# RECORD OF DECISION
# FOR EARLY INTERIM REMEDIAL ACTION

## CHEM-FAB SUPERFUND SITE
## OPERABLE UNIT 2

### DOYLESTOWN, BUCKS COUNTY, PENNSYLVANIA

**U. S. ENVIRONMENTAL PROTECTION AGENCY**
**REGION 3, PHILADELPHIA, PENNSYLVANIA**
**JULY 2017**

CHEM-FAB SUPERFUND SITE
OPERABLE UNIT 2
DOYLESTOWN BOROUGH, PENNSYLVANIA

RECORD OF DECISION

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CHEM-FAB
SUPERFUND SITE
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## DECLARATION

### Site Name and Location

Chem-Fab Superfund Site
Operable Unit 2
Doylestown Borough, Bucks County, Pennsylvania
CERCLIS ID Number PAD002323848

### Statement of Basis and Purpose

This decision document presents the selected early interim remedial action for Operable Unit 2 ("OU2") of the Chem-Fab Superfund Site ("Site") located in Doylestown Borough, Bucks County, Pennsylvania (see Figure 1) which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended ("CERCLA"), 42 U.S.C. §§ 9601 -9675, and the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C.F.R. Part 300. This decision document explains the factual and legal basis for selecting the early interim remedial action for OU2 of the Site. The information considered or relied upon in making this decision is contained in an Administrative Record established in connection with the selected action. The Pennsylvania Department of Environment Protection ("PADEP") concurred with the selected remedy in a letter dated June 27, 2017.

### Assessment of the Site

The early interim remedial action selected in this record of decision ("ROD") is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

### Description of the Selected Remedy

The remedial action for OU2 described here is an early interim remedy and will be the second remedial action selected for the Site. Former electroplating and disposal operations conducted at the Site have resulted in residual contamination, mainly hexavalent chromium ("Cr[VI]") and volatile organic compounds ("VOCs"), in soil and groundwater.

The Site consists of a commercial property located at 300-360 N. Broad Street in Doylestown, Pennsylvania ("Property"), upon which industrial and disposal operations occurred in the past as well as other properties where contamination from such operations has migrated or otherwise come to be located. From approximately 2001 through the present, the Property has been used for commercial leasing of office space. EPA and the Commonwealth of Pennsylvania have performed extensive investigations and a number of response actions at the Site, including the Property, since the 1980s, including the following:

- In August 1987, EPA performed a preliminary assessment focused on groundwater at the Site and detected VOCs in residential wells located in the vicinity of the Property. In October 1987, EPA conducted a removal action which included the delivery of bottled water and carbon filtration units to affected residences, and ultimately, the connection of affected residences to public water supplies.
- In September 1994, EPA performed a removal assessment at the Property and found improperly and incompatibly stored drums of hazardous materials, including flammable liquids and acids. Samples from these drums indicated the presence of VOCs and Cr[VI]. EPA also found a 50-foot underground storage tank ("UST") which contained approximately 6,000 gallons of liquid and sludge and which appeared to be leaking. In 1994-1995, EPA conducted a second removal action to remove drums and wastes from the Property.
- Between 1998-2007, PADEP conducted investigations at the Site, including the Property, and found VOCs and metals in soils and groundwater at the Site.
- In September 2007, EPA proposed the Site to the CERCLA National Priorities List ("NPL"). The Site was finalized to the NPL in March 2008.
- In September 2009, EPA commenced a Fund-lead remedial investigation and feasibility study ("RI/FS") at the Site. This study is ongoing.
- In late 2011 and early 2012, EPA collected subslab and indoor air samples from commercial buildings at the Property and determined that unacceptable levels of VOCs were migrating into office spaces in one of the buildings. In November 2012, EPA selected additional removal actions which resulted in the placement of air purifiers in several offices within the impacted building.
- In December 2012, EPA issued an Interim ROD for Operable Unit 1 ("OU1"), which selected excavation and disposal of contaminated soils outside the footprint of the buildings on the Property and backfilling the excavation with clean fill. This work was ultimately implemented in a removal action selected by EPA in 2014.
- In September 2015, EPA selected additional removal actions which resulted in the replacement of the air purifiers within the impacted building at the Property with a permanent subslab depressurization system.
- In September 2016, EPA finalized a focused feasibility study ("FFS") to identify alternatives for an interim remedial action to address the most significant groundwater contamination at the Site. The FFS identifies alternatives for addressing risks presented by contaminated groundwater within the area of highest groundwater contamination ("AOHC").

The selected early interim remedial action addresses the threat from contaminated groundwater within the AOHC. This contamination presents a risk of exposure via direct contact with the contaminated groundwater from a nearby drinking water well, exposure to surface water and sediments that have been contaminated by the groundwater and vapor intrusion from volatilization of contaminated groundwater. The goal of the action is to prevent further migration of contaminated groundwater from the AOHC, including migration to a nearby drinking water well, and begin restoration of the groundwater to beneficial use by reducing volume of contaminated groundwater within the AOHC.

The selected early interim remedial action includes the following major components:

- Construction of an extraction/treatment system to extract groundwater from the AOHC to prevent further migration of contaminants within the AOHC from migrating outside the AOHC;

- Treatment of contaminated groundwater and discharge of treated groundwater to Cook's Run;

- Long-term monitoring.

**Statutory Determinations**

The selected early interim remedial action is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action ("ARARs") that are not waived, is cost-effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

The selected action is considered an "early" action because it is being selected prior to completion of the RI/FS at the Site. In addition, the selected remedy is an "interim action" because it is limited in scope and solely addresses areas or media that will also be addressed by a final ROD. This early interim remedial action will be consistent with the subsequent remedial actions which will address the remaining contaminated groundwater at the Site and other contaminated media.

Section 121(d)(4)(A) of CERCLA provides that EPA may select a remedial action that does not meet an applicable or relevant and appropriate standard, requirement, criteria, or limitation ("ARAR") if the remedial action is only part of a total remedial action that will attain such level or standard of control when completed. Because this remedial action is part of a total remedial action that will meet ARARs when completed, EPA is waiving, and this early interim remedial action will not meet, ARARs establishing groundwater cleanup standards. Specifically, EPA is waiving the requirement that Site groundwater meet Maximum Contaminant Levels ("MCLs") and non-zero Maximum Contaminant Level Goals ("MCLGs") established pursuant to the Safe Drinking Water Act, 42 U.S.C. §§ 300f et seq. These requirements are waived pursuant to the interim action waiver set forth in Section 121(d)(4)(A) of CERCLA and 40 C.F.R. § 430(f)(1)(ii)(C)(1).

ARARs for this action that are not waived include, among others, Federal and State regulations covering dust suppression, erosion control, disposal requirements and other construction-related activities. Other ARARs for this action that are not waived include Federal and State regulations covering discharge of contaminants to surface water from groundwater extraction and treatment.

The early interim remedy selected for OU2 satisfies the statutory preference for treatment. The ultraviolet ("UV") oxidation system, air stripping unit, ion exchange unit, and granular activated carbon ("GAC ") will treat contamination in the extracted groundwater and are principal elements of the selected remedy.

Because this early interim remedial action will result in hazardous substances remaining on-Site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted every five years after initiation of the early interim remedial action to ensure that the remedy is protective of human health and the environment pursuant to CERCLA Section 121(c) and 40 C.F.R. § 300.430(f)(4)(ii).

**Data Certification Checklist**

The following information is included in the Decision Summary of this Early Interim ROD. Additional information can be found in the Administrative Record for this early interim remedial action.

| ROD CERTIFICATION CHECKLIST | |
|---|---|
| **Information** | **Location/Page Number** |
| Chemicals of concern and respective concentrations | Section 5.2.1, p. 8 and Section 7.1.1, p. 12 |
| Baseline risk represented by the chemicals of concern | Section 7.0, p. 12 |
| Clean-up levels established for chemicals of concern and the basis for these levels | Section 8.0, p. 14 |
| How source materials constituting principal threat are addressed | Section 7.1.2, p. 13 and Section 12.5, p. 31 |
| Current and reasonably anticipated future land use assumptions and potential future beneficial uses of groundwater | Section 6, p. 11 and Section 11.4, p. 29 |
| Potential future land and groundwater use that will be available at the Site as a result of the selected remedy | Section 11.4, p. 29 |
| Estimated capital, annual operation and maintenance, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected | Section 11.3, p. 29 and Table 3 |
| Key factors that led to selecting the remedy | Section 11.1, p. 25 |

Karen Melvin

Karen Melvin, Director
Hazardous Site Cleanup Division
EPA Region III

JUL 17 2017

Date

# *II. DECISION SUMMARY*

## *CHEM-FAB SUPERFUND SITE*
## *OPERABLE UNIT 2*
## *EARLY INTERIM REMEDIAL ACTION*

## *DOYLESTOWN BOROUGH, BUCKS COUNTY, PENNSYLVANIA*

## 1.0 SITE NAME, LOCATION AND DESCRIPTION

The Chem-Fab Superfund Site ("Chem-Fab Site" or "Site") is located at and around 300-360 N. Broad Street in Doylestown Borough, Bucks County, Pennsylvania (Figure 1). The Site is located approximately 0.6 miles from the center of Doylestown and is surrounded by a mixture of commercial, industrial and residential areas. The closest school is approximately 0.5 miles to the southwest.

The Site includes 300-360 N. Broad Street (the "Property") upon which industrial and disposal operations occurred in the past as well as other properties where contamination from such operations has migrated or otherwise come to be located. The Property currently contains an office park located in three buildings which host several commercial tenants. From the mid-1960s to the early 1990s, Chem-Fab, Inc. ("Chem-Fab") operated an electroplating and metal etching facility on the Property. Chem-Fab's operations generated wastes that included metals, volatile organic compounds ("VOCs") and other industrial wastes. The Comprehensive Environmental Response, Compensation, and Liability Information System ("CERCLIS") identification number for the Site is PAD002323848.

The U.S. Environmental Protection Agency ("EPA") is the lead agency for Site activities and the Pennsylvania Department of Environmental Protection ("PADEP") is the support agency. The first operable unit ("OU1") consists of certain contaminated soils at the Property. In December 2012, an interim record of decision ("ROD") for OU1 was signed. The selected remedy in the OU1 interim ROD consisted of excavation and off-Site disposal of contaminated soils outside the footprint of the buildings on the Property and backfilling the excavation areas with clean fill. The action in this ROD addresses the area of highest groundwater contamination ("AOHC") within Operable Unit 2 ("OU2"). OU2 consists of contaminated groundwater at the Site. This action comprises the first remedial action for OU2 and is considered an early interim action.

An "interim action" is limited in scope and solely addresses areas/media that will also be addressed by a final ROD. Interim actions are implemented to:

- Take quick action to protect human health and the environment from an imminent threat in the short term while a final remedial action is being developed, or

- Institute temporary measures to stabilize the Site or OU and/or prevent further migration of contaminants or further environmental degradation.

In this instance, it is appropriate to take an interim action in order to prevent further migration of groundwater contamination and to ensure that contamination does not reach areas where it could expose the public and the environment to unacceptable levels of contamination. The scope and media to be addressed by this interim action are limited to groundwater within the AOHC.

The term "early" is used to describe when an action is taken in the Superfund process. In this instance, the action is "early" because it is being implemented before completion of the remedial investigation and feasibility study ("RI/FS") for the Site[1].

In August 2015, EPA began work on a focused feasibility study ("FFS") to identify alternatives for an early interim remedial action to address the AOHC at the Site based on data collected by EPA during the current RI and by PADEP in its previous investigations. The FFS, dated September 2016, summarizes these investigations and identifies alternatives for addressing contaminated groundwater within the AOHC.

## 2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Prior to construction of the Chem-Fab facility, land use in the vicinity of the Site was mainly agricultural. The Property contained a residential farmhouse and a smaller building. In or around 1965, the Chem-Fab facility was erected and operated as an electroplating and metal etching company through the early 1990s. Electroplating and metal etching operations generated wastes that included ferric chloride, mineral spirits, chromic acid rinse water and sludge, chromic acid, sulfuric acid, sodium bisulfate, sodium hydroxide, and lime. A trichloroethylene ("TCE") vapor degreasing process was used until 1973. The former Chem-Fab tank farm contained up to six above-ground storage tanks ("ASTs"), including 2,500-, 4,000-, and 8,500-gallon ASTs. The Property additionally contained one 10,000-gallon underground storage tank ("UST") and a 1,000-gallon underground catch basin.

The Chem-Fab facility was cited several times during the 1960s and 1970s by both the Bucks County Department of Health and the Pennsylvania Department of Environmental Resources ("PADER") (PADEP's predecessor agency) for spills and improper discharge of industrial wastes from ASTs, USTs, and the catch basin to Cooks Run, a nearby creek. These releases included chromic acid rinse water spills from broken valves on pretreatment tanks and overflows of the catch basin.

In the late 1970s, Chem-Fab was acquired by Boarhead Corporation, a business established by Manfred DeRewal, Sr ("DeRewal"). DeRewal was also a principal of DeRewal Chemical Company Inc. ("DCC"), which removed, transported, and disposed of chemical waste generated by other companies. Following acquisition by Boarhead Corporation, liquid wastes, including hundreds of thousands of gallons of ammonia, hydrochloric acid, and pickle liquor waste were transported from various industrial entities to the Property for disposal. In addition to Chem-Fab, two other entities associated with DeRewal – a gallium reclamation business and a computer assembly operation – operated at the Property during the 1980s and 1990s, respectively. Chem-Fab owned the property through approximately May 1999.

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[1] See "A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents" (Office of Solid Waste and Emergency Response) (July 1999) ("ROD Guidance"), at 8-2

In August 1987, EPA performed a preliminary assessment and site inspection ("PA/SI") at the Site. During the PA/SI, water samples from residential wells and the municipal well located in the vicinity of the Site were found to contain elevated levels of VOCs including TCE and tetrachloroethylene ("PCE"). In October 1987, EPA conducted a removal action which included the delivery of bottled water and carbon filtration units to affected residences and, ultimately, the connection of affected residences to public water supplies.

In September 1994, EPA conducted a removal assessment at the Property. EPA found improperly and incompatibly stored drums of hazardous material, including flammable liquids and acids. Samples from these drums indicated the presence of acids, TCE, and chromium. A drum of radioactive thorium nitrate and containers of ammonia were also discovered. EPA also found a 10,000 gallon UST which contained approximately 6,000 gallons of liquid and sludge and which appeared to be leaking. Samples from the UST were found to contain hexavalent chromium ("Cr[VI]"). Samples taken from a sump located inside the warehouse indicated the presence of TCE.

In 1994-1995, EPA conducted a second removal action at the Site, at which time it found label information on drums and other containers indicating the presence of xylene, toluene, hydrochloric acid, sulfuric acid, nitric acid, caustic soda, methyl isobutyl ketone, polymeric isocyanate, benzenesulfonic acid, nickel rinse waste, methylene chloride, ferric chloride, chromate waste acid, and anhydrous ammonia. During that response, EPA removed 117 drums and 8,400 gallons of liquid wastes, including chromium-contaminated wastes from the UST as well as other solid wastes and fuel oils.

In or around November 1998, PADEP assumed the lead role in further assessing the Site. Beginning in 1999, PADEP began an investigation of the soils and groundwater in the vicinity of the Site. PADEP found Cr[VI] and VOCs in the soils and in the groundwater on the Property and on an adjacent property. Visible chromium contamination was found in the drainage ditch on the adjacent property. In 2004, PADEP issued a Statement of Decision selecting a groundwater remedy for the Site. However, implementation of the remedy was delayed due to technical issues and a lack of funding. PADEP continued its investigation and requested that EPA list the Site on the CERCLA National Priorities List ("NPL"). EPA proposed the Site for the NPL in September 2007. The Site was formally added to the NPL in March 2008.

In September 2009, EPA initiated a Fund-lead RI/FS to comprehensively characterize the nature and extent of contamination at the Site and to evaluate alternatives for addressing threats to human health and the environment presented by such contamination. The remedial investigation ("RI"), which has not yet been completed, has thus far included additional soil, sediment, and groundwater testing to supplement previous investigations conducted by PADEP. EPA has also conducted vapor intrusion sampling in the homes of residents living down-gradient from the Site, and has conducted vapor intrusion sampling in the commercial spaces at the Property.

In November 2012, EPA initiated a third removal action intended to reduce VOCs in suites inside an office building located on the Property. This removal action involved the installation of portable air purifiers into selected suites within the impacted building. Additional indoor air sampling was conducted at the former Chem-Fab facility, and in 2015, a subslab vapor mitigation system was installed to reduce concentrations of VOCs in both the indoor air and subslab. Analysis of samples taken in January 2017 confirm that the vapor mitigation system reduces levels of VOCs in the indoor air and subslab to acceptable levels.

In December 2012, EPA issued an interim ROD for OU1. The selected remedy in the OU1 interim ROD consisted of excavation and disposal of contaminated soils outside the footprint of the buildings on the Property and backfilling the excavation with clean fill.

In September 2013, EPA selected a fourth removal action consisting of excavation and off-Site disposal of certain contaminated soil located at the Property. The removal action was implemented between March and August, 2014. Post-excavation sampling confirmed that soil had been excavated to cleanup levels identified in the OU1 interim ROD.

From August 2015 through September 2016, EPA conducted an FFS to identify alternatives for an interim remedial action to address the AOHC based on data collected by EPA during the ongoing RI and by PADEP in its previous investigations.

## 3.0 COMMUNITY PARTICIPATION

The FFS, proposed remedial action plan ("PRAP"), and other documents relating to OU2 of the Site are contained in the administrative record supporting selection of this early interim remedial action, which can be viewed at https://semspub.epa.gov/src/collection/03/AR64588 or at the following locations:

| | |
|---|---|
| EPA Administrative Records Room,<br>Attention: Administrative Coordinator<br>1650 Arch Street<br>Philadelphia, PA<br>(215) 814-3157<br>Hours: Monday through Friday, 8:00am to 4:30pm; by appointment only. | Bucks County Free Library<br>150 South Pine Street<br>Doylestown, PA 18901<br>(215) 348-9081 |

A notice of availability of these documents was published in the Intelligencer, a Bucks County newspaper, on October 6, 2016. In addition, EPA sent a fact sheet summarizing the Agency's preferred remedial alternative for early interim remedial action at OU2 to residences and businesses near the Site in October 2016.

EPA held a 30-day comment period from October 1-October 31, 2016 to accept public comments on the remedial alternatives presented in the PRAP, as well as on the other documents contained within the administrative record file. On October 18, 2016, EPA held a public meeting to discuss the PRAP and accept comments. A transcript of this meeting is included in the administrative record for this early interim remedial action. The summary of significant comments received during the public comment period and EPA's responses are included in the Responsiveness Summary which is a part of this early interim ROD.

## 4.0 SCOPE AND ROLE

This early interim remedial action addresses the AOHC within OU2. OU2 consists of contaminated groundwater at the Site. A final action for the Site will be proposed following completion of the RI/FS, which addresses all remaining contaminated media, including groundwater, at the Site.

The AOHC is generally located at the Property where the former Chem-Fab facility was historically located, and the adjacent commercial property to the southwest, as shown on Figure 1. The AOHC is based on groundwater data which indicate that the highest groundwater contamination is generally found in monitoring wells on the Property and adjacent commercial property.

This early interim remedial action for OU2 will specifically address the groundwater within the AOHC located on the Property and the neighboring self-storage facility and will be consistent with subsequent remedial actions which will address all groundwater contamination at the Site.

EPA characterizes waste on-Site as either principal threat waste or low-level threat waste. The concept of principal threat waste and low-level threat waste, as developed by EPA in the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), is applied on a Site-specific basis when characterizing source material. "Source material" is defined as material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater, to surface water, to air, or that act as a source for direct exposure[2]. Principal threat wastes are those source materials considered to be highly toxic or highly mobile, which would present a significant risk to human health or the environment should exposure occur. Contaminated groundwater is generally not considered to be source material. However, non-aqueous phase liquids ("NAPLs") in groundwater may be considered source material. The presence of NAPLs has not been determined at the Site. However, TCE and PCE are at concentrations exceeding 1% of their solubility, which is indicative of the presence of NAPLs.

[2] ROD Guidance, at p. 6-40

## 5.0 SITE CHARACTERISTICS

### 5.1 Surface Features, Soil and Geology, Hydrogeology, and Surface Hydrogeology

#### 5.1.1 Surface Features and Resources

The Site includes the Property located at 300-360 N. Broad Street upon which industrial and disposal operations occurred in the past as well as other properties where contamination from such operations has migrated or otherwise come to be located. The Property is currently zoned for commercial use and contains a small office park with three buildings housing several commercial tenants, partially vegetated land, and paved and gravel driveways and parking areas. The Property is bordered to the north by N. Broad Street, to the east by an operating commercial business, and to the south and west by an active self-storage facility. Elevations in the area range from approximately 340 to 360 feet above mean sea level, with the ground sloping gently to the west towards Cooks Run.

#### 5.1.2 Soil and Geology

Soil at the Site is associated with the Doylestown Series and Abbottstown Series and consists of deep, poorly drained, nearly level to gently sloping soil on uplands. The Doylestown soil was formed in silty material overlying a variety of loamy materials generally weathered from shale and sandstone, and the Abbottstown Series consists of deep, somewhat poorly drained, nearly level soil on uplands, formed in loamy material weathered from brown shale and sandstone. Both soil series are considered poorly to moderately permeable and allow for slow to moderate runoff. Across much of the Site, the aforementioned soil series are overlain by fill material. The fill material likely consists of various unconsolidated local soils and gravel compacted and used to level and develop the Site to its current state. Soil boring logs describe soil at the Site as being unsaturated, primarily brown to red silty clay or clayey silt with trace sand.

Overburden material, consisting of soils and saprolite, range in thickness from 4 to 13 feet across the Site. Based on previous investigations, a weathered bedrock zone, consisting of very loose, dry, reddish-brown silt and trace fine to coarse sand, directly overlies the competent bedrock. Depending on the degree of weathering, very stiff reddish-brown clay may also be present.

The Site is located within the Triassic-Lowland physiographic province, which is characterized by an uplifted plane of inclined strata, with the more resistant strata forming residual ridges. Local relief within the region does not exceed 250 feet. The bedrock underlying the Site is Triassic-aged Stockton lithofacies, which consists of interbedded light-colored red to brown coarse-grained sandstones and conglomerates; fine-grained siliceous sandstones; and shales. The sandstones are more prevalent than the shales in this area. The shales and sandstones are interbedded, with individual beds pinching out laterally over short distances.

This geologic unit has a calculated thickness of approximately 3,000 feet, strikes from northeast to southwest (approximately N30°E), with a dip of approximately 10 degrees to the northwest. The formation contains a system of extensive fractures, generally oriented parallel and perpendicular to the strike of the bedrock units. The formation is cut by a well-developed system of joints and fractures.

### 5.1.3 Hydrogeology

Groundwater was encountered in the overburden soils and within the bedrock underlying the Site. The bedrock unit underlying the Site is the Triassic Stockton formation and was encountered at depths ranging from 8 to 18 feet below ground surface. Data collected to date indicate components of groundwater flow to the west and to the southwest. The formation has a wide range of well yields, ranging from 2 to 440 gallons per minute. A network of ninety-two (92) monitoring wells has been installed to characterize the contamination and hydrogeologic conditions at the Site. In order to help interpret and describe the geology at the Site, the rock stratigraphy in the monitoring wells has been divided into shallow, intermediate and deep zones. Monitoring wells have also been installed in the overburden layer to assess the groundwater flowing above the bedrock. The general groundwater flow direction at the Site is along the strike direction towards the southwest.

### 5.1.4 Surface Hydrogeology

Cooks Run is the sole named water body located within a one-mile radius of the Site. Surface drainage from the Property generally flows to the west and southwest toward Cooks Run via overland flow. A surface swale is also present on the self-storage facility, which directs surface run-off south and then west to Cooks Run. Cooks Run also receives groundwater from areas where the stream directly intersects the local groundwater table, as well as from nearby groundwater upwelling, which flows into Cooks Run in the form of overland flow. Cooks Run is a tributary of Neshaminy Creek, which eventually flows into the Delaware River.

The forested area to the west of Cooks Run includes scattered forested wetlands. These include isolated pools as well as areas associated with periodic inundation from Cooks Run. Many of the wetlands extend a significant distance from Cooks Run and appear to drain nearby forest corridors and developments. These wetlands are expected to receive inputs from a variety of sources, including overbank flooding, overland flow, ponding over fine grained deposits of clay or silt, and groundwater seeps. Temperature and conductivity surveys of these wetlands did not identify gradients that would clearly indicate the presence of seeps. Sediment in these wetlands was observed to be dense clay mixed with sand and gravel, which, along with the shallow physiographic setting of the wetlands, indicate that they are likely to be dominated by overland water sources rather than seeps.

Wetlands are also located east of Cooks Run in the forest and open field area. Temperature and conductivity surveys of these wetlands also did not identify gradients that would clearly indicate the presence of groundwater seeps. However, groundwater seeps have been observed on previous Site visits along the drainage swale leading from the area south of the self-storage facility. Also, several areas of the open field along Cooks Run have been observed to hold water for long periods after precipitation and exhibit drainage patterns that do not originate from an obvious overland source. Therefore, it is suspected that these low lying areas may function as groundwater seeps after periods of precipitation.

Surface water is also present in the form of two ponds south of the self-storage facility. One of the ponds is associated with a wastewater treatment facility, and the second appears to be a stormwater management pond associated with a housing development. It is unknown if these ponds are lined or if they may have a hydrologic connection with underlying groundwater. Observations during Site visits indicate that the pond associated with the housing development appears to have a clay bottom.

## 5.2 Nature and Extent of Contamination

Between 1998 and 2007, PADEP conducted extensive testing to assess the soils, groundwater and surface water at and in the vicinity of the Site. PADEP's efforts revealed high levels of soil contamination on the Property and the presence of Site-related contamination in the groundwater underneath, and migrating from, the Property. After listing the Site on the NPL, EPA initiated an RI to further characterize contamination at the Site, which has included additional soil, sediment, surface water and groundwater sampling, as well as installation of additional groundwater monitoring wells to delineate the groundwater plume. EPA has also conducted vapor intrusion sampling in the homes of residents living down-gradient from the Site, and in the commercial spaces at the Property.

### 5.2.1 Surface Soil

During the course of its investigation, PADEP collected 261 soil samples from 168 locations at and around the Property between 1999 and 2007. Soil at the Property was found to be contaminated with 47 chemicals above EPA Regional Screening Levels ("RSLs") including a number of inorganics, VOCs, and semi-volatile organic compounds ("SVOCs"). The most significant exceedances included Cr[VI], PCE, and TCE. Cr[VI], PCE, and TCE were found at concentrations up to 781 mg/kg, 190 mg/kg, and 4,000 mg/kg, respectively. The area of highest soil contamination roughly corresponds to the area where the above-ground tank farm was previously located. The former Chem-Fab facility had up to six above-ground storage tanks as well as a 10,000 gallon underground storage tank. Drums of hazardous waste were also found in this area during the 1994 EPA removal action.

As stated in Section 2.0, in December 2012, an interim ROD was issued selecting a remedy for OU1 to address the soil contamination outside the footprint of the existing buildings on the Property. The selected remedy consisted of excavation and disposal of contaminated soils and backfilling the excavation with clean fill. In September 2013, EPA selected a removal action to excavate and dispose these soils off-Site. The removal action was conducted between March and August of 2014, and met the performance standards of the OU1 interim ROD.

### 5.2.2 Groundwater

Groundwater at the Site contains many of the constituents found in soil at the Property including, among other contaminants, Cr[VI], PCE, TCE, and chemicals associated with the degradation of PCE and TCE. The presence of the same contamination in groundwater and soil suggests that the two are linked and that the groundwater contamination is likely a result of infiltration of contamination from the soil into the water table below. Figure 3 shows the current network of groundwater monitoring wells. Groundwater at the Property was found to be contaminated with 47 chemicals above EPA screening levels including a number of inorganics, VOCs, and semi-volatile organic compounds ("SVOCs"). Table 1 provides a list of chemicals exceeding EPA screening levels in the groundwater. The most significant exceedances include Cr[VI], PCE, and TCE. Cr[VI] has been detected at concentrations up to 233,000 µg/L in the groundwater. PCE and TCE have been detected in the groundwater at concentrations up to 4,330 µg/L and 35,000 µg/L, respectively. 1,4-dioxane was detected at a maximum concentration of 40 µg/L. Perfluoroalkyl substances ("PFASs") were also detected in the groundwater. Perfluorooctanoic acid ("PFOA") has been detected at concentrations up to 0.211 µg/L and perfluorooctane sulfonic acid ("PFOS") has been detected at concentrations up to 1.9 µg/L. Figures 2 to 10 are the most current plume maps for Cr [VI], PCE, and TCE. The AOHC is located primarily below the former Chem-Fab property and the adjacent self-storage facility.

Groundwater contamination extends from the Property in a southwest direction beneath the adjacent self-storage facility and beneath neighboring properties in Doylestown Township. The groundwater contamination also flows slightly westward in the dip direction towards Cooks Run, which is a tributary of the Neshaminy Creek. The highest levels of contamination reside in the overburden, shallow, and intermediate zones. However, groundwater contamination is also present in the deeper bedrock zone. Groundwater contamination continues to be investigated as part of the RI.

### 5.2.3 Residential Wells

Tenants at the Property rely on the local public water supply for potable water. However, residential and commercial wells exist in areas considered downgradient from the groundwater contamination. In 1987, residential wells in the vicinity of the Property were sampled as part of the PA/SI. Water samples from some of these wells were found to contain elevated levels of TCE and PCE. As a result, EPA conducted a removal action consisting of the delivery of bottled water and carbon filtration units to affected residences and connection of affected residences to public water supplies in 1987.

In November 2013 and January 2014, EPA collected samples from five residential wells and one commercial well located to the west and southwest of the Site, primarily along West Street and Shady Retreat Road. One of the residential wells was found to be contaminated with TCE above the applicable Maximum Contaminant Level ("MCL") established under the Safe Drinking Water Act. No other Site-related contamination was found in this well at levels of concern. In May 2014, EPA began providing bottled water to the impacted resident. The resident was subsequently connected to public water in 2015.

EPA collected samples from these residential and commercial wells again in July 2014 and from two additional private wells in September 2014. These samples were analyzed for PFASs. No PFASs were found in these wells above the EPA Lifetime Health Advisory for PFOS/PFOA of 0.07 ug/L.

#### 5.2.4 Municipal Supply Wells

In Doylestown Borough, potable water is obtained by drilling into the bedrock and extracting the groundwater. Doylestown Municipal Water Authority Well #13 ("MSW-13") is located approximately one-quarter mile southwest of the Property and was shut down in 2001 to prevent further spread of the contamination. Doylestown Municipal Water Authority Well #13 was historically pumped in the deeper portion of the aquifer. Doylestown Municipal Water Authority Well #8 ("MSW-08") is located approximately a half mile downgradient of the Property and continues to be monitored regularly for contamination. Samples in MSW-08 thus far have not shown levels of contamination which would warrant further response actions.

#### 5.2.5 Surface Water

Contamination in the overburden layer appears to be discharging in the drainage swale surrounding the adjacent self-storage facility. Additionally, contamination in the surface water and on-Site swale may also be attributable to overland flow of surface run-off through areas where contaminated groundwater seeps have collected. PADEP enclosed the swale to prevent the potential for contact with the contamination.

#### 5.2.6 Vapor Intrusion

VOCs that are released into the subsurface may form hazardous vapors. Those vapors can be transported through unsaturated soils and eventually enter buildings through cracks or other conduits in basement floors, walls or foundations. This phenomenon is known as vapor intrusion. VOC contamination in soils and groundwater at the Site has raised concerns for vapor intrusion as an exposure pathway. In April 2010, a vapor intrusion sampling assessment was conducted by EPA at nine residential properties and one elementary school near the Property. VOCs were not detected in the indoor air samples collected from the elementary school. Five residential properties had detections of VOCs in sub-slab samples. However, no residential properties had detection of VOCs above screening criteria in indoor air samples.

In October 2011 and January 2012, sub-slab and indoor air sampling was conducted in the three buildings located at the Property. VOCs were detected in the indoor air of one of the buildings and below the sub-slab of two of the buildings. In August 2012, the indoor air of the largest of the three buildings was reassessed. VOCs were again identified in portions of the building. As a result, EPA initiated a removal action intended to reduce VOCs in the building. To accomplish this, EPA installed portable air purifiers into selected suites within the impacted building. EPA then collected additional data to evaluate the efficacy of such units with the existing building vapor mitigation system in reducing VOCs levels within the building.

In July 2015, EPA conducted tests to support the design and construction of a vapor mitigation system to address vapor intrusion in the main building on the Property. The vapor mitigation system was constructed in late 2015. In January 2017, sampling was performed to confirm that the vapor mitigation system is reducing VOC concentrations in the indoor air to acceptable levels.

### 5.3 Conceptual Site Model

A conceptual site model ("CSM") describes contaminant sources, contaminant release mechanisms and migration routes, exposure pathways, and potential receptors. It documents what is known about human exposure under current and potential future Site conditions. Since this early interim remedial action for OU2 addresses contaminated groundwater, this portion of the CSM is considered in this early interim ROD.

The primary source of contamination to the AOHC is the soils on the Property which were impacted during the operation of the former electroplating facility and disposal operations at the Property. Contamination in soils migrates into groundwater via leaching. Exposure to contaminated groundwater occurs via ingestion or dermal contact with contaminated groundwater. Groundwater can be ingested or contacted when the contamination reaches drinking water supply wells or private drinking water wells. Groundwater may also contaminate surface water or sediment if it daylights through seeps. Surface water and sediment contamination may then impact either human or ecological receptors. Groundwater contamination may also contribute to vapor intrusion and affect the indoor air in buildings. For these exposure scenarios, potential human receptors include residents (adult and child), commercial workers, trespassers, recreational users, and construction workers.

## 6.0 CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES

The Site includes the Property (land upon which industrial and disposal operations occurred in the past) as well as other properties where contamination from such operations has migrated or otherwise come to be located. The Property is a one-acre parcel that currently contains three buildings renovated into commercial office spaces: a large building formerly used for warehousing/manufacturing, a smaller building formerly used for storage, and an older farmhouse. The warehouse/manufacturing building was constructed of a steel frame with block walls on an on-grade slab over a small crawl space. The storage building is a two-story structure with a crawl space. The farmhouse is a 2.5-story structure with a partial crawl space. Space between the buildings is used as parking areas. Surrounding land use is primarily commercial/industrial, although residential areas are located just west and northwest of Cooks Run and southwest of the wastewater treatment system. Cooks Run is surrounded by wetlands and/or wooded areas. Future land use is anticipated to be consistent with the current land use.

The aquifer at the Site is designated by Pennsylvania as a Class IIA aquifer, a drinking water aquifer. Residents in the vicinity of the Site area served by the Borough of Doylestown public water supply. Two Doylestown Municipal Authority supply wells have been affected by contamination from the Site. MSW-13 was shut down due to concerns over the effect of pumping on plume migration. MSW-08 has shown low levels of Site-related contamination and continues to be monitored. Continued use of groundwater as a water supply is anticipated in the future.

## 7.0 SUMMARY OF SITE RISKS

Information from PADEP and EPA investigations was used to evaluate potential risks to human health and the environment from exposure to contaminants from the Site. Because the scope of this early interim remedial action is limited to addressing groundwater within the AOHC, only contamination in groundwater was considered in evaluation of these risks for this early interim ROD. Since the RI has not been completed for the Site, a baseline human health risk assessment ("HHRA") was not prepared for this operable unit. Instead, a risk evaluation was performed, which is described in the following sections. A full HHRA will be performed prior to selecting a final remedial action at the Site.

### 7.1 Summary of Risk Evaluation

The risk evaluation involved comparison of contaminant levels in groundwater within the AOHC to their respective risk-based standards. These standards include EPA's drinking water standards known as MCLs, established under the Safe Drinking Water Act, 42 U.S.C. § 300f et seq., and 40 C.F.R. Part 141, Subpart G, and Regional Screening Levels ("RSLs"). For contaminants which have both an MCL as well as an RSL, the lower of the two values was used to provide a more conservative screening. The May 2016 EPA Office of Drinking Water Lifetime Health Advisories for PFOA and PFOS were used to calculate a screening value for PFOS and PFOA. A screening level of 0.04 ug/L combined concentration of PFOS and PFOA was calculated based on the reference dose in the Health Advisories and a hazard quotient of 0.1. Table 1 summarizes this risk evaluation.

#### 7.1.1 Contaminants of Concern

The primary contaminants of concern ("COCs") within the AOHC consist of Cr [VI], PCE, TCE, and chemicals associated with the degradation of PCE and TCE. The designation of these COCs is based on their exceedances of their respective standards for human ingestion which provide the basis for this interim remedial action. Cr[VI] was detected at concentrations of up to 233,000 µg/L. The tap water RSL for Cr[VI] is 0.035 µg/L. TCE was detected at concentrations of up to 35,000 µg/L. The tap water RSL for TCE is 0.28 µg/L and the MCL is 5 µg/L. PCE was detected at concentrations of up to 4,330 µg/L. The RSL for PCE is 4.1 µg/L and the MCL is 5 µg/L. Direct contact with these concentrations of Cr[VI], TCE and PCE would result in cancer risk levels that exceed

EPA's acceptable risk range of $10^{-4}$ to $10^{-6}$ or non-cancer risk levels that exceed a hazard index ("HI") of 1.0.

### 7.1.2 Principal Threat Waste

EPA characterizes waste as either principal threat waste or low-level threat waste. The concept of principal threat waste and low-level threat waste, as developed by EPA in the NCP, is applied on a site-specific basis when characterizing source material. "Source material" is defined as material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater, to surface water, to air, or that act as a source for direct exposure. Principal threat wastes are those source materials considered to be highly toxic or highly mobile, which would present a significant risk to human health or the environment should exposure occur. Contaminated groundwater is generally not considered to be source material. However, non-aqueous phase liquids ("NAPLs") in groundwater may be considered source material. The presence of NAPLs has not been determined at the Site. However, TCE and PCE are at concentrations exceeding 1% of their solubility, which is indicative of the presence of NAPLs.

## 7.2 Conclusion of Risk Assessments

While risk calculations were not performed as part of a HHRA to establish baseline risk levels, groundwater contaminant concentrations exceeded EPA MCLs and RSLs by several orders of magnitude. EPA concludes, based on the data, that the concentrations of COCs in groundwater in the AOHC at OU2 of the Site present unacceptable risks based on the direct contact exposure pathway, namely, that direct contact via ingestion and dermal contact to the groundwater within the AOHC presents risks that exceed the cancer risk range of $10^{-4}$ to $10^{-6}$ or the non-cancer risk hazard index of 1.0 as described at 40 C.F.R. 300.430(e)(2)(i)(A)(2).

EPA has conducted sampling of both private drinking water wells and MSW-08. Based on the results, EPA has determined that the public is not currently being exposed to contamination exceeding EPA's acceptable risk range. However, the continued use of MSW-08 has the potential to introduce contamination into the drinking water supply and expose the public to unacceptable levels of contamination in the future.

As indicated in Section 5.2.6, groundwater contamination has the potential to expose the public through the vapor intrusion pathway. Residential areas exist to the southwest and west of the Site in the direction of groundwater flow. Continued migration of contamination towards these areas has the potential to increase the risk of vapor intrusion into these homes.

Movement of contaminants from the groundwater to surface water via seeps has the potential to expose human and ecological receptors to contaminants. A forested wetlands area and creek are situated to the west of the Property, in the direction of groundwater flow. It is unknown to what extent groundwater from the Property discharges to these areas.

However, continued uncontrolled migration of contamination has the potential to impact these sensitive ecosystems and receptors located there.

In addition, sampling results indicate the presence of 1,4-dioxane and PFAS in the groundwater within the AOHC. EPA will continue to monitor for these contaminants as part of the ongoing RI/FS to determine if these particular contaminants present an unacceptable risk to human health or the environment at the Site.

EPA has determined that the early interim remedial action selected in this early interim ROD is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances, pollutants, or contaminants into the environment.

## 8.0 REMEDIAL ACTION OBJECTIVES

EPA guidance states that "[a]n interim action is limited in scope and only addresses areas/media that also will be addressed by a final Site/operable unit ROD."[3] This early interim remedial action is not intended reduce all contamination in all media types at this Site. However, the Remedial Action Objectives ("RAOs") are designed to support a final remedial action which will comply with CERCLA requirements for cleanup of contaminated groundwater and restore the groundwater to beneficial use as required by the NCP. This early interim remedial action is intended solely to address contaminated groundwater within the geographic boundaries of the AOHC. Therefore, the RAOs reflect this limited scope. By addressing contaminated groundwater within the AOHC, the early interim remedial action will reduce Site risks by ensuring contamination within the AOHC does not continue to migrate toward locations including MSW-08, residential areas, and wetlands where it could impact human and ecological receptors via direct contact or vapor intrusion. The early interim remedial action will also begin restoration of the Site groundwater by treating contaminated groundwater from the AOHC, thereby reducing the volume of contaminated groundwater present in the aquifer. These RAOs are designed to support a final remedial action which will entail complete restoration of the aquifer. The RAOs are as follows:

- Prevent further migration of contaminated groundwater from the AOHC, and
- Begin restoration of the groundwater to beneficial use by reducing volume of contaminated groundwater within the AOHC.

The remedial alternatives listed below are limited in scope to solely address these RAOs. Contamination in other media and other Site locations will be addressed separately.

## 9.0 SUMMARY OF REMEDIAL ALTERNATIVES

An RI/FS is currently being conducted to comprehensively characterize Site contamination and risks and to facilitate selection of additional remedial actions for the Site. With the

[3] ROD Guidance at p. 8-2.

exception of the No Action alternative, the remedial alternatives for early interim remedial action evaluated during the FFS and presented below will meet the RAOs as well as contribute to subsequent remedial actions. Detailed information on these alternatives may be found in the administrative record supporting selection of this early interim remedial action.

The remedial alternatives for early interim remedial action that were considered in the FFS are as follows:

- Alternative 1: No Action
- Alternative 2: Groundwater Extraction and Treatment with Air Stripping, Ultra-Violet ("UV") Oxidation, Ion Exchange, and Carbon Adsorption
- Alternative 3: Groundwater Extraction and Treatment with Air Stripping, Photo-Cat, and Carbon Adsorption

### 9.1 Remedial Alternatives

This section describes the remedial alternatives that EPA considered. The total present worth cost for each alternative was calculated using a 7% discount rate and an operation and maintenance ("O&M") period of 30 years (unless otherwise noted).

**Common Elements**

Both Alternatives 2 and 3 require extraction of groundwater, treatment, and discharge to Cooks Run. To prevent further migration of contaminated groundwater from the AOHC, these alternatives include installation of approximately ten extraction wells with a total anticipated pumping rate of 100 gallons per minute ("gpm"). The exact number, location, depth and pump rate of extraction wells would be determined during the remedial design phase. For cost estimating purposes, it is assumed that seven extraction wells would be installed down to 75 feet below ground surface ("bgs") and three extraction wells would be installed to a depth of 50 feet bgs. These depths are based on current knowledge of bedrock geology; however geophysical testing would be needed to determine the final construction depths. Figure 11 provides potential locations of extraction wells. Actual locations would be determined during the remedial design. The extracted water from the unconfined overburden, shallow bedrock, and semiconfined bedrock aquifer would be treated by a groundwater extraction and treatment system ("GETS").

For both Alternatives 2 and 3, a treatment building would be constructed to house the necessary equipment to treat the extracted groundwater. Assuming all treatment components are required, the building would need to be approximately 40-feet by 40-feet in plan view and approximately 20 feet tall. The actual components that would be included in the treatment train would be determined during remedial design. Potential locations for the treatment building under current consideration are:

A. The Property (300-360 N. Broad Street, location "A" on Figure 11): An access road from the adjacent self-storage facility would likely need to constructed in order to access the treatment system. Approximately ten parking spaces would be covered once the treatment building is constructed.

B. The southern portion of the adjacent self-storage facility (390 N. Broad Street, location "B" on Figure 11): This area has soft soil, and the land is characterized as forested wetland. Due to these conditions, helical anchor/piles would be installed to bedrock to support the foundation of the building if this location or similar location were selected.

C. The field to the west of the self-storage facility (400 N. Broad Street, location "C" on Figure 11): An access road would need to be constructed from North Broad Street to access this location.

Treatment building locations A and C as depicted in Figure 11 would minimize impact to surface water hydrology and forested wetlands as compared to location B. Construction in location B would need to comply with Executive Order 11990 (42 Fed. Reg. 26961 (May 24, 1977)) Sections 1 and 2 pertaining to the protection of wetlands as well as any substantive requirements determined to be applicable and/or relevant and appropriate under Section 121(d) of CERCLA, 42 U.S.C. § 9621(d).

Common elements of the treatment technologies for Alternatives 2 and 3 include bag filters to remove suspended solids, granular activated carbon ("GAC") to remove VOCs and PFASs, and air stripping to remove VOCs, if it is determined that GAC would not cost-effectively remove both VOCs and PFASs.

For both Alternatives 2 and 3, the treated water would be discharged to Cooks Run. Influent and effluent sampling would be conducted according to National Pollution Discharge Elimination System ("NPDES") substantive requirements. Depending on the number of technologies included in the treatment train, additional sampling would be conducted to monitor effectiveness and estimate breakthrough curves. For cost estimating purposes, the frequency of this performance monitoring is assumed to be monthly during the first year of operation and could change to quarterly for the remaining years of operation. A long-term monitoring program would be implemented, which includes an estimated 35 monitoring locations, including the extraction wells that would be sampled semiannually for the first five years of operation and annually thereafter. These monitoring locations would be divided equally between the unconfined overburden, unconfined shallow bedrock, and semiconfined bedrock aquifer.

**ALTERNATIVE 1: NO ACTION**

| | |
|---|---|
| *Estimated Capital Cost:* | *$0* |
| *Estimated Present Worth O&M Cost:* | *$0* |
| *Estimated Total Present Worth Cost:* | *$0* |
| *Estimated Construction Timeframe:* | *None* |

Consideration of this alternative is required by the NCP and CERCLA. Alternative 1 requires no additional remedial action to be taken at the Site. The No Action alternative serves as a basis against which the effectiveness of all the other proposed alternatives can be compared. Under this alternative, the Site would remain in its present condition, and groundwater contamination would be subject to natural processes only.

### ALTERNATIVE 2: GROUNDWATER EXTRACTION AND TREATMENT WITH AIR STRIPPING, UV OXIDATION, ION EXCHANGE, AND CARBON ADSORPTION

| | |
|---|---|
| *Estimated Capital Cost:* | *$1,619,000* |
| *Estimated Present Worth O&M Cost:* | *$6,492,000* |
| *Estimated Total Present Worth Cost:* | *$8,111,000* |
| *Estimated Construction Timeframe:* | *1 year* |
| *Estimated Time to Achieve RAOs:* | *30 years* |

Under Alternative 2, groundwater within the AOHC would be extracted to prevent further migration of such contamination outside the AOHC; treated using ion exchange, carbon adsorption, and (depending on treatment needs to be determined during the remedial design) UV oxidation or air stripping; and discharged to Cooks Run. Information about the influent concentrations of PFASs and 1,4-dioxane would be used to develop site-specific discharge criteria in accordance with the Pennsylvania Clean Streams Law and Section 402 of the Clean Water Act ("CWA") during the remedial design. Once discharge limits are set, the need to treat PFASs and 1,4-dioxane to meet those limits would be determined. Figure 12 illustrates three different scenarios depending on which constituents need treatment. These differences in the treatment train would have a significant impact on the capital and operation and maintenance ("O&M") cost of the GETS. To ensure and accurate comparison with Alternative 3, the cost estimate for this alternative assumes that all Site COCs would require treatment, which corresponds to Scenario 1, described below. Testing during design and initial system operation would determine if treatment components targeting specific COCs could be eliminated or bypassed. The following sections describe the different scenarios depending on the contaminants that would need to be treated.

**Scenario 1: UV Oxidation, Ion Exchange, GAC**

This scenario assumes treatment for VOCs, 1,4-dioxane, Cr[VI] and PFASs (Figure 12). Within the treatment system, the extracted water would initially go through bag filters to remove suspended solids. A UV oxidation system would then be used to treat 1,4-dioxane. The UV oxidation system would also reduce the VOC concentrations and potentially reduce PFAS concentrations without reducing 1,4-dioxane treatment efficiency. However, the reductions of these constituents would likely not be sufficient to meet the VOC and PFAS discharge criteria. Although a more robust UV oxidation system could be designed to completely treat the VOCs and improve PFAS removal, the remaining VOCs and PFASs would likely be more efficiently treated by carbon adsorption. The concentrations of VOCs and PFASs, however, would be significantly reduced, decreasing the chemical loading on the treatment components for VOCs and PFASs.

After passing through the UV oxidation system, the water would run through an ion exchange system to treat Cr[VI].

To treat the remaining VOCs and PFASs, liquid-phase GAC vessels would be installed to treat the water effluent from the ion exchange units. The rationale for installing the GAC vessels after the removal of Cr[VI] would be to eliminate the potential contamination of GAC with chromium because chromium-contaminated GAC could not be reactivated and would have to be sent to a Resource Conservation and Recovery Act ("RCRA")-permitted facility for disposal. Based on design of systems at Sites with similar contamination, treatment of PFASs by GAC requires a longer contact time than other contaminants typically treated with GAC. As such, the size of the GAC vessels may be comparatively larger than a typical system. During the remedial design, an accelerated column test ("ACT") can be conducted with Site groundwater to determine the effect of Site-specific water quality on PFAS removal, the effect of TCE treatment on PFAS removal, and appropriate GAC vessel dimensions.

**Scenario 2: Air Stripper, Ion Exchange, GAC**

If additional study during the remedial design concludes that 1,4-dioxane is not present at levels that would require treatment prior to discharge to surface water, the UV oxidation system could be removed from the treatment train. Therefore, this scenario assumes only VOCs, Cr[VI], and PFASs would require treatment (Figure 12). However, without the presence of the UV oxidation system, the GAC would likely receive higher VOC concentrations. This scenario assumes that the GAC would not be able to simultaneously treat PFASs and VOCs to attain the potential discharge criteria. As a result, this scenario includes a low-profile air stripper or tray aerator to treat VOCs at the head of the treatment plant after the bag filters. The blower and transfer pump would be designed to handle the anticipated influent rate and VOC mass loading. If it is determined that the off-gas from the air stripper presents an unacceptable risk to human health, it would be treated using vapor-phase GAC vessels.

**Scenario 3: Ion Exchange, GAC**

This scenario assumes, like Scenario 2, that the UV oxidation system would not be required for treatment of 1,4-dioxane. Therefore, this scenario assumes only VOCs, Cr[VI], and PFASs would require treatment (Figure 12). The difference between this scenario and Scenario 2 is that this scenario assumes that the GAC would be able to simultaneously treat VOCs and PFASs. Additionally, if PFASs do not require treatment, it is likely that only GAC would be needed to treat the VOCs. As a result, the air stripper would not be needed, and the treatment system would consist of ion exchange and GAC.

## ALTERNATIVE 3: GROUNDWATER EXTRACTION AND TREATMENT WITH AIR STRIPPING, PHOTO-CAT, AND CARBON ADSORPTION

| | |
|---|---|
| *Estimated Capital Cost:* | *$2,190,000* |
| *Estimated Present Worth O&M Cost:* | *$6,782,000* |
| *Estimated Total Present Worth Cost:* | *$8,972,000* |
| *Estimated Construction Timeframe:* | *1 year* |
| *Estimated Time to Achieve RAOs:* | *30 years* |

Under Alternative 3, groundwater within the AOHC would be extracted to prevent further migration of such contamination outside the AOHC; treated using air stripping, photo-catalyzation, and carbon adsorption; and discharged to Cooks Run. To provide an accurate comparison between Alternative 3 and Alternative 2, Alternative 3 assumes that 1,4-dioxane and PFASs would not meet the discharge criteria and would require treatment. This is the same assumption as in Alternative 2, Scenario 1. Testing during design and initial system operation would determine if treatment components specific to these parameters could be eliminated or bypassed based on discharge criteria and influent concentrations.

Alternative 3 would utilize Photo-Cat technology to treat 1,4-dioxane and Cr[VI]. A Photo-Cat system is designed to reduce Cr[VI] to lower levels than typical ion exchange systems. This system would require a comprehensive pilot test to evaluate Cr[VI] treatment efficiency for Site-specific groundwater. Water from the air stripper would run through the Photo-Cat platform. On the Photo-Cat platform, citric acid would be injected into the water to facilitate the reaction. The water would then be mixed with titanium dioxide ($TiO_2$) and passed through tubes that would expose the water to UV light. The UV light would activate the $TiO_2$, which would oxidize the citric acid and 1,4-dioxane and use the removed electrons to reduce the Cr[VI] to trivalent chromium. The trivalent chromium would then adsorb onto the $TiO_2$.

The water would then pass through two cross-flow filters that would separate the flow stream from the $TiO_2$. The treated water would exit the Photo-Cat system and be discharged to Cooks Run. The separated $TiO_2$ slurry would return to the $TiO_2$ accumulation tank and be reused to treat incoming water. A slipstream of the $TiO_2$ would continuously be removed. This material would enter the vessels where the $TiO_2$ would be dewatered and concentrated. Once the level of $TiO_2$ in these vessels reaches preset levels, the $TiO_2$ cleaning process would begin. Heated sulfuric acid would then be added and agitated to remove the adsorbed chromium. Water would be added to the vessels, agitated, and pushed out to remove any residual chromium and acid. The cleaned $TiO_2$ would be returned to $TiO_2$ storage tank for reuse. The residual acid and water would enter the chrome recovery tank. Sodium hydroxide would be added to this tank to neutralize the pH. This would cause the trivalent chromium to precipitate out as chromium hydroxide, which would be removed from the system as a slurry into a drum for off-Site disposal.

Although the treatment of VOCs could be addressed by the selected treatment technology for Cr[VI] (Photo-Cat), the presence of VOCs would decrease the efficiency of the Photo-

Cat system in treating Cr[VI]. Therefore, a low profile stripper to treat the VOCs would be included in this alternative as the first step of the treatment train after the bag filters. If it is determined that emission of VOCs present an unacceptable risk to human health or the environment, the off-gas from the air stripper would be treated using vapor-phase GAC vessels.

## 10.0 EVALUATION OF ALTERNATIVES

In this section, the remedial alternatives summarized above are compared to each other using the criteria set forth in 40 C.F.R. § 300.430(e)(9)(iii). In the remedial decision-making process, EPA profiles the relative performance of each alternative against the evaluation criteria, noting how each compares to the other options under consideration. A detailed analysis of alternatives can be found in the FFS which is in the administrative record supporting selection of this early interim remedial action.

These evaluation criteria relate directly to requirements of Section 121 of CERCLA, 42 U.S.C. § 9621, for determining the overall feasibility and acceptability of a remedy. The nine criteria fall into three groups described as follows:

***Threshold criteria*** must be satisfied in order for a remedy to be eligible for selection. The first two criteria are threshold criteria: (1) overall protection of human health and the environment, and (2) compliance with applicable or relevant and appropriate requirements ("ARARs"). The selected remedy must meet the first criteria as well as the second criteria unless an ARARs waiver is invoked.

***Primary balancing*** criteria are used to weigh major tradeoffs between remedies. The next five criteria are the primary balancing criteria: (3) long-term effectiveness and permanence; (4) reduction of toxicity, mobility or volume through treatment; (5) short-term effectiveness; (6) implementability; and (7) cost.

***Modifying criteria*** are formally taken into account after public comment is received on the Proposed Plan. The modifying criteria include the remaining two criteria: (8) State acceptance and (9) community acceptance.

The following discussion summarizes the evaluation of the remedial alternatives developed for the early interim remedial action at OU2 of the Site against the nine evaluation criteria.

### Overall Protectiveness of Human Health and the Environment

A primary requirement of CERCLA is that the selected remedial action be protective of human health and the environment. A remedial action is protective if it reduces, to acceptable levels, current and potential risks associated with each exposure pathway at a Site. Because this is an early interim remedial action, the intent is not to address all exposure pathways. Only exposure pathways associated with contaminated groundwater within the AOHC are considered in this criterion.

Alternative 1 (No Action) does not include measures to prevent current and future receptors from contact with contaminated groundwater. While a human health and ecological risk assessment has not been completed, comparison of contaminants detected in the groundwater with risk-based standards suggests that several contaminants would present unacceptable risk if human receptors were exposed to the contaminated groundwater. If action is not taken, contaminated groundwater could potentially be drawn into public water supplies and expose the public to unacceptable levels of Site-related contaminants. Movement of contaminants from the groundwater to surface water via seeps has the potential to also expose human and ecological receptors to contaminants if no action is taken. Under Alternative 1, contaminated groundwater would be allowed to continue to migrate in the aquifer, potentially impacting downgradient receptors. Therefore, this alternative would not be protective of human health and the environment. Because Alternative 1 would not be protective of human health and the environment and fails the threshold criteria, it is eliminated from further consideration under the remaining eight criteria.

Both Alternatives 2 and 3 would provide adequate protection of human health and the environment by extracting and treating contaminated groundwater within the AOHC. By eliminating migration of the highest levels of contamination from the AOHC, Alternatives 2 and 3 would prevent contaminated groundwater within the AOHC from impacting downgradient pathways and receptors, including MSW-08, residential properties, and ecological receptors.

**Compliance with ARARs**

This criterion addresses whether a remedy will meet federal and state ARARs and/or whether there are grounds for invoking a waiver.

Applicable requirements are "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA Site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable." (NCP, at 40 C.F.R. § 300.5). Relevant and appropriate requirements are "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not 'applicable' to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA Site, address problems or situations sufficiently similar to those encountered at the CERCLA Site that their use is well suited to the particular site" (NCP, at 40 C.F.R. § 300.5).

To meet the requirements of Section 121(d) of CERCLA, remedial actions must comply with ARARs unless a waiver is justified. ARARs are used to help determine the appropriate extent of Site cleanup that is necessary to develop remedial alternatives, and to govern the implementation of a selected response action.

Section 121(d)(4)(A) of CERCLA provides that EPA may select an action that does not meet an ARAR if the selected action "is only part of a total remedial action that will attain such level or standard of control when completed." The proposed action is an early interim remedial action and will be part of a total remedial action for contaminated groundwater at the Site. While the final remedial action will seek to restore the aquifer to beneficial use, this early interim remedial action seeks limited action to prevent migration of contaminated groundwater from the AOHC and reduce the volume of contaminated groundwater at the Site. The early interim remedial action will support the final remedial action. The final remedial action will be selected at some time in the future following completion of the RI/FS.

Groundwater cleanup levels will be selected in the final ROD for OU2. Because this is an early interim action which does not seek complete restoration of the aquifer, EPA is waiving, and this early interim remedial action will not meet, ARARs establishing groundwater cleanup standards. Specifically, EPA is waiving the requirement that COCs in Site groundwater meet their respective MCLs and non-zero Maximum Contaminant Level Goals ("MCLGs") established under the Safe Drinking Water Act, 40 U.S.C. §§ 300f, et seq. These requirements are waived in this early interim remedial action pursuant to the interim action waiver set forth in Section 121(d)(4)(A) of CERCLA and 40 CFR § 300.430(f)(1)(ii)(C)(1).

For Alternatives 2 and 3, all the components of the groundwater extraction system would comply with Federal and State ARARs that have not been waived as required under Section 121(d) of CERCLA.

Major ARARs include:

- Substantive requirements of relevant portions of 40 C.F.R. Parts 122 and 25 Pa. Code § 92, governing the establishment of limits on the discharge of contaminants to surface water from groundwater extraction and treatment.

- Federal and State regulations covering dust suppression, erosion control, disposal requirements and other construction-related activities.

A detailed list of all ARARs identified for this interim remedial action is included in Table 2.

**Long-Term Effectiveness and Permanence**

This criterion considers the ability of an alternative to maintain protection of human health and the environment over time. The evaluation takes into account the residual risk remaining from untreated waste at the conclusion of remedial activities, as well as the adequacy and reliability of containment systems and institutional controls.

For both Alternatives 2 and 3, groundwater treatment is expected to achieve long-term effectiveness and permanence assuming the treatment system is properly operated and maintained. The proposed components of the GETS have been utilized at sites with the same COCs at similar concentrations. The GETS, as currently envisioned, would be effective in reducing the contaminant mass within the AOHC and controlling plume migration. GETS operation would require continued maintenance.

**Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment**

This evaluation criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce the toxicity, mobility, or volume of the hazardous substances as their principal element. This preference is satisfied when treatment is used to reduce the principal threats at a Site.

For both Alternatives 2 and 3, the GETS would control the mobility of the contaminants by establishing hydraulic capture. The contaminated water would be treated by the GETS, thereby reducing the toxicity and volume of the contaminants in groundwater.

**Short-term Effectiveness**

This evaluation criterion addresses the effects of the alternative during the construction and implementation phase until remedial action objectives are met. It considers risk to the community and on-Site workers (i.e., personnel implementing the action) and available mitigation measures, as well as the time frame for attainment of the response objectives.

For both Alternatives 2 and 3, construction of the GETS would pose short-term impacts to the surrounding community, which includes residents and commercial workers, and on-Site workers constructing the GETS. It is anticipated that construction activities would last less than one year. During this time, a Site-specific health and safety plan would be in place; such plan would specify how the surrounding community and on-Site workers would be protected against potential dermal contact and inhalation of vapors during construction of extraction wells and the treatment plant. Proper site-access controls and air monitoring during installation of extraction wells would minimize the risks of the residents and commercial workers in the surrounding community from being exposed to dust and potential VOC vapors. Site workers would be protected from these potential exposures through the use of proper personal protective equipment and proper workplace safety procedures. EPA anticipates that there would not be a significant detrimental effect to the community from the increased noise or the increased road traffic during the drilling and construction activities. Minimal effort would be required to establish and enforce exclusion zones during Site work. If the GETS is located in a wetlands area, erosion and sediment controls would be used to mitigate runoff and minimize damage to the wetlands.

**Implementability**

This criterion considers the technical and administrative feasibility of implementing an alternative and the availability of services and materials required during implementation.

Alternative 2 is more implementable than Alternative 3. For Alternative 2, all of the materials and services needed for the GETS are standard and are readily available from multiple vendors. For Alternative 3, the Photo-Cat system is provided by only one vendor. As a result, work backlog or other factors affecting this one vendor could negatively affect project implementability. The Photo-Cat technology also has many moving parts and controls, which could result in multiple points of failure that could impact system startup, operation, and maintenance. In addition, because Alternative 2 utilizes separate technologies to treat 1,4-dioxane and Cr[VI], it has the flexibility to remove treatment of 1,4-dioxane if treatment is proven to be unnecessary, which would simplify the treatment train and make the alternative more implementable. Alternative 3 would require the use of the Photo-Cat technology to treat Cr[VI] even if 1,4-dioxane does not require treatment. Once the Photo-Cat system is configured, commissioned, and fully automated, it is anticipated that operation of Alternative 3 would be less labor intensive than Alternative 2.

Long-term access would be needed for the treatment plant building. Obtaining such access would be a challenging component to building the treatment system for both Alternatives 2 and 3. Another challenging component of both Alternatives 2 and 3 is the construction of the treatment plant building on the soft soils of the forested wetland, if that location is chosen. A proven technology (helical anchors/piles) would be used to overcome this technical issue. However, placement of the building in a wetlands area would trigger legal requirements governing wetlands mitigation, which would further complicate implementation of the alternative. Construction of an access road to the GETS would also be necessary for both Alternatives 2 and 3, depending on the location of the treatment plant building. Timing and interfacing of different technologies are significant factors, and the installation of each unit by separate contractors would have to be coordinated and supervised. As stated in the previous paragraph, this may adversely affect the implementability of Alternative 3 as the single source of the Photo-Cat system may limit the availability of the system and may subsequently delay installation of other components of the remedy.

The approximate time to construct both Alternatives 2 and 3 is one year after the remedial design has been completed, contingent on Photo-Cat availability. During the remedial design phase, bench-scale studies and other Site investigations would be conducted to assist in the design of the extraction system and treatment train and would be documented in a comprehensive report.

**Cost**

Capital, annual operation and maintenance ("O&M"), and present worth costs were developed for all alternatives. Capital costs include construction, engineering design, construction management, administration and contingency costs. O&M costs are expressed as the present worth of the estimated annual O&M costs of the remedy throughout the life of the project. To offer an accurate comparison with Alternative 3, the cost estimate for Alternative 2 assumes that all Site COCs will require treatment, which corresponds to Scenario 1. Table 3 provides a summary of the costs of Alternatives 2 and 3.

**Table 3: Cost Summary for Remedial Alternatives**

| Alternative | Description | Capital Costs | O&M Costs (Present Worth) | Total Cost (Present Worth) |
|---|---|---|---|---|
| 2 | Groundwater Extraction and Treatment with Air Stripping, UV Oxidation, Ion Exchange, and Carbon Adsorption | $1,619,000 | $6,492,000 | $8,111,000 |
| 3 | Groundwater Extraction and Treatment with Air Stripping, Photo-Cat, and Carbon Adsorption | $2,190,000 | $6,782,000 | $8,972,000 |

**State/Support Agency Acceptance**

PADEP concurred with the selection of Alternative 2 in a letter dated June 27, 2017.

**Community Acceptance**

EPA held a 30-day public comment period from October 1, 2016 through October 31, 2016 to accept public comments on the remedial alternatives presented in the PRAP and on the other documents contained in the administrative record file compiled in support of this early interim remedial action. On October 18, 2016, EPA held a public meeting to discuss the PRAP and accept comments. A transcript of this meeting is included in the administrative record. In addition to comments received during the public meeting, EPA received two written submissions via postal mail. No comments were received which disagreed with EPA's preferred alternative. The topic of concern expressed in the written comments pertained to the location of the treatment building and the potential adverse impacts to businesses on the Property. A summary of significant comments received during the public comment period and EPA's responses are included in the Responsiveness Summary which is a part of this ROD.

## 11.0 SELECTED REMEDY

Following review and consideration of the information in the administrative record supporting selection of this early interim remedial action, the requirements of CERCLA and the NCP, public comments, and State acceptance, EPA has selected Alternative 2 (Groundwater Extraction and Treatment with Air Stripping, UV Oxidation, Ion Exchange, and Carbon Adsorption) as the early interim remedial action for the AOHC at OU2 of the Site.

### 11.1 Summary of the Rationale for the Selected Remedy

The early interim remedial action selected for the AOHC at OU2 of the Site is Alternative 2 (Groundwater Extraction and Treatment with Air Stripping, UV Oxidation, Ion

Exchange, and Carbon Adsorption). As discussed in Section 9.1 of this ROD, the specific treatment technologies to be employed in the treatment train will be determined during remedial design. Alternative 2 has been selected because it satisfies the threshold criteria for selection and provides a better mix of tradeoffs under the primary balancing criteria than Alternative 3. Alternative 2 is preferred because it is considered more implementable than Alternative 3 and at a lower cost.

Alternative 2 is considered more implementable than Alternative 3 because all of the materials and services needed for the GETS are standard and are readily available from multiple vendors. In addition, because Alternative 2 utilizes separate technologies to treat 1,4-dioxane and Cr[VI], treatment of 1,4-dioxane could be removed from if treatment is proven to be unnecessary, which would simplify the treatment train and make the alternative more implementable. The capital costs and operation and maintenance costs for Alternative 2 are also less than for Alternative 3.

Alternative 2 will prevent further migration of contaminated groundwater from the AOHC and will begin restoring the groundwater to beneficial use by reducing the volume of contaminated groundwater within the AOHC.

Groundwater contamination from the Site has the potential to impact a public water supply well, residential homes via vapor intrusion, and ecological receptors in a downgradient wetland. By extracting and treating groundwater within the AOHC, Alternative 2 will prevent further migration of contamination towards these locations and receptors. Alternative 2 will comply with ARARs that are not waived for this early interim remedial action. Alternative 2 will also provide a high degree of long-term effectiveness and permanence and will reduce the mobility and volume of contaminated groundwater through treatment. Alternative 2 will pose short-term impacts to the surrounding community due to increased vehicle traffic and noise from treatment during drilling and construction activities. However, proper engineering and administrative controls during installation of extraction wells and construction of the GETS will minimize the risks of workers and the community being exposed to dust and VOC vapors. Erosion and sediment controls will be used to mitigate runoff and minimize damage to the wetlands.

### 11.2 Description of the Selected Remedy and Performance Standards

Based on the comparison of the nine criteria, EPA's selected early interim remedial action for the AOHC at OU2 of the Site is Alternative 2 (Groundwater Extraction and Treatment with Air Stripping, UV Oxidation, Ion Exchange, and Carbon Adsorption). The total present worth cost of EPA's selected early interim remedial action is $8,111,000. The major components of the selected early interim remedial action are:

- Construction of an extraction/treatment system to extract groundwater from the AOHC to prevent further migration of contaminants within the AOHC from migrating outside the AOHC;

- Treatment of contaminated groundwater and discharge of treated groundwater to Cooks Run;

- Long-term monitoring.

### 11.2.1 Construction of an extraction/treatment system to extract groundwater from the AOHC to prevent further migration of contaminants within the AOHC from migrating outside the AOHC

Installation of approximately ten extraction wells with a total estimated pumping rate of 100 gpm will be necessary to prevent further migration of contaminated groundwater from the AOHC. Operation of the extraction wells will meet the RAOs described in Section 8.0. The exact number, location, depth and pump rate of extraction wells will be determined during the remedial design phase. The extracted groundwater from the unconfined overburden, shallow bedrock, and semiconfined bedrock aquifer will be treated by a groundwater extraction and treatment system ("GETS").

A treatment building will be constructed to house the GETS to treat extracted groundwater sufficiently to permit discharge into surface water. Assuming all treatment components are required, the building will need to be approximately 40-feet by 40-feet in plan view and approximately 20 feet tall. The actual components that will be included in the treatment train will be determined during the remedial design phase. Depending on the exact location of the treatment building, additional considerations will need to be addressed. If the soil is too soft for a typical foundation, helical anchor/piles will need to be installed to bedrock to support the foundation of the building. If the location is in an area that is currently inaccessible for the types of vehicles that will be needed to construct and conduct operation and maintenance, an access road will need to be constructed.

**Performance Standards for Construction of Extraction/Treatment System**

1. The GETS shall prevent the migration of the COCs in groundwater within the AOHC from migrating outside the AOHC.

2. Construction of the extraction/treatment system, access roads and other activities which would disturb soils shall be conducted in accordance with the substantive portions of Pennsylvania regulations governing erosion and sediment control (25 PA Code §§ 102.4(b)(1) and (4), 102.11, 102.22).

3. Construction of the extraction/treatment system will be performed in a manner that minimizes, to the extent practicable, adverse impacts on the operation of businesses located near the treatment system.

4. Air monitoring shall be conducted during construction activities. Emission controls shall be implemented to comply with regulations governing fugitive air emissions (40 C.F.R. §§ 50.6-50.7, 25 PA Code §§ 123.1(a) and (c), 123.2, 123.31, and 123.41).

5. Construction activities that would potentially impact wetlands areas shall comply with Executive Order No. 11990 requiring the avoidance of adverse impacts from the destruction or loss of wetlands.

6. Construction activities which impact wetlands areas shall comply with substantive portions of 40 C.F.R. § 230.93 and 25 Pa. Code §§ 105.1, 105.17, 105.18a and 105.20a, which govern compensatory mitigation of wetlands.

### 11.2.2 Treatment of contaminated groundwater and discharge of treated groundwater to a surface water body

Contaminated groundwater that is extracted by the GETS described in section 11.2.1 will be treated to permit discharge to Cooks Run. Within the treatment system, the extracted water will initially go through bag filters to remove suspended solids. A UV oxidation system will then be used to treat 1,4-dioxane. However, if additional study during the design stage concludes that treatment of 1,4-dioxane is not present at levels that would require treatment prior to discharge to surface water, the UV oxidation system will be removed from the treatment train. Without the presence of the UV oxidation system, the GAC will likely receive higher VOC concentrations. As a result, a low-profile air stripper or tray aerator will be used to treat VOCs. If it is determined that emission of VOCs present an unacceptable risk to human health or the environment, the off-gas from the air stripper will be treated using vapor-phase GAC vessels.

After passing through the UV oxidation system or the air stripper, the water will run through an ion exchange system to treat the Cr[VI]. To treat the remaining VOCs and PFASs, liquid-phase GAC vessels will be installed to treat the water effluent from the ion exchange units.

**Performance Standards for Treatment of Contaminated Groundwater and Discharge of Treated Groundwater to a Surface Water Body**

1. Groundwater shall be treated and discharged to meet the substantive requirements of Pennsylvania Water Quality Standards (25 Pa. Code §§ 93.6, 93.7(a) and (b), 93.8c(a) and 25 Pa. Code §§ 16.24, 16.32-16.33, 16.51, 16.102 and Part 16, Appendix A Table 1A).

2. Influent and effluent sampling shall be conducted according to NPDES substantive requirements. Depending on the number of technologies included in the treatment train, additional sampling will be conducted to monitor effectiveness and estimate breakthrough curves.

3. Spent GAC from both the vapor and liquid streams shall be tested to determine if it is hazardous. If the spent GAC is determined to be hazardous, it shall be stored on-Site and subsequently disposed of in accordance with RCRA and Pennsylvania Hazardous Waste Management regulations.

4. Air emissions from the treatment system shall meet substantive portions of Pennsylvania regulations governing Construction, Modification, Reactivation, and Operation of Sources (25 Pa. Code § 127.1)

### 11.2.3 Long-term monitoring

Groundwater will continue to be monitored to ensure the GETS operates in accordance with the RAOs.

**Performance Standards for Long-Term Monitoring**

1. A long-term groundwater monitoring program shall be implemented, which includes monitoring well locations and the extraction wells, that would be sampled semiannually for the first five years of operation and annual monitoring thereafter. These monitoring locations will be divided between the unconfined overburden, unconfined shallow bedrock, and semiconfined bedrock aquifer.

2. Groundwater monitoring shall be performed periodically to confirm that the GETS has established and maintained an inward hydraulic gradient within the AOHC and that concentrations of groundwater COCs are not increasing outside of the AOHC.

## 11.3 Summary of the Estimated Remedy Costs

The estimated present worth cost of the selected early interim remedial action is $8,111,000. The information in the cost summary table (Table 3) is based on the best available information regarding the anticipated scope of the response action. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost. Changes in the cost elements may occur as a result of new information and data collected during the engineering design of the selected remedial action.

## 11.4 Expected Outcomes of the Selected Remedy

This section presents the expected outcomes of the selected early interim remedial action in terms of resulting land and groundwater uses and risk reduction achieved as a result of the response action.

Implementation of the selected early interim remedial action will prevent further migration of contaminated groundwater from the AOHC, and will begin restoration of the groundwater to beneficial use by reducing volume of contaminated groundwater within the AOHC.

By preventing further migration of contaminated groundwater from the AOHC, risks to downgradient receptors will be reduced. Contaminated groundwater within the AOHC will be restricted from flowing to private drinking water wells and MSW-08, which will prevent direct contact to the contaminated groundwater. Additionally, contaminated groundwater within the AOHC will be restricted from migrating to surface water via seeps, which will prevent the potential exposure of human and ecological receptors to contaminants. Finally, contaminated groundwater within the AOHC will be prevented from reaching residential areas to the southwest and west of the Site, which will reduce the potential for exposure to the public through the vapor intrusion pathway.

The removal of contaminated groundwater from the AOHC will also begin the restoration of the groundwater at the Site and will potentially reduce the time it will take to clean up contaminated groundwater over the entire Site.

The selected early interim remedial action will be consistent with the subsequent remedial actions which will address the remaining contaminated soils and contaminated groundwater at the Site.

## 12.0 STATUTORY DETERMINATIONS

Under CERCLA, selected remedies must protect human health and the environment, comply with ARARs that are not waived, be cost-effective and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Additionally, CERCLA includes a preference for remedies that use treatment to significantly and permanently reduce the volume, toxicity or mobility of hazardous substances, pollutants, and contaminants as their principal element. The following sections discuss how the selected interim remedial action for OU2 of the Site meets these statutory requirements.

### 12.1 Protection of Human Health and the Environment

The selected early interim remedial action will protect human health and the environment by preventing the further migration of contaminated groundwater within the AOHC from migrating outside of the AOHC through the operation of the GETS. The selected remedial action will prevent contamination within the AOHC from impacting downgradient pathways and receptors, including MSW-08, residential properties, and ecological receptors.

### 12.2 Compliance with Applicable or Relevant and Appropriate Requirements

The selected early interim remedial action will comply with ARARs that are not waived. Because this is an early interim action which does not seek complete restoration of the aquifer, EPA is waiving, and this early interim remedial action will not meet, ARARs establishing groundwater cleanup standards (see "Compliance with ARARs" within Section 10.0 of this ROD). These requirements are waived in this early interim remedial action pursuant to the interim action waiver set forth in Section 121(d)(4)(A) of CERCLA and 40 CFR § 300.430(f)(1)(ii)(C)(1).

ARARs for this early interim remedial action that are not waived would include, among others, Federal and State regulations covering dust suppression, erosion control, disposal requirements and other construction-related activities. Other ARARs for this early interim remedial action that are not waived include Federal and State regulations covering discharge of contaminants to surface water from groundwater extraction and treatment. The selected remedial action will attain all ARARs that are identified in Section 10.0 and specified in Table 2 of this ROD.

### 12.3 Cost Effectiveness

Section 300.430(f)(1)(ii)(D) of the NCP, 40 C.F.R. § 300.430(f)(1)(ii)(D), requires EPA to evaluate cost-effectiveness by comparing all the alternatives meeting the threshold criteria - protection of human health and the environment and compliance with ARARs - against long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; and short-term effectiveness (collectively referred to as "overall effectiveness"). The NCP further states that overall effectiveness is then compared to cost to ensure that the remedy is cost effective and that a remedy is cost effective if its costs are proportional to its overall effectiveness.

EPA concludes, following an evaluation of these criteria, that the selected remedial action is cost-effective in providing overall protection in proportion to cost and meets all other requirements of CERCLA. The estimated present worth cost for the selected remedy is $8,111,000.

### 12.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected early interim remedial action utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. Extraction and treatment of contaminated groundwater within the AOHC will permanently eliminate the threats to human health and the environment by permanently removing the contaminants from the extracted groundwater. The selected remedial action does not include alternative treatment technologies. However, the proven technologies used in the selected remedial action achieve risk reduction and protectiveness in the most cost effective manner.

### 12.5 Preference for Treatment as a Principal Element

The selected remedial action employs treatment as a principal element. The UV oxidation system, air stripping unit, ion exchange unit, and GAC will treat contamination in the extracted groundwater.

### 12.6 Five-Year Review Requirements

Because this remedial action will result in hazardous substances remaining on-Site above levels that allow for unlimited use and unrestricted exposure (i.e., contaminated groundwater outside of the AOHC and contaminated soil, surface water and sediment), a statutory review will be conducted every five years after initiation of the remedial action to ensure that the remedial action is protective of human health and the environment pursuant to CERCLA Section 121(c) and the NCP, 40 C.F.R. § 300.430(f)(4)(ii).

## 13.0 DOCUMENTATION OF SIGNIFICANT CHANGES

There have been no significant or fundamental changes to the proposed remedy as a result of public comments.

# *III. RESPONSIVENESS SUMMARY*

## *CHEM-FAB SUPERFUND SITE*
## *OPERABLE UNIT 2*
## *EARLY INTERIM REMEDIAL ACTION*

## *DOYLESTOWN BOROUGH, BUCKS COUNTY, PENNSYLVANIA*

## CHEM-FAB SUPERFUND SITE
## OPERABLE UNIT 2
## EARLY INTERIM REMEDIAL ACTION
## DOYLESTOWN, BUCKS COUNTY, PENNSYLVANIA

## RESPONSIVENESS SUMMARY

### 1. INTRODUCTION

This Responsiveness Summary provides a summary of significant public comments and concerns regarding the Proposed Plan for early interim remedial action at the Chem-Fab Superfund Site ("Site") Operable Unit 2 ("OU2") and provides the U.S. Environmental Protection Agency's ("EPA") responses to those comments. After reviewing and considering all public comments received during the public comment period, EPA has selected an early interim remedial action to address groundwater contamination at OU2 of the Site.

The Proposed Plan and supporting documentation were made available to the public in the administrative record file compiled to support selection of this remedial action. EPA provided notice to the public that the administrative record file could also be viewed at the following locations:

Bucks County Free Library
150 South Pine Street
Doylestown, PA 18901
Hours: Call (215) 348-9081

EPA Administrative Records Room
Administrative Coordinator
1650 Arch Street
Philadelphia, PA 19103
Phone: (215) 814-3157
Hours: Monday-Friday 8:30 am to 4:30pm
By appointment only

EPA issued a public notice in the Intelligencer, a Bucks County newspaper, on October 6, 2016 which contained a list of the components of EPA's preferred alternative, information relevant to the duration of the public comment period, the date of the public meeting, and the availability of the Proposed Plan and the administrative record file. The 30-day comment period began on October 1, 2016 and ended at midnight, October 31, 2016.

EPA conducted a public meeting in Doylestown, Pennsylvania to inform local officials, interested citizens and other stakeholders in attendance about EPA's proposed cleanup plan and the Superfund process, to respond to questions and to receive comments on the Proposed Plan. The public meeting was held by EPA on October 18, 2016 at the Doylestown Borough Hall located at 57 West Court Street, Doylestown, Pennsylvania. Responses to the comments received at the public meeting and during the public comment period are included in this Responsiveness Summary.

This Responsiveness Summary provides a comprehensive summary of significant questions, comments, concerns, and responses by summarizing oral and written comments received during the public comment period and EPA's responses. Section 2 of the Responsiveness Summary contains general comments received from commenters and EPA's responses. Section 3 contains more specific and detailed comments along with EPA's responses. In section 3, the comments have been grouped into the following categories:

- Effect of Location of Extraction Wells on Location of Treatment Building
- Impact of Groundwater Contamination and Early Interim Remedial Action on Neighboring Properties
- Impact of Locating the Treatment Building on the former Chem-Fab Property
- Decision-Making Process for Location of the Treatment Building
- Effect of Future Remediation Work on Location of the Treatment Building
- Community Advisory Group
- Pennsylvania Department of Environmental Protection Involvement

## 2. GENERAL COMMENTS

### 2.1 Location of Treatment Building

Two commenters have expressed concern over the location of the treatment system and potential impacts on the neighboring businesses.

**EPA Response:** EPA is studying the relative costs of each potential location to determine the most cost-effective way to implement the remedy. However, EPA will also consider other factors in addition to cost to determine the location of the treatment building. EPA intends to implement the selected remedial action so that impacts to businesses are minimized to the extent practicable.

## 3. DETAILED QUESTIONS, COMMENTS AND CONCERNS

### 3.1 Effect of Location of Extraction Wells on Location of Treatment Building

One commenter expressed concern that without knowing the location of the extraction wells, it would be difficult to determine which location of the treatment building would be most cost-effective.

**EPA Response:** EPA and PADEP have collected enough groundwater data to determine that the groundwater underlying the former Chem-Fab property and neighboring self-storage facility contains the highest levels of contaminants at the Site. As a result, they have designated these properties as the Area of Highest Contamination ("AOHC"), which is the focus of the OU2 early interim remedial action. In order to meet the Remedial Action Objectives ("RAOs") for the remedial action, all extraction wells will be located within the AOHC. While the exact location and number of extraction wells will still need to be determined during the remedial design phase, the location of the extraction wells should not significantly impact the cost to run piping to the various proposed locations for the treatment building, since each of the potential locations for the treatment plant is located relatively close to the AOHC.

EPA will also take other factors in addition to cost into account when determining the best location for the treatment system, including minimizing the impact on local businesses to the extent practicable.

## 3.2 Impact of Groundwater Contamination and Early Interim Remedial Action on Neighboring Properties

One commenter asked about the extent of the groundwater contamination and asked if the remedial action would cause the groundwater to move away from the Site.

**EPA Response:** The primary purpose of this remedial action is to prevent further migration of contamination from the AOHC. EPA currently has monitoring wells as far south as West Street, and has detected low levels of contamination in these wells. EPA is installing additional wells further south to determine the extent of the groundwater plume. The remedial action calls for groundwater to be pumped up from the extraction wells, treated, and then discharged to a surface water body. Therefore, it is not anticipated that groundwater currently within the AOHC would migrate from the AOHC during implementation of the remedial action. However, this remedial action is not intended to treat all groundwater at the Site. Groundwater outside of the AOHC is outside the scope of this remedial action and the migration of groundwater outside of the AOHC may not be impacted by this action. EPA will address all groundwater in a future final remedial action for OU2.

## 3.3 Impact of Locating the Treatment Building on the Former Chem-Fab Property

One commenter raised concerns over the impact of locating the treatment building on the former Chem-Fab property. The commenter expressed concern with the impact on parking, air emissions from the treatment system, noise, and the duration of operation.

**EPA Response:** The selected remedial action will be implemented to minimize impacts to businesses, including those on the former Chem-Fab property, to the extent practicable. This includes studying how much parking would be lost at each location from both the treatment system and vehicles needed to service the system and how that would impact the businesses. Regarding the air emissions, EPA will meet all applicable or relevant and appropriate requirements ("ARARs") with regard to air emissions from the treatment system, which includes utilizing granular activated carbon ("GAC") to scrub the air effluent from the treatment system if it is determined that these emissions present an unacceptable risk to human health. EPA will evaluate potential noise issues during the remedial design and will try to minimize the noise from the treatment system to the extent practicable. With regard to the duration of this remedial action, the RAOs for the remedial action are designed to prevent further migration of contamination from the AOHC and to begin treatment of the contaminated groundwater. EPA has developed this early interim remedial action with the expectation that this would support the final remedial action for the Site. Therefore, this remedial action will need to operate at least until a final remedial action for the Site is selected.

### 3.4 Decision-Making Process for Location of the Treatment Building

One commenter asked when the decision for the location of the treatment building would be made and how he could stay involved with the process.

**EPA Response:** A final decision on the location of the treatment system will not be made until the remedial design phase. All members of the community are encouraged to participate and be involved with the Community Advisory Group ("CAG") for the Site. Members who are interested in joining the CAG may contact EPA Community Involvement Coordinator ("CIC") Larry Johnson at (215) 814-3239 or johnson.larry-c@epa.gov. EPA currently provides and will continue to provide regular updates to the CAG. Additionally, EPA's Remedial Project Manager ("RPM") and CIC are available to discuss the Site with any interested member of the community.

### 3.5 Effect of Future Remediation Work on Location of the Treatment Building

One commenter asked if the future remediation work that would be conducted further away from the Site would impact where the treatment building would be located.

**EPA Response:** Because the extraction wells for this remedial action will be located within the AOHC, it is anticipated that the treatment system will need to be located near the extraction wells to be most cost-effective. Since the remedial investigation ("RI") for the Site is still ongoing, it is difficult to speculate what additional remediation work would be needed beyond the early interim remedial action at this time. However, if future remediation work requires additional extraction wells to be installed, those wells could potentially be connected to the current treatment system, or an additional treatment building could be constructed.

### 3.6 Community Advisory Group

One commenter mentioned that there is a CAG for the Chem-Fab Site and asked EPA to explain what the CAG is and invite interested residents and business owners to participate.

**EPA Response:** A CAG is made up of members of the community and is designed to serve as the focal point for the exchange of information among the local community and EPA, the State regulatory agency, and other pertinent Federal agencies involved in cleanup of the Superfund site. There is an active CAG for the Chem-Fab Site that meets quarterly. All members of the community are welcome to participate. Members who are interested in joining the CAG may contact EPA community involvement coordinator Larry Johnson at (215) 814-3239 or johnson.larry-c@epa.gov. EPA's RPM and CIC are also available to discuss the Site with any interested member of the community. A fact sheet regarding the interim remedy is available as well and can be found on the Doylestown Borough's website: http://www.doylestownborough.net/.

### 3.7 Pennsylvania Department of Environmental Protection Involvement

One commenter from PADEP mentioned that PADEP will stay involved with the project as it moves through the remedial design and remedial action phases. PADEP will review EPA's design and ensure it complies with Pennsylvania ARARs. Specifically, PADEP will ensure the remedial action complies with regulations governing air emissions and discharge of treated water.

**EPA Response:** EPA has no response to PADEP's comment other than we look forward to continue to work collaboratively with PADEP and all other stakeholders on the clean-up of the Chem-Fab Superfund Site.

# *IV. TABLES*

## *CHEM-FAB SUPERFUND SITE*
## *OPERABLE UNIT 2*
## *EARLY INTERIM REMEDIAL ACTION*

## *DOYLESTOWN BOROUGH, BUCKS COUNTY, PENNSYLVANIA*

## Table 1
## Identification of Groundwater COPCs and Maximum Detected Concentrations

| Chemical | Screening Value (µg/L) | Basis | Maximum Historical Value Detected (µg/L) | Well ID Maxium Detection | Date |
|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | 200 | Drinking Water MCL | 1320 | SB-05 | 1/5/2000 |
| 1,1,2,2-Tetrachloroethane | 0.076 | Tapwater RSL | 3 | MW-05 | 9/10/2002 |
| 1,1,2-Trichloroethane | 0.041 | Tapwater RSL | 10 | MW-05 | 9/10/2002 |
| 1,1-Dichloroethene | 7 | Drinking Water MCL | 280 | MW-16 | 5/6/2002 |
| 1,1-Dichloroethane | 2.8 | Tapwater RSL | 148 | SB-34 | 1/13/2000 |
| 1,2-Dichlorobenzene | 30 | Tapwater RSL | 45.1 | SB-05 | 1/5/2000 |
| 1,2-Dichloroethane | 0.17 | Tapwater RSL | 13 | OW-09 | 1/13/2014 |
| 1,4-Dichlorobenzene | 0.48 | Tapwater RSL | 5.09 | SB-13 | 1/6/2000 |
| Benzene | 0.46 | Tapwater RSL | 8 | MW-05 | 9/10/2002 |
| Bromodichloromethane | 0.13 | Tapwater RSL | 3 | MW-05 | 9/10/2002 |
| Carbon tetrachloride | 0.46 | Tapwater RSL | 13 | MW-14 | 9/19/2007 |
| Chloroform | 0.22 | Tapwater RSL | 160 | MW-04 | 9/17/2002 |
| cis-1,2-Dichloroethene | 3.6 | Tapwater RSL | 6740 | SB-05 | 1/5/2000 |
| Ethylbenzene | 1.5 | Tapwater RSL | 1260 | SB-05 | 1/5/2000 |
| Methylene chloride | 5 | Drinking Water MCL | 9700 | MW-04 | 5/16/2002 |
| o-Xylene | 19 | Tapwater RSL | 530 | MW-04 | 7/9/2003 |
| Tetrachloroethene | 4.1 | Tapwater RSL | 4330 | SB-05 | 1/5/2000 |
| Toluene | 110 | Tapwater RSL | 604 | SB-05 | 1/5/2000 |
| Trans-1,2-Dichloroethene | 36 | Tapwater RSL | 90 | MW-05 | 5/14/2002 |
| Trans-1,3-Dichloropropene | 0.47 | Tapwater RSL | 50 | SB-04 | 1/4/2000 |
| Trichloroethene | 0.28 | Tapwater RSL | 35000 | MW-04 | 9/17/2002 |
| Vinyl Chloride | 0.019 | Tapwater RSL | 56 | SB-04 | 1/4/2000 |
| Xylenes | 19 | Tapwater RSL | 6700 | SB-05 | 1/5/2000 |
| 1,4-dioxane | 0.46 | Tapwater RSL | 40 | MW-16 | 9/21/2007 |
| Naphthalene | 0.17 | Tapwater RSL | 69.6 | SB-05 | 1/5/2000 |
| Aluminum | 2000 | Tapwater RSL | 4080 | MW-07 | 1/8/2002 |
| Antimony | 0.78 | Tapwater RSL | 842 | MW-07 | 1/8/2002 |
| Arsenic | 0.052 | Tapwater RSL | 160 | MW-04 | 8/11/2004 |
| Barium | 380 | Tapwater RSL | 8640 | MW-10 | 8/12/2004 |
| Beryllium | 2.5 | Tapwater RSL | 47.2 | MW-07 | 1/8/2002 |
| Cadimium | 0.92 | Drinking Water MCL | 23.8 | MW-07 | 1/8/2002 |
| Chromium | 0.035 | Tapwater RSL | 240000 | MW-04 | 9/17/2002 |
| Hexavalent chromium | 0.035 | Tapwater RSL | 233000 | MW-04 | 5/16/2004 |
| Cobalt | 0.6 | Tapwater RSL | 5170 | MW-07 | 1/8/2002 |
| Copper | 80 | Tapwater RSL | 5600 | SB-05 | 1/5/2000 |
| Iron | 1400 | Tapwater RSL | 55100 | DW | 1/9/2002 |
| Lead | 15 | Drinking Water MCL | 339 | SB-13 | 1/6/2000 |
| Manganese | 43 | Tapwater RSL | 35800 | MW-10 | 7/6/2001 |
| Mercury | 0.063 | Tapwater RSL | 1.3 | MW-04 | 5/16/2002 |
| Nickel | 39 | Tapwater RSL | 13500 | MW-07 | 1/8/2002 |
| Selenium | 10 | Tapwater RSL | 24.7 | MW-04 | 5/16/2002 |
| Silver | 9.4 | Tapwater RSL | 16.8 | MW-04 | 4/22/2010 |
| Thallium | 0.02 | Tapwater RSL | 63.8 | MW-03 | 10/24/2001 |
| Vanadium | 8.6 | Tapwater RSL | 82.1 | OW-05 | 4/15/2009 |
| Zinc | 600 | Tapwater RSL | 1490 | MW-07 | 1/8/2002 |
| Perfluorooctanic acid (PFOA ) | 0.04 | Lifetime Health Advisory* | 0.211 | MW-45 | 12/9/2015 |
| Perfluorooctane sulfonic acid (PFOS) | 0.04 | Lifetime Health Advisory* | 1.9 | MW-40A | 1/14/2014 |

Notes:
µg/L – micrograms per liter
COPC – contaminant of poential concern
MCL – Maximum Contaminant Level
RSL – regional screening level (November 2015)
*Based on reference dose and combined Hazard Quotient of 0.1 in May 2016 EPA Office of Drinking Water Health Advisory for PFOA/PFOS
SB - groundwater sample collected from temporary piezometer
OW - groundater sample collected from monitoring well screened in the overburden
MW - groundwater sample collected from monitoring well screened in bedrock

**Table 2**
**Applicable or Relevant and Appropriate Requirements**
**Chem-Fab Superfund Site, Doylestown, PA**

| ARAR | Legal Citation | ARAR Class | Requirement Synopsis | Applicability to Selected Remedy |
|---|---|---|---|---|
| **Chemical Specific ARARs** | | | | |
| A. Water | | | | |
| Pennsylvania Water Quality Standards | 25 Pa. Code §§ 93.6, 93.7(a) and (b), 93.8c(a) | Relevant and Appropriate | These are specific water quality criteria established pursuant to Section 304 of the CWA. These provisions set the concentrations of pollutants that are allowable at levels that preserve human health based on water and fish ingestion and to preserve aquatic life. Ambient water quality criteria may be relevant and appropriate to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) cleanups based on uses of a water body. | The discharge of treated groundwater will be required to meet the requirements established for protection of human health and aquatic life. |

## Table 2
## Applicable or Relevant and Appropriate Requirements
## Chem-Fab Superfund Site, Doylestown, PA

| ARAR | Legal Citation | ARAR Class | Requirement Synopsis | Applicability to Selected Remedy |
|---|---|---|---|---|
| **Location-Specific ARARs** | | | | |
| Groundwater Withdrawal Regulations | 18 C.F.R. §§ 430.7, 430.9, 430.15(b)(1) and (2) | Relevant and Appropriate | Governs the withdrawal of water and operation of groundwater wells withdrawing water from the Delaware River Basin where the Site is located | Wells utilized to undertake groundwater withdrawals at the Site will meet these standards |
| Wetland Protection and Mitigation | 40 C.F.R. § 230.10 | Applicable | No discharge of dredged or fill material into an aquatic ecosystem is permitted if there is a practicable alternative that would have less adverse impact on the aquatic ecosystem; causes or contributes to violations of State water quality standards; violates any applicable toxic effluent standard; jeopardizes continued existence of a species; vilates any requirement to protect a marine sanctuary; or if it will cause or contribute to significant degradation of the waters of the U.S. No discharge of dredge or fill material shall occur unless appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem | These regulations shall be triggered if the treatment plant is located in the wetland and a "discharge of fill material" occurs within the meaning of 40 C.F.R. § 230.2 |
| Compensatory Mitigation for Loss of Aquatic Resources | 40 C.F.R. § 230.93 | Relevant and Appropriate | Describes the standards and criteria for establishing compensatory mitigation of wetlands | Minor disruption to potential wetlands may occur during the construction and operation of the treatment building |
| Dam Safety and Waterway Management | Substantive requirements of 25 Pa. Code §§ 105.1; 105.17; 105.18a; and 105.20a | Relevant and Appropriate | Establishes criteria for placing structures and conducting activities in wetlands | Minor disruption to potential wetlands may occur during the construction and operation of the treatment building |

**Table 2**
**Applicable or Relevant and Appropriate Requirements**
**Chem-Fab Superfund Site, Doylestown, PA**

| ARAR | Legal Citation | ARAR Class | Requirement Synopsis | Applicability to Selected Remedy |
|---|---|---|---|---|
| **Action-Specific ARARs** | | | | |
| A. Water | | | | |
| Pennsylvania Water Quality Toxics Management Strategy | 25 Pa. Code §§ 16.24, 16.32 – 16.33, 16.51 and 16.102<br><br>25 Pa. Code § 16 Appendix A Table 1A | Applicable | These regulations provide standards and criteria for protection of human health and aquatic life in waters of the Commonwealth. | The groundwater treatment system will comply with the substantive requirements of these discharge standards. |
| Clean Water Act (CWA)<br><br>Pennsylvania National Pollutant Discharge Elimination System Requirements | 40 C.F.R. § 122.41(a)(1), (d), (e); 122.44(a)(1), (b)(1)(first sentence), (d), (e), (i)(1), and (k); 122.45(a), (c)-(f)<br><br>25 Pa. Code §§ 92a.11, 92a.12(a), 92a.41(a)(4) and (5), 92a.41(c), 92a.44, 92a.45, 92a.61(d), (e), and (i) | Relevant and Appropriate | Establishes effluent limitations for discharges to waters of Pennsylvania and the United States. | The groundwater treatment system will comply with the substantive requirements of these provisions. |
| Pennsylvania Stormwater Management Act | 32 P.S. § 680.13 | Applicable | Requires implementation of storm water control measures to prevent injury to health, safety, or property. | Storm water controls will be implemented and maintained during construction of the remedy |

**Table 2**
**Applicable or Relevant and Appropriate Requirements**
**Chem-Fab Superfund Site, Doylestown, PA**

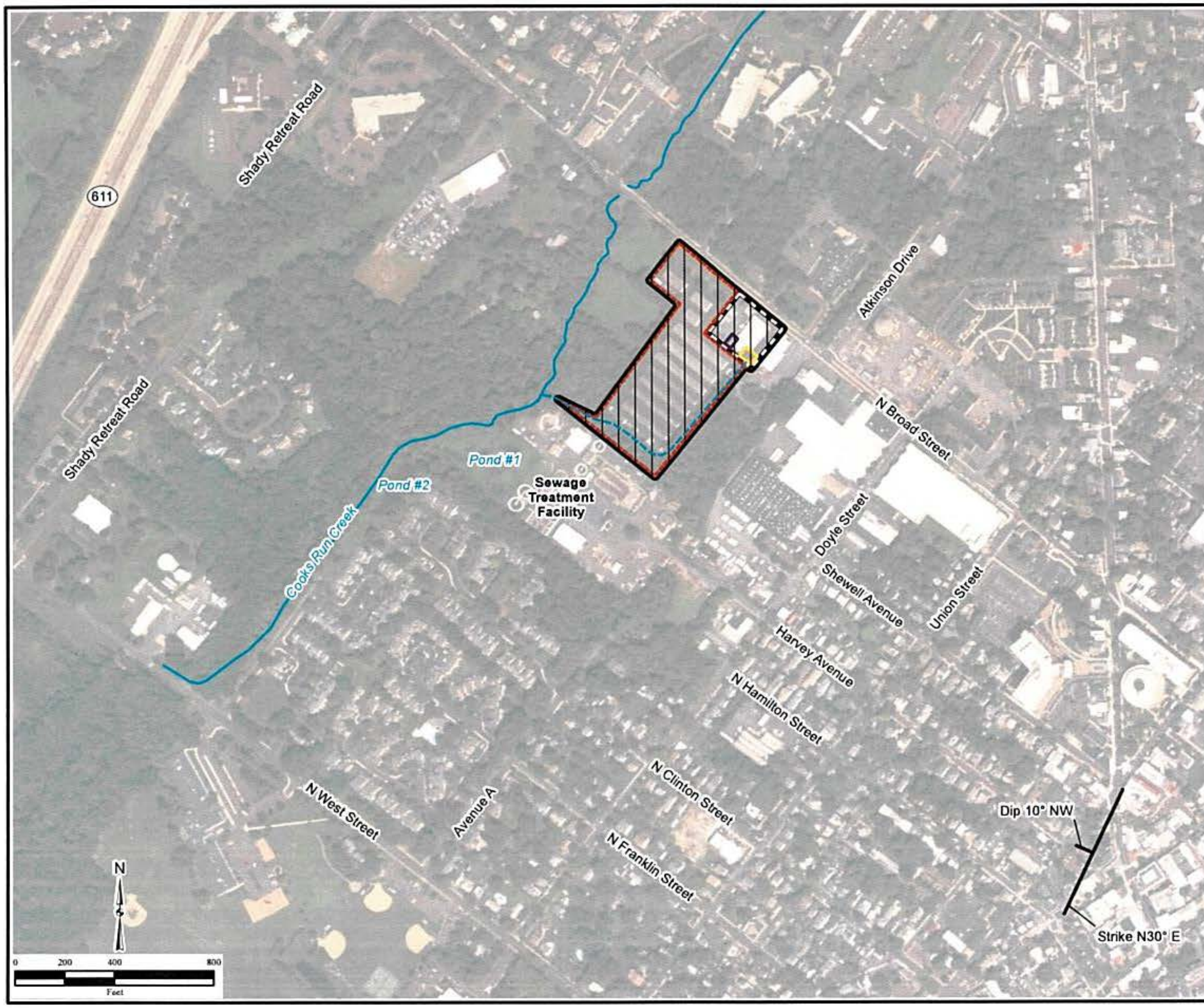
| ARAR | Legal Citation | ARAR Class | Requirement Synopsis | Applicability to Selected Remedy |
|---|---|---|---|---|
| B. Soil | | | | |
| Erosion and Sediment Control | 25 Pa. Code §§102.4(b)(1) and (4), 102.11, 102.22 | Applicable | Identifies erosion and sediment control requirements and criteria for activities involving land clearing, grading and other earth disturbances and establishes erosion and sediment control criteria. | These regulations apply to construction activities at the Site that disturb the ground surface including clearing grading, excavation, or well installation. |
| C. Wastes | | | | |
| Resource Conservation and Recovery Act (RCRA)<br><br>EPA-authorized Pennsylvania Hazardous Waste Management Regulations | 40 C.F.R. § 262.34 (accumulation time and requirements) 40 C.F.R §§ 264.171-175 (containers) (as incorporated by 25 Pa. Code § 262a.10 and 25 Pa. Code § 264a.1<br><br>25 Pa. Code §§ 262a.34, 264a.173, 265a.179 | Relevant and Appropriate | These provisions govern the accumulation time for storage of hazardous wastes and management of containers. | These requirements must be followed for any groundwater treatment remedy that generates and stores hazardous waste. |
| D. Air | | | | |
| Fugitive Air Emissions | 40 C.F.R. § 50.6 – 50.7<br><br>25 Pa Code §§ 123.1(a) and (c), 123.2, 123.31, 123.41 | Applicable | Establishes the fugitive dust regulation for particulate matter. | Any construction and/or excavation activities will comply with the substantive requirements of these regulations. |
| Construction, Modification, Reactivation, and Operation of Sources | 25 Pa Code § 127.1 | Applicable | Establishes the requirements for the use of best available technology on new air pollutant emissions sources. | Any construction and/or excavation activities as well as any treatment alternative that would result in the emission of site contaminants to the air, such as air stripping, will comply with the substantive requirements of these regulations. |

# *V. FIGURES*

***CHEM-FAB SUPERFUND SITE***
***OPERABLE UNIT 2***
***EARLY INTERIM REMEDIAL ACTION***

***DOYLESTOWN BOROUGH, BUCKS COUNTY, PENNSYLVANIA***

**Figure 1**
**Site Layout**




Legend

- Drainage Ditch
- Creek
- Area of Highest Groundwater Concentration (AOHC)
- Former 10,000-Gallon UST
- Former AST Farm
- Self-Storage Facility
- Former Chem-Fab Facility

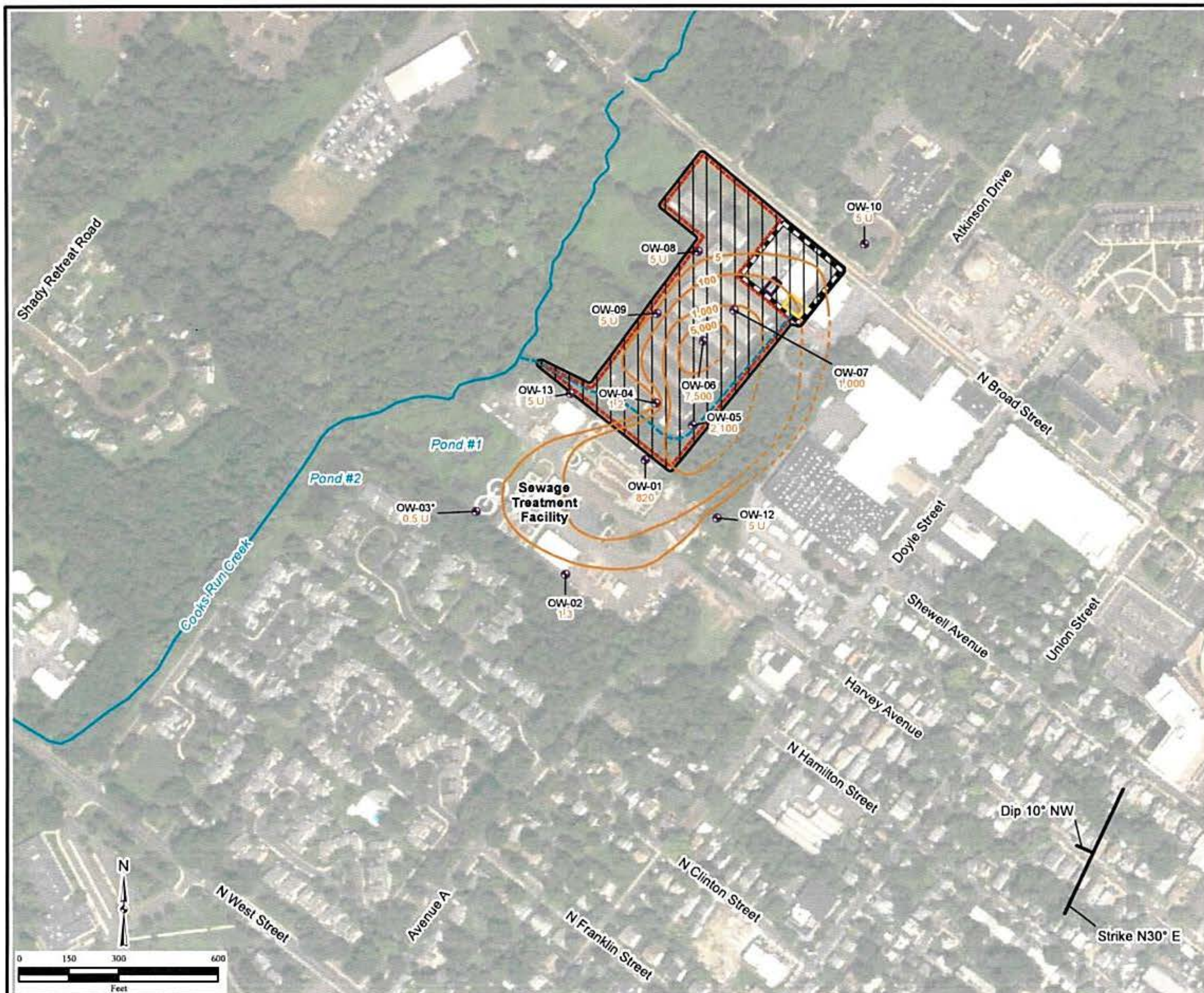
Notes
Bedrock fracture sets strike from northeast to southwest (approximately N30°E), with a dip of approximately 10 degrees to the northwest.

AST=aboveground storage tank
UST=underground storage tank

*\\Gat-srv-01\HGLGIS\Chem-Fab_MSIW\FFS\(1-02)Site_Layout.mxd*
*9/21/2016 TB*
*Source: HGL, URS, EA, AECOM*
*ESRI Online Aerial Imagery*

*HGL—Focused Feasibility Study Report*
*Chem-Fab Superfund Site, Doylestown, PA*

# Figure 2
# January/February 2014
# TCE
# Unconfined Overburden Groundwater Isoconcentration Contours




Legend

- UO Monitoring Well
- Drainage Ditch
- Creek
- OW-07 1,000 — Well Identification TCE Concentration (µg/L)
- —100— TCE Concentration Contour (µg/L) (dashed where inferred)
- Area of Highest Groundwater Concentration (AOHC)
- Former 10,000-Gallon UST
- Former AST Farm
- Self-Storage Facility
- Former Chem-Fab Facility

Notes:
Bedrock fracture sets strike from northeast to southwest (approximately N30°E), with a dip of approximately 10 degrees to the northwest

*=data from April 2010
µg/L=microgram per liter
AST=aboveground storage tank
TCE=trichloroethene
U=The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted Contract Required Quantitation Limit (CRQL) for sample and method
UO=unconfined overburden
UST=underground storage tank

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*8/31/2016 TB*
*Source: HGL, URS, EA, AECOM*
*NAIP Aerial Imagery*

HGL HydroGeoLogic, Inc.

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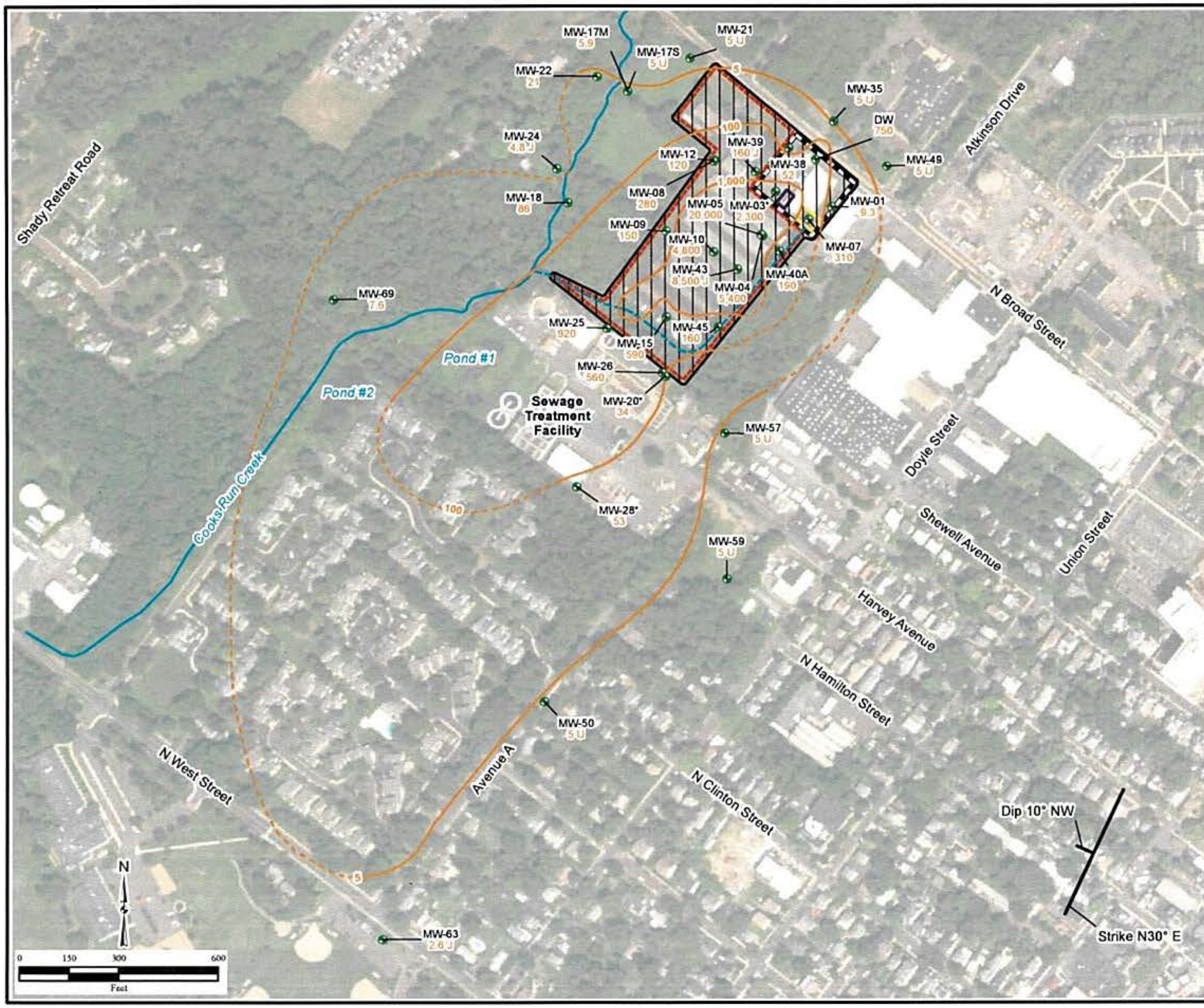
*Chem-Fab Superfund Site, Doylestown, PA*

# Figure 3
## January/February 2014 TCE Unconfined Shallow Bedrock Groundwater Isoconcentration Contours




### Legend

- USB Monitoring Well
- Drainage Ditch
- Creek
- MW-01 9.3 — Well Identification TCE Concentration (μg/L)
- 100 — TCE Concentration Contour (μg/L) (dashed where inferred)
- Area of Highest Groundwater Concentration (AOHC)
- Former 10,000-Gallon UST
- Former AST Farm
- Self-Storage Facility
- Former Chem-Fab Facility

Notes:
Bedrock fracture sets strike from northeast to southwest (approximately N30°E), with a dip of approximately 10 degrees to the northwest.

*=data from April 2010
μg/L=microgram per liter
AST=aboveground storage tank
J=The result is an estimate quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
TCE=trichloroethene
U=The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted Contract Required Quantitation Limit (CRQL) for sample and method.
USB=unconfined shallow bedrock
UST=underground storage tank

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*8/31/2016 TB*
*Source: HGL, URS, EA, AECOM*
*NAIP Aerial Imagery*

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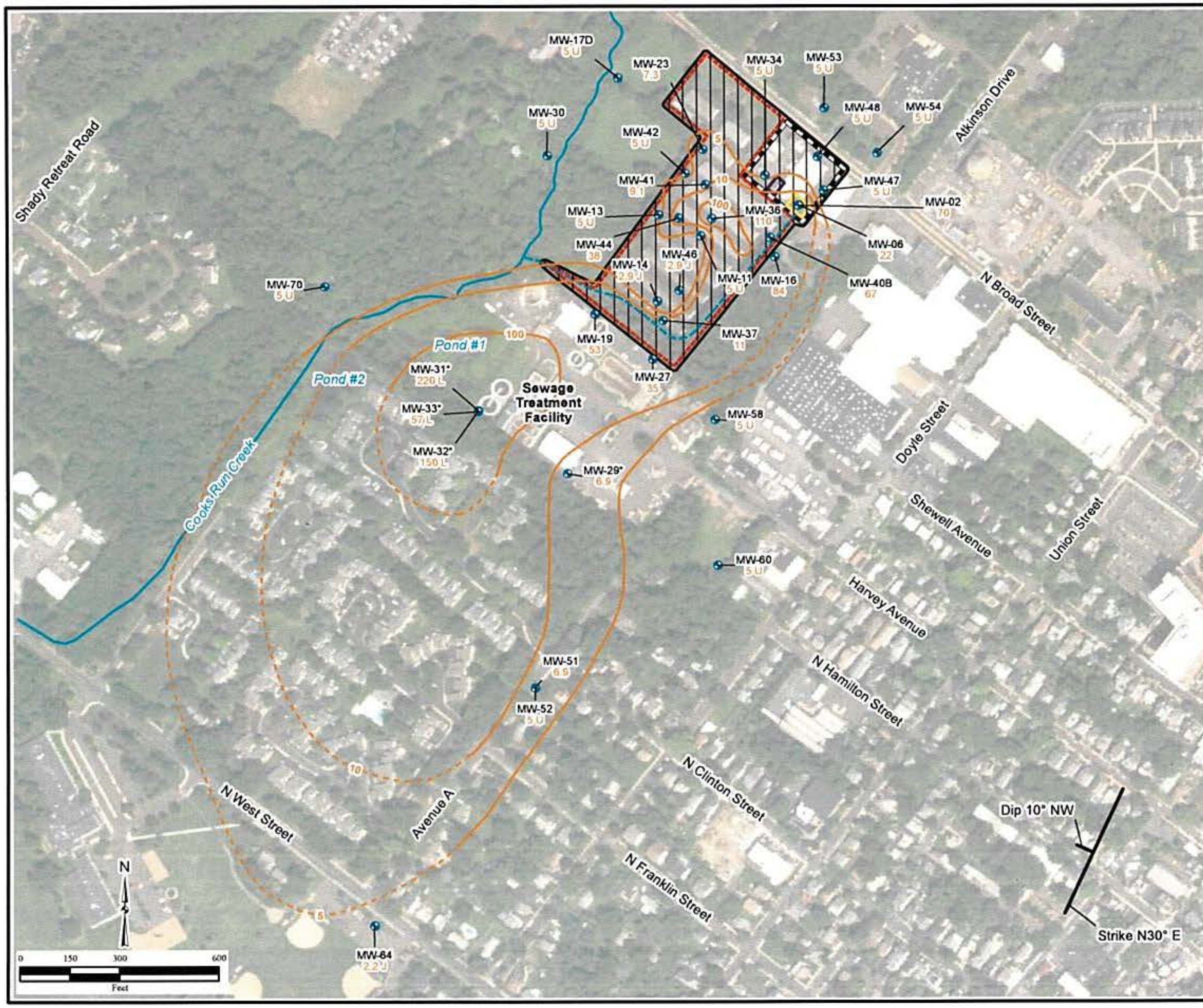
*Chem-Fab Superfund Site, Doylestown, PA*

# Figure 4
# January/February 2014
# TCE
# Semiconfined Bedrock Groundwater Isoconcentration Contours




Legend

- SC Monitoring Well
- Drainage Ditch
- Creek
- MW-02 70 — Well Identification, TCE Concentration (µg/L)
- 100 — TCE Concentration Contour (µg/L) (dashed where inferred)
- Area of Highest Groundwater Concentration (AOHC)
- Former 10,000-Gallon UST
- Former AST Farm
- Self-Storage Facility
- Former Chem-Fab Facility

Notes
Bedrock fracture sets strike from northeast to southwest (approximately N30°E), with a dip of approximately 10 degrees to the northwest.

*Data from April 2010
µg/L=microgram per liter
AST=aboveground storage tank
J=The result is an estimate quantity. The associated numerical value is the approximate concentration of the analyte in the sample
L=The analyte was detected, but the result may be biased low
SC=semiconfined bedrock
TCE=trichloroethene
U=The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted Contract Required Quantitation Limit (CRQL) for sample and method
UST=underground storage tank

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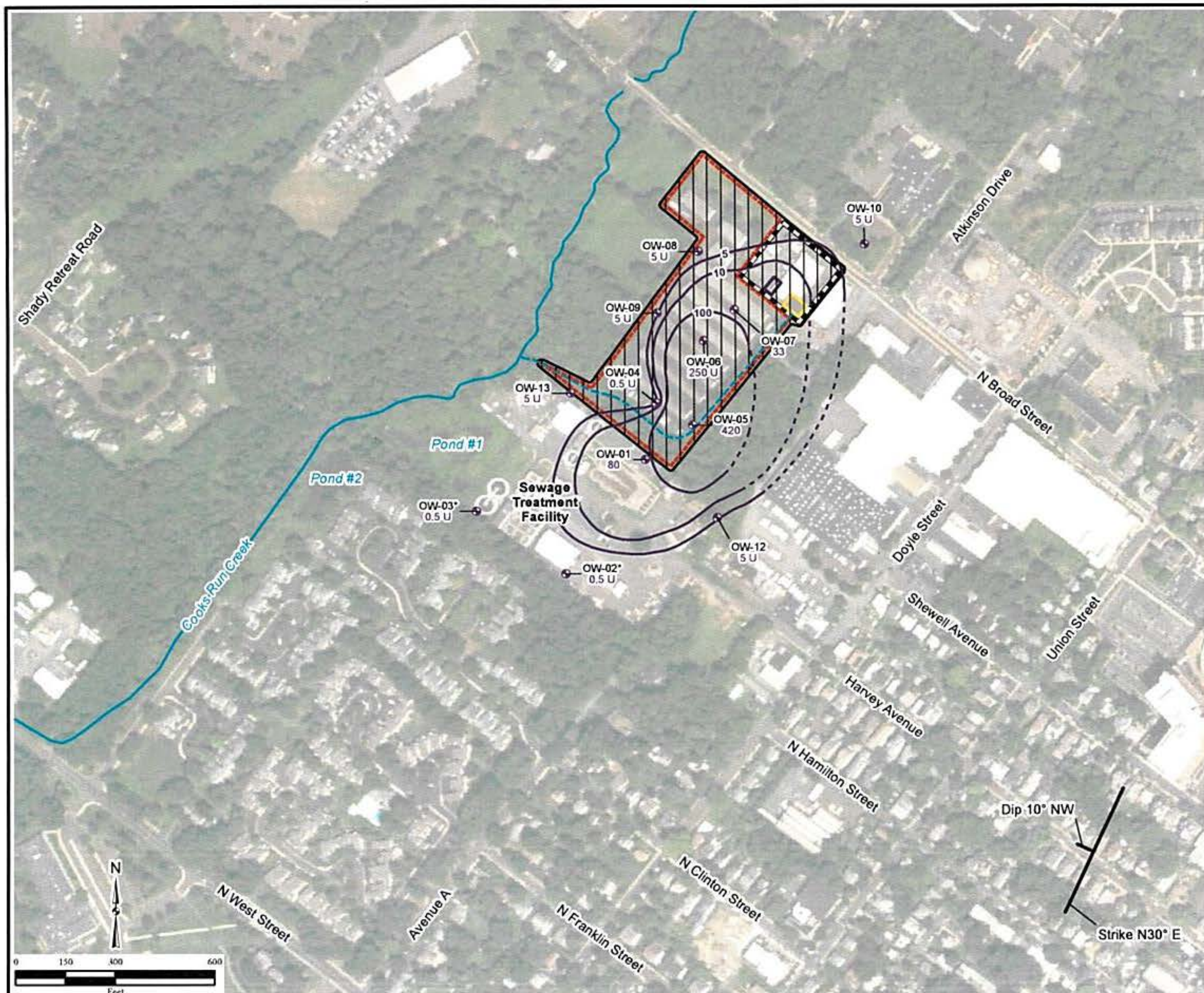
*8/31/2016 TB*
*Source: HGL, URS, EA, AECOM NAIP Aerial Imagery*

HGL

**Figure 5**
**January/February 2014**
**PCE**
**Unconfined Overburden Groundwater**
**Isoconcentration Contours**




Legend

- UO Monitoring Well
- Drainage Ditch
- Creek
- OW-08 5 U — Well Identification, PCE Concentration (µg/L)
- —100— PCE Concentration Contour (µg/L) (dashed where inferred)
- Area of Highest Groundwater Concentration (AOHC)
- Former 10,000 Gallon UST
- Former AST Farm
- Self-Storage Facility
- Former Chem-Fab Facility

Notes:
Bedrock fracture sets strike from northeast to southwest (approximately N30°E), with a dip of approximately 10 degrees to the northwest.

*=data from April 2010.
µg/L=microgram per liter
AST=aboveground storage tank
PCE=tetrachloroethene
U=The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted Contract Required Quantitation Limit (CRQL) for sample and method
UO=unconfined overburden
UST=underground storage tank

*\\Gst-srv-01\hglgis\Chem-Fab_MSIW\FFS\(1-09)Jan-Feb_PCE_Unconf_Overburden.mxd*
*8/31/2016 TB*
*Source: HGL, URS, EA, AECOM*
*NAIP Aerial Imagery*

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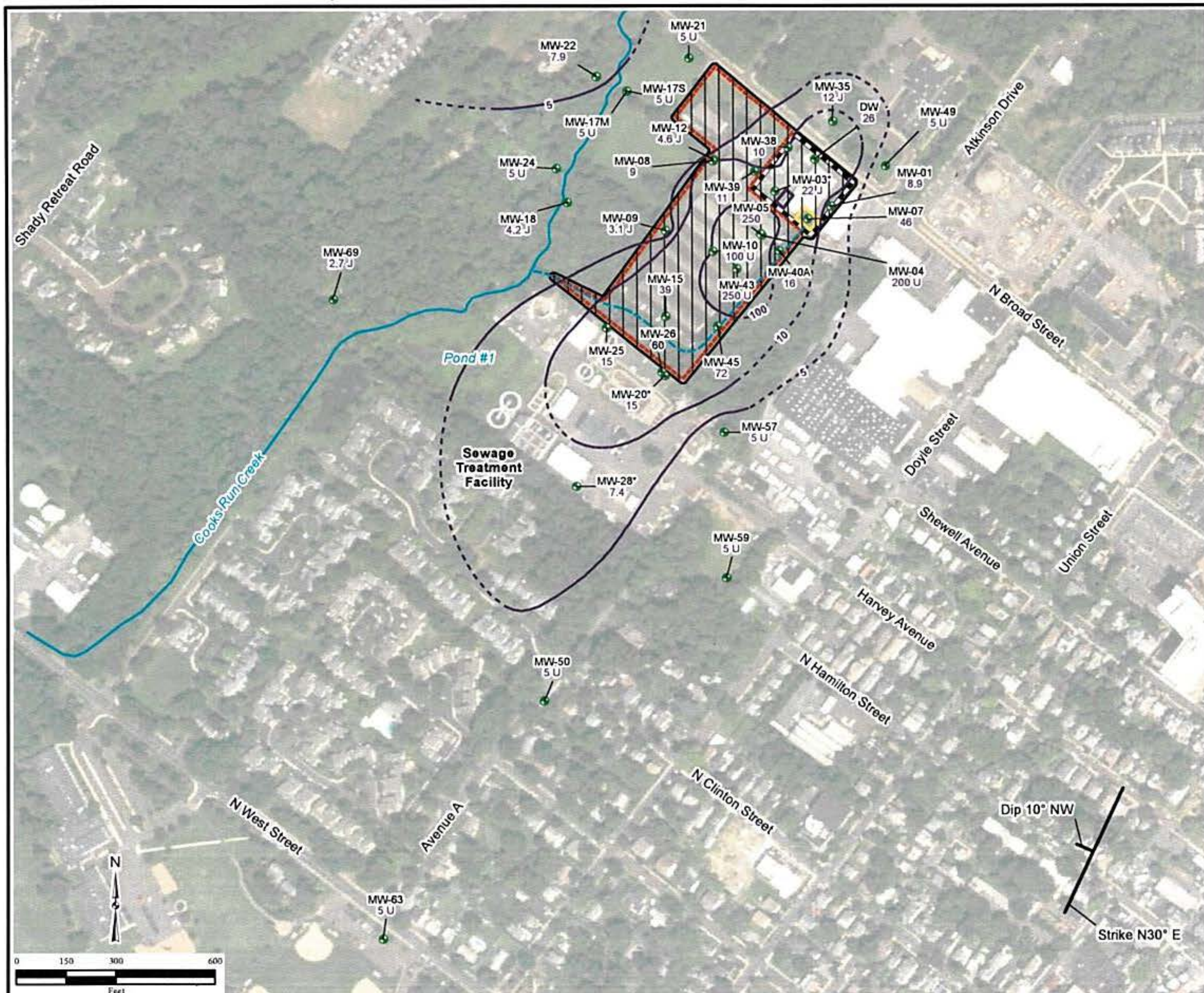
*Chem-Fab Superfund Site, Doylestown, PA*

**Figure 6**
**January/February 2014**
**PCE**
**Unconfined Shallow**
**Bedrock Groundwater**
**Isoconcentration Contours**




Legend

- USB Monitoring Well
- Drainage Ditch
- Creek
- MW-04 200 U — Well Identification PCE Concentration (µg/L)
- —100— PCE Concentration Contour (µg/L) (dashed where inferred)
- Area of Highest Groundwater Concentration (AOHC)
- Former 10,000 Gallon UST
- Former AST Farm
- Self-Storage Facility
- Former Chem-Fab Facility

Notes
Bedrock fracture sets strike from northeast to southwest (approximately N30°E), with a dip of approximately 10 degrees to the northwest.

*=data from April 2010
µg/L=microgram per liter
AST=aboveground storage tank
J=The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
PCE=tetrachloroethene
U=The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted Contract Required Quantitation Limit (CRQL) for sample and method.
USB=unconfined shallow bedrock
UST=underground storage tank

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*8/31/2016 TB*
*Source: HGL, URS, EA, AECOM*
*NAIP Aerial Imagery*

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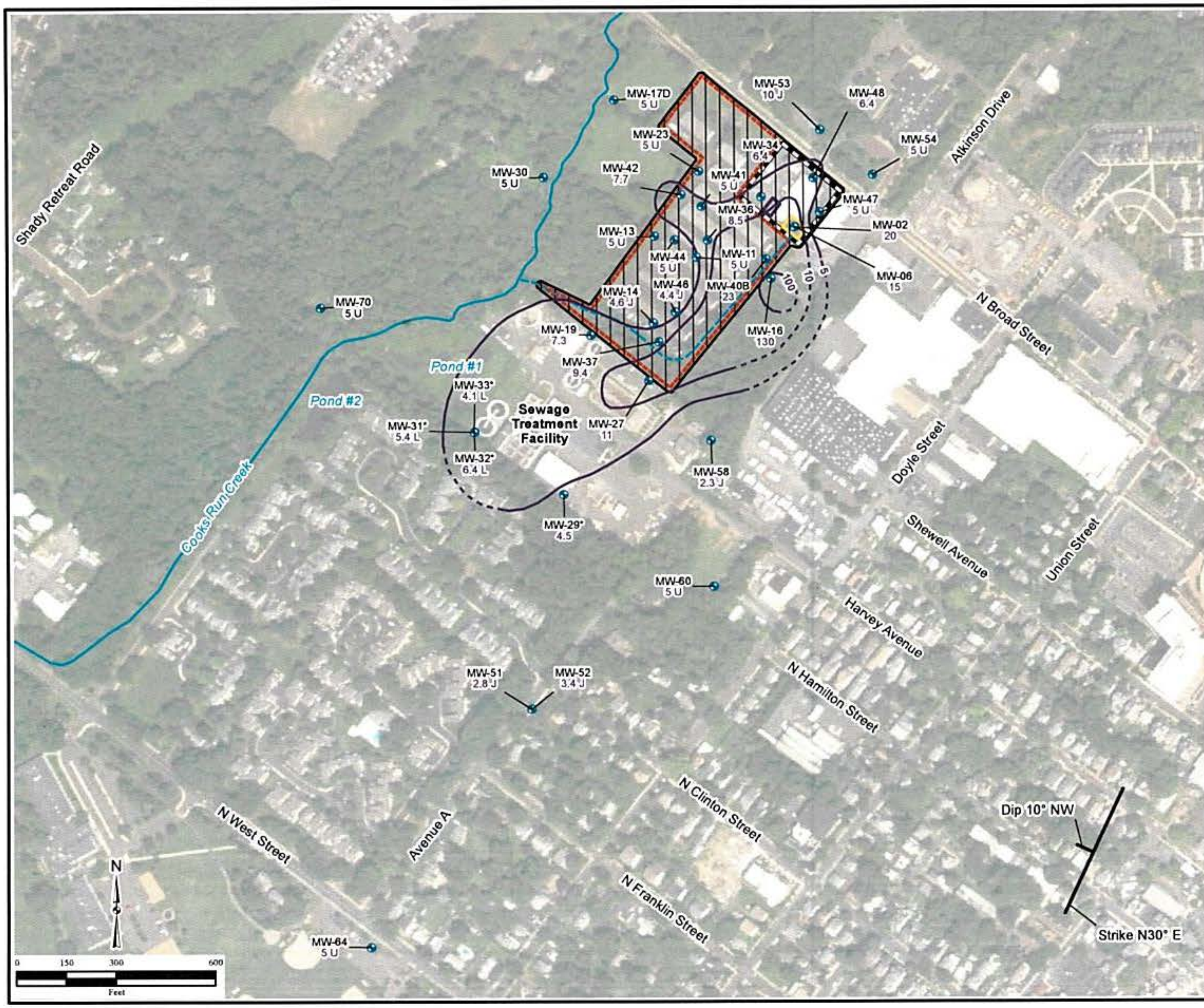


# Figure 7
## January/February 2014
## PCE
## Semi-Confined Bedrock Groundwater Isoconcentration Contours

### Legend

- SC Monitoring Well
- Drainage Ditch
- Creek
- MW-02 20 — Well Identification PCE Concentration (µg/L)
- —100— PCE Concentration Contour (µg/L) (dashed where inferred)
- Area of Highest Groundwater Concentration (AOHC)
- Former 10,000 Gallon UST
- Former AST Farm
- Self-Storage Facility
- Former Chem-Fab Facility

Notes:
Bedrock fracture sets strike from northeast to southeast (approximately N30°E), with a dip of approximately 10 degrees to the northwest.

*=data from April 2010
µg/L=microgram per liter
AST=aboveground storage tank
J=The result is an approximate quantity The associate numerical value is the approximate concentration of the analyte in the sample.
L=The analyte was detected, but the result may be biased low
PCE=tetrachloroethene
SC=semi-confined bedrock
U=The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted Contract Required Quantitation Limit (CRQL) for sample and method
UST=underground storage tank

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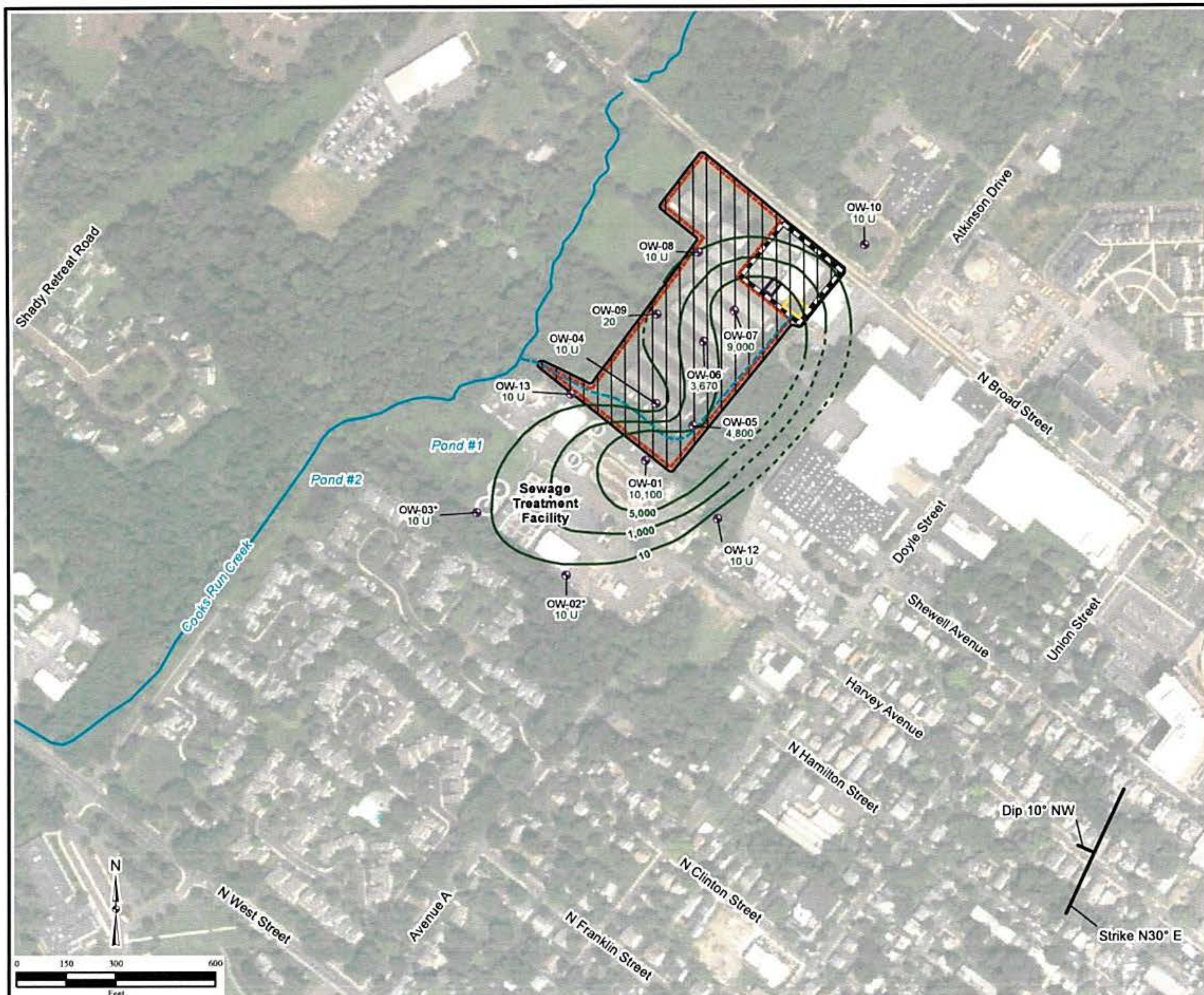
*8/31/2016 TB*
*Source: HGL, URS, EA, AECOM*
*NAIP Aerial Imagery*

## Figure 8
## January/February 2014 Hexavalent Chromium Unconfined Overburden Groundwater Isoconcentration Contours




### Legend

- UO Monitoring Well
- Drainage Ditch
- Creek
- OW-07 9,000 — Well Identification, Hexavalent Chromium Concentration (µg/L)
- -10- — Hexavalent Chromium Concentration Contour (µg/L, dashed where inferred)
- Area of Highest Groundwater Concentration (AOHC)
- Former 10,000-Gallon UST
- Former AST Farm
- Self-Storage Facility
- Former Chem-Fab Facility

Notes:
Bedrock fracture sets strike from northeast to southwest (approximately N30°E), with a dip of approximately 10 degrees to the northwest.

*=data from April 2010
µg/L=microgram per liter
AST=aboveground storage tank
U=The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted Contract Required Quantitation Limit (CRQL) for sample and method
UO=unconfined overburden
UST=underground storage tank

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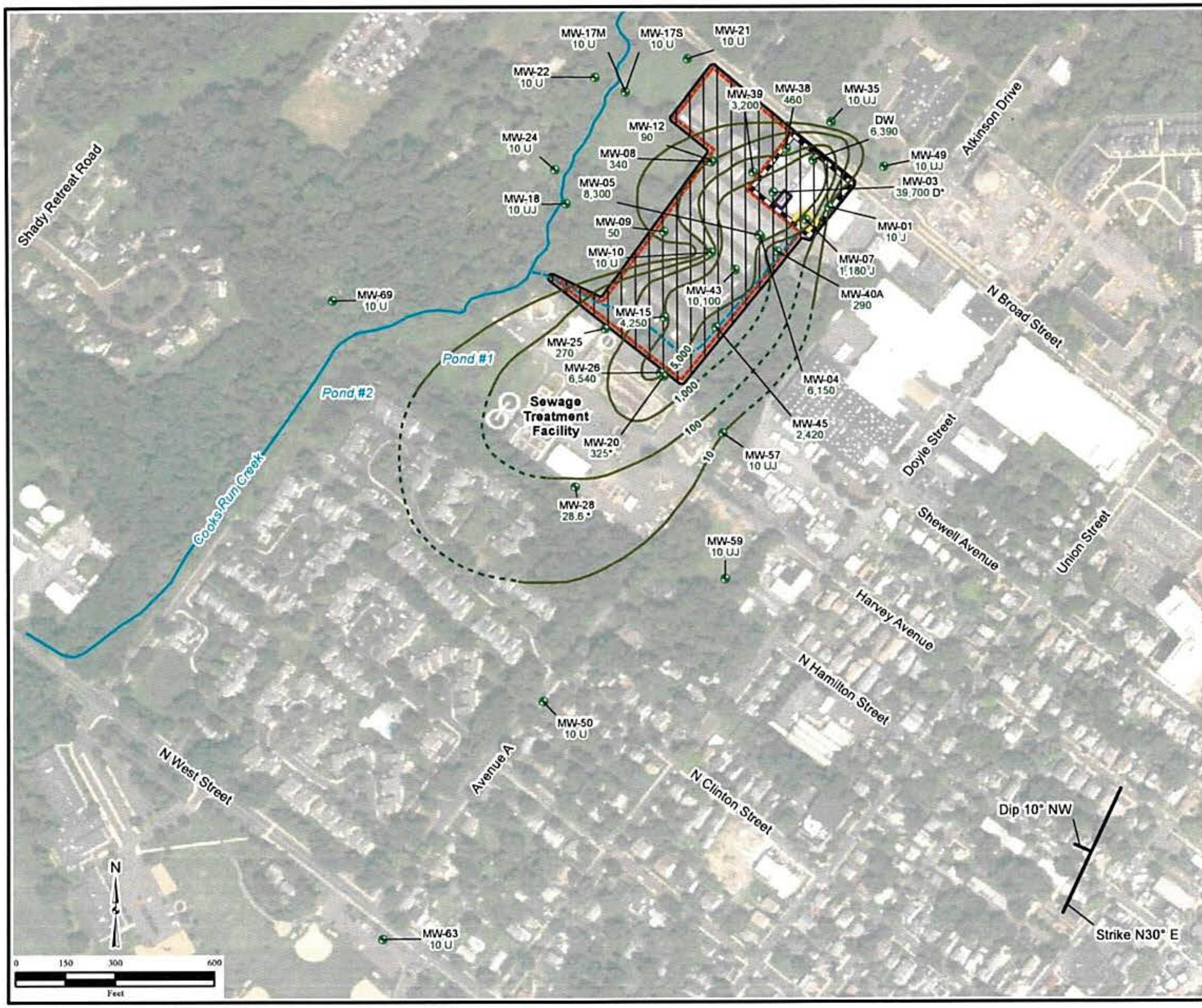
(1-15)Jan-Feb_HexChrom_Unconf_Overburden.mxd
9/1/2016 TB
Source: HGL, URS, EA, AECOM
NAIP Aerial Imagery

# Figure 9
## January/February 2014 Hexavalent Chromium Unconfined Shallow Bedrock Groundwater Isoconcentration Contours




### Legend

- USB Monitoring Well
- Drainage Ditch
- Creek
- MW-01 10 J — Well Identification; Hexavalent Chromium Concentration (µg/L)
- —10— Hexavalent Chromium Concentration Contour (µg/L, dashed where inferred)
- Area of Highest Groundwater Concentration (AOHC)
- Former 10,000-Gallon UST
- Former AST Farm
- Self-Storage Facility
- Former Chem-Fab Facility

Notes:
Bedrock fracture sets strike from northeast to southwest (approximately N30°E), with a dip of approximately 10° to the northwest.

*=data from April 2010
µg/L=microgram per liter
AST=aboveground storage tank
J=The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
U=The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted Contract Required Quantitation Limit (CRQL) for sample and method.
UJ=The analyte was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
USB=unconfined shallow bedrock
UST=underground storage tank

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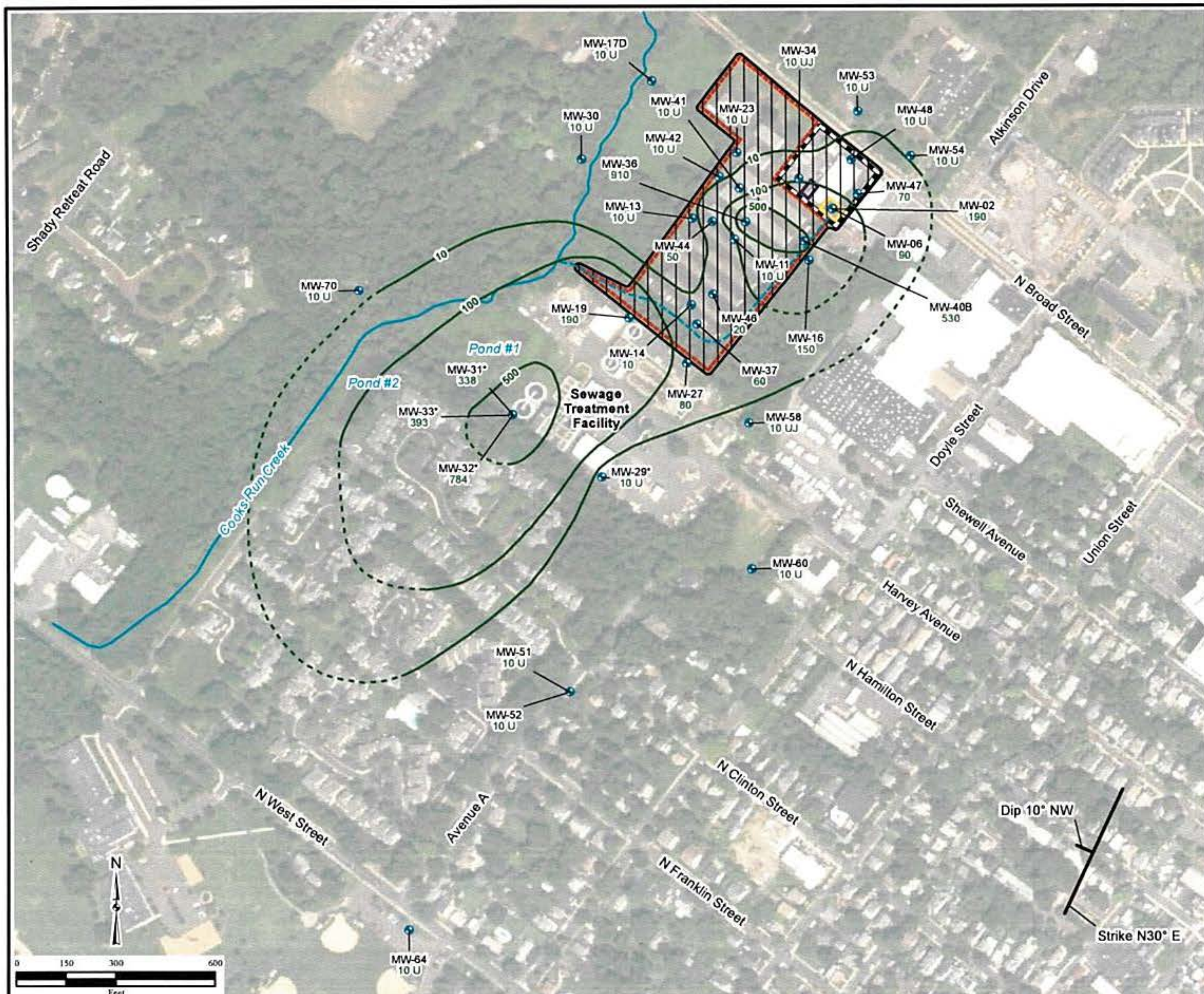
*9/1/2016 TB*
*Source: HGL, URS, EA, AECOM*
*NAIP Aerial Imagery*

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*Chem-Fab Superfund Site, Doylestown, PA*

**Figure 10**
**January/February 2014**
**Hexavalent Chromium**
**Semiconfined Bedrock Groundwater**
**Isoconcentration Contours**

Legend

- SC Monitoring Well
- Drainage Ditch
- Creek
- MW-02 190 — Well Identification; Hexavalent Chromium Concentration (µg/L)
- —100— Hexavalent Chromium Concentration Contour (µg/L, dashed where inferred)
- Area of Highest Groundwater Concentration (AOHC)
- Former 10,000-Gallon UST
- Former AST Farm
- Self-Storage Facility
- Former Chem-Fab Facility

Notes:
Bedrock fracture sets strike from northeast to southwest (approximately N30°E), with a dip of approximately 10° to the northwest.

*=data from April 2010
µg/L=microgram per liter
AST=aboveground storage tank
SC=semiconfined bedrock
U=The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted Contract Required Quantitation Limit (CRQL) for sample and method
UJ=The analyte was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
UST=underground storage tank

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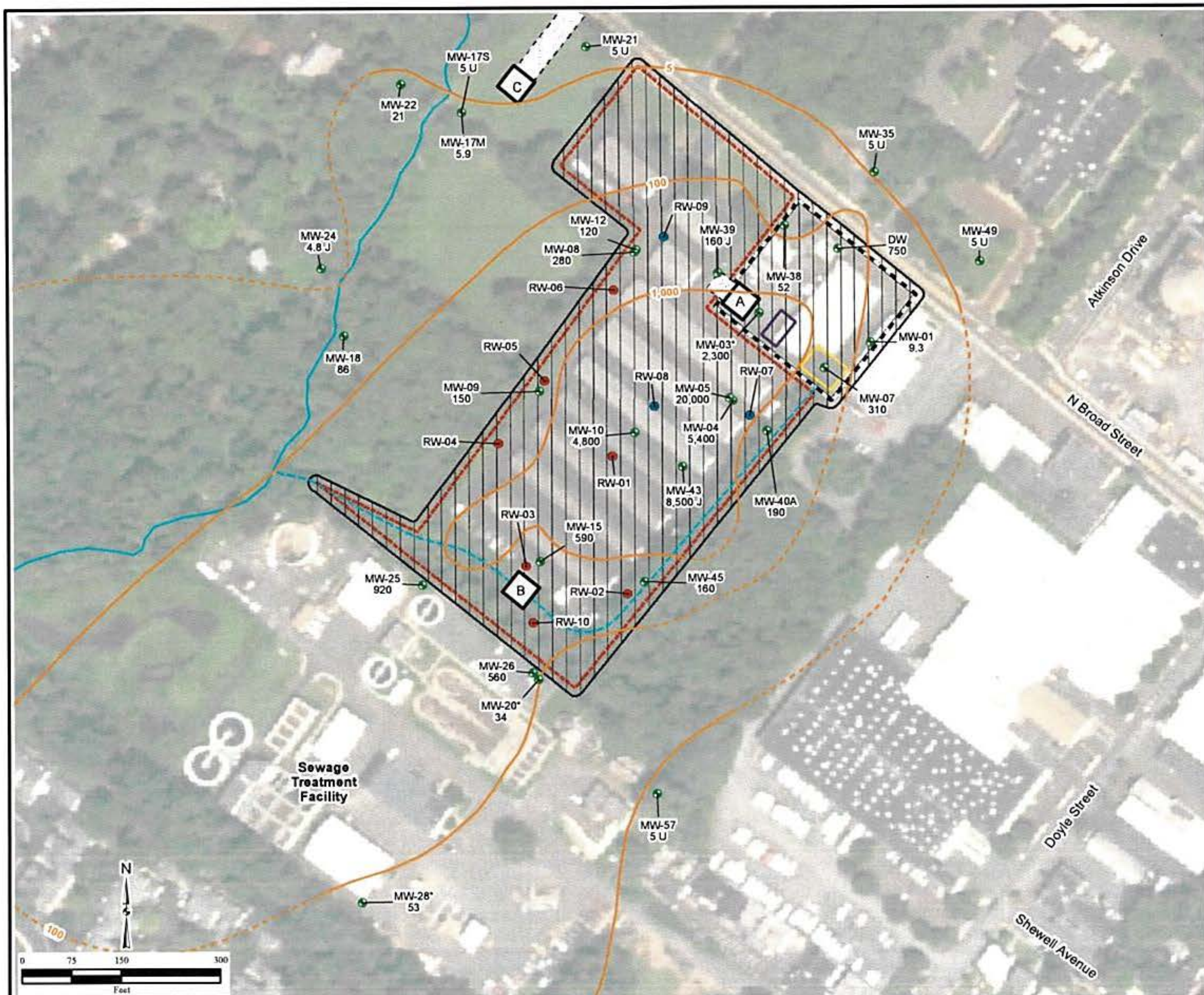
*9/1/2016 TB*
*Source: HGL, URS, EA, AECOM*
*NAIP Aerial Imagery*

AR300239

*HGL—Focused Feasibility Study Report*
*Chem-Fab Superfund Site, Doylestown, PA*

# Figure 11
# Remedial Design Example Layout



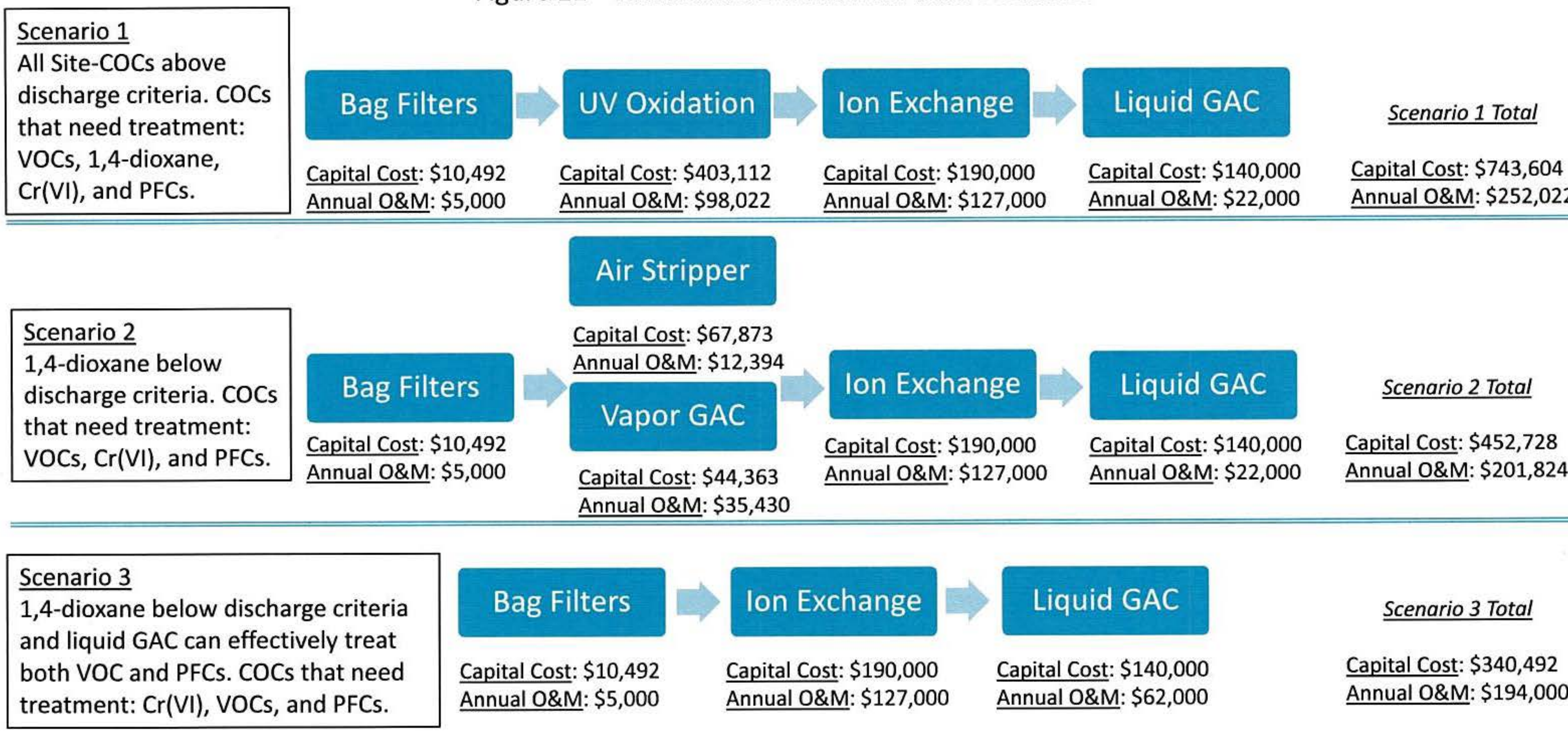

## Legend

- USB Monitoring Well
- Proposed Recovery (75 ft-bgs)
- Proposed Recovery (50 ft-bgs)
- MW-01 9.3 — Well Identification, TCE Concentration (µg/L)
- Drainage Ditch
- Creek
- —100— TCE Concentration Contour (Dashed where inferred)
- Area of Highest Groundwater Concentration (AOHC)
- Former 10,000-Gallon UST
- Former AST Farm
- Self-Storage Facility
- Former Chem-Fab Facility
- Potential Water Treatment Building Location
- Proposed Access Road to Treatment Building

Notes:
*=data from April 2010
µg/L=microgram per liter
AST=aboveground storage tank
TCE=trichloroethene
U=The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted Contract Required Quantitation Limit (CRQL) for sample and method
USB=unconfined shallow bedrock
UST=underground storage tank

*\\gst-srv-01\HGLGIS\Chem-Fab_MSIW\FFS\(4-01)RD_Ex_Layout.mxd*
*9/1/2016 TB*
*Source: HGL, URS, EA, AECOM NAIP Aerial Imagery*

Figure 12 – Alternative 2 Treatment Train Scenarios




Note: The total capital costs presented in this figure do not include capital expenditures associated with the construction, operation, and maintenance of the treatment building. The annual O&M costs are non-labor costs and include only energy and materials costs associated with each individual treatment component.