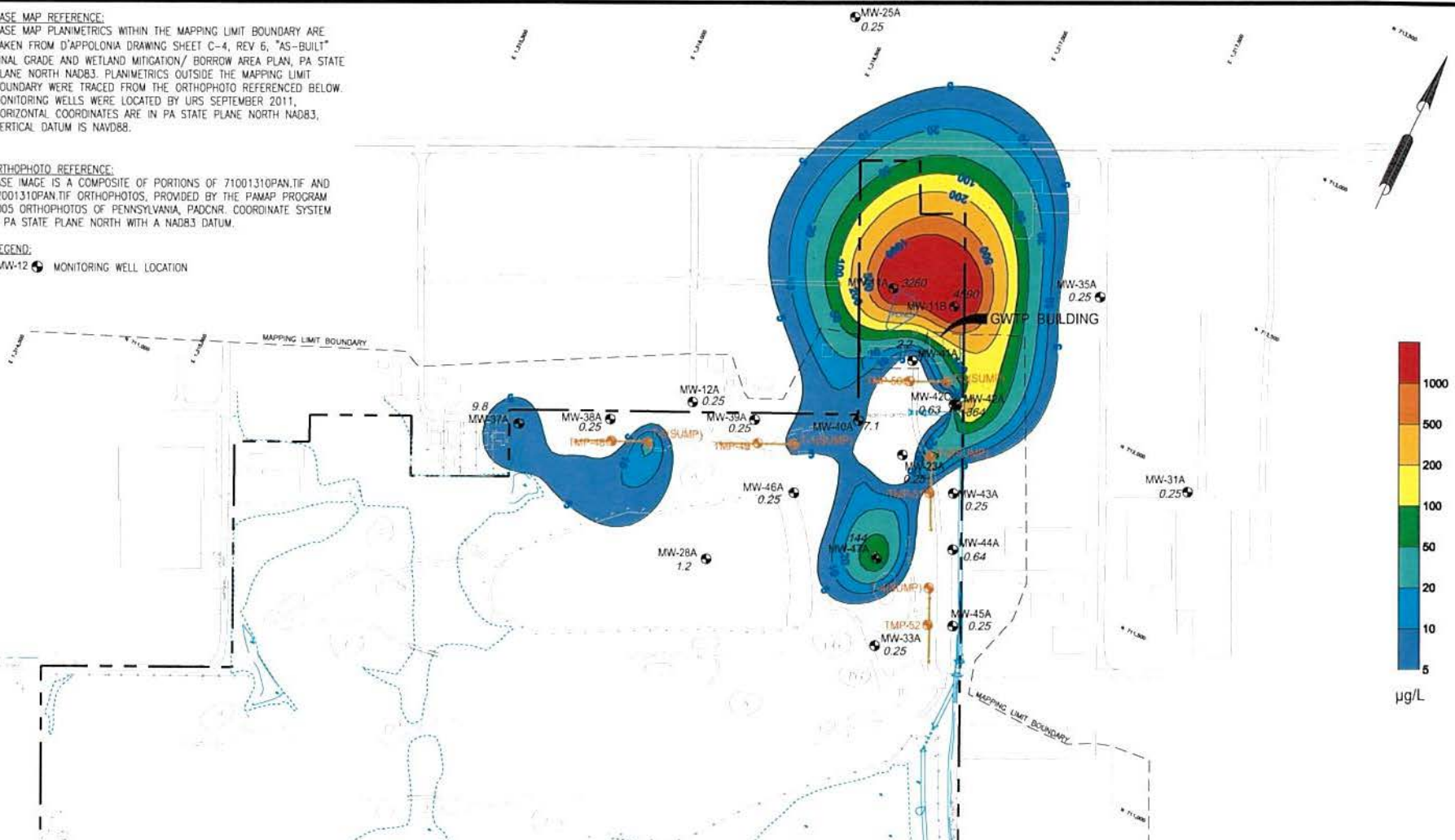
BASE MAP PLANIMETRICS WITHIN THE MAPPING LIMIT BOUNDARY ARE TAKEN FROM D'APPOLONIA DRAWING SHEET C-4, REV 6, "AS-BUILT" FINAL GRADE AND WETLAND MITIGATION/ BORROW AREA PLAN, PA STATE PLANE NORTH NAD83. PLANIMETRICS OUTSIDE THE MAPPING LIMIT BOUNDARY WERE TRACED FROM THE ORTHOPHOTO REFERENCED BELOW. MONITORING WELLS WERE LOCATED BY URS SEPTEMBER 2011. HORIZONTAL COORDINATES ARE IN PA STATE PLANE NORTH NAD83. VERTICAL DATUM IS NAVD88.

ORTHOPHOTO REFERENCE:

BASE IMAGE IS A COMPOSITE OF PORTIONS OF 71001310PAN.TIF AND 72001310PAN.TIF ORTHOPHOTOS, PROVIDED BY THE PAMAP PROGRAM 2005 ORTHOPHOTOS OF PENNSYLVANIA, PADCNR. COORDINATE SYSTEM IS PA STATE PLANE NORTH WITH A NAD83 DATUM.

LEGEND:

MW-12  MONITORING WELL LOCATION



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PITTSBURGH, PENNSYLVANIA

**2015 ANNUAL GROUNDWATER MONITORING REPORT
A-ZONE (DEEP) cis-DCE DISTRIBUTION MAP - AUGUST 2015**

MILLCREEK DUMP NPL SITE

ERIE, PA

CLIENT: PA DEPT. OF ENVIRONMENTAL PROTECTION

JOB NO.: 2499-MILLCREEKD

SCALE: AS SHOWN

FIGURE
NUMBER

Figure 5

REV
0

BASE MAP REFERENCE:
 BASE MAP PLANIMETRICS WITHIN THE MAPPING LIMIT BOUNDARY ARE TAKEN FROM D'APPOLONIA DRAWING SHEET C-4, REV 6, "AS-BUILT" FINAL GRADE AND WETLAND MITIGATION/ BORROW AREA PLAN, PA STATE PLANE NORTH NAD83. PLANIMETRICS OUTSIDE THE MAPPING LIMIT BOUNDARY WERE TRACED FROM THE ORTHOPHOTO REFERENCED BELOW. MONITORING WELLS WERE LOCATED BY URS SEPTEMBER 2011. HORIZONTAL COORDINATES ARE IN PA STATE PLANE NORTH NAD83, VERTICAL DATUM IS NAVD88.

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LEGEND:

MW-12  MONITORING WELL LOCATION

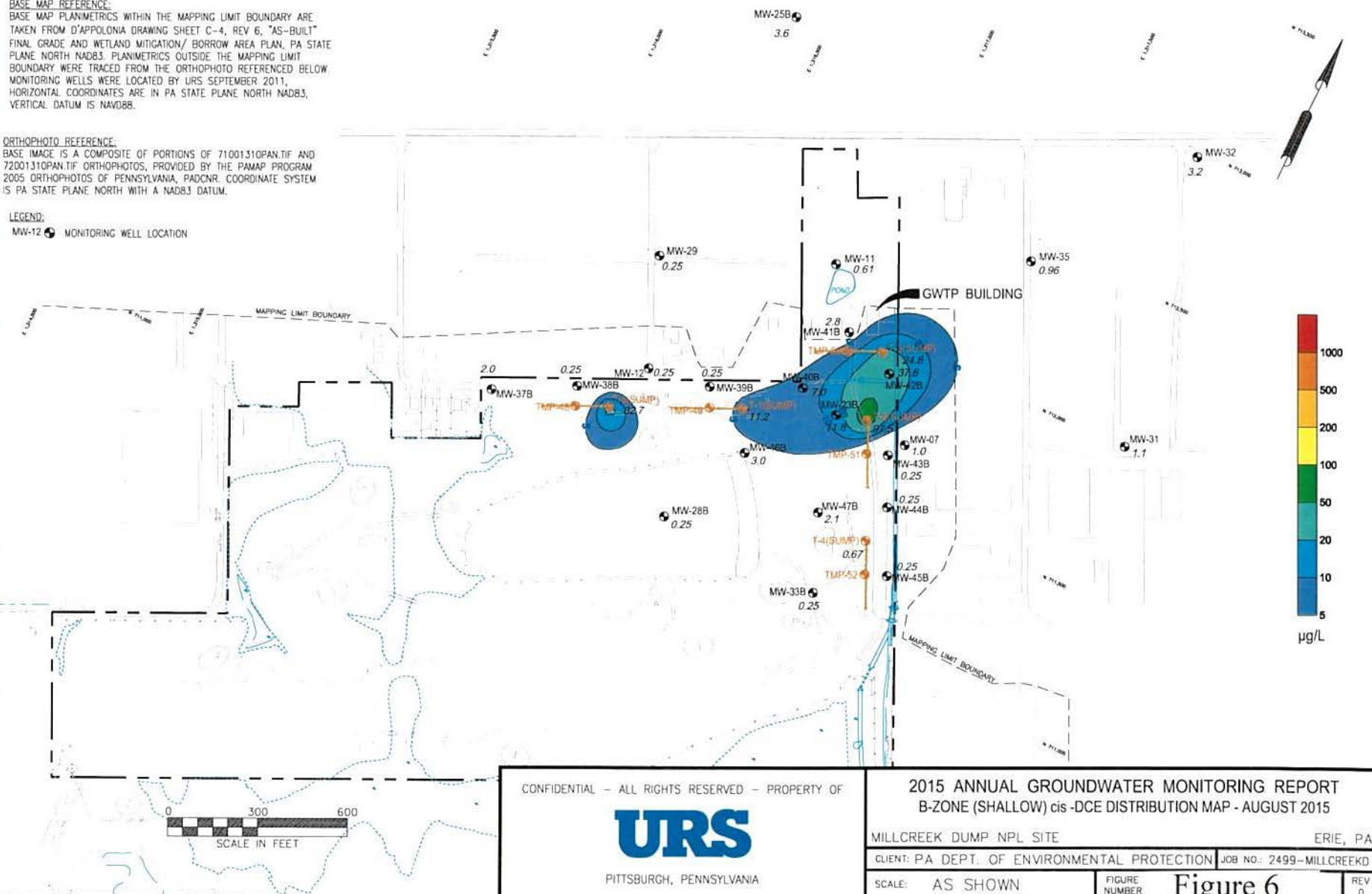


Figure 7

Annual Groundwater Recovery Trench Operational Summary 2008-2014
2014 Annual Groundwater Monitoring Report
Millcreek Dump NPL Site - Erie, PA

