

HRS DOCUMENTATION RECORD COVER SHEET

Name of Site: Valley Pike VOCs
EPA ID No. OHN000510489

Contact Persons

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Pathways, Components, or Threats Not Scored

The surface water migration, soil exposure, and air migration pathways were not scored in this Hazard Ranking System (HRS) documentation record because the ground water migration pathway achieves an HRS site score sufficient for inclusion on the National Priorities List (NPL). The nearest surface water body is located within 0.5 mile of the site (Ref. 3). Contaminated soil and soil vapor samples collected at and in the vicinity of the site indicate the presence of hazardous substances (Ref. 15, p. 19). Due to the proximity of the site to potential targets for the surface water migration, soil exposure, and air migration pathways, these pathways may be of future concern to the U.S. Environmental Protection Agency (EPA).

HAZARD RANKING SYSTEM DOCUMENTATION RECORD

Name of Site: Valley Pike VOCs

Date Prepared: April 2016

EPA Region: 5

Street Address of Site*: 2949 Valley Pike (Figure 1)

City, County, State, Zip Code: Riverside, Montgomery County, Ohio 45404

General Location in the State: West-central part of Ohio (east of Dayton, Ohio)

Topographic Map: Dayton North, Ohio (Ref. 3)

Latitude: 39° 47' 50" North

Longitude: 84° 7' 57" West

The latitude and longitude coordinates listed above were measured from observed release ground water sampling location MW-EPA-8 (Refs. 9; 10) (see Figure 4 of this HRS documentation record).

* The street address, coordinates, and contaminant locations presented in this HRS documentation record identify the general area where the site is located. They represent one or more locations EPA considers to be part of the site based on the screening information EPA used to evaluate the site for NPL listing. EPA lists national priorities among the known “releases or threatened releases” of hazardous substances; thus, the focus is on the release, not precisely delineated boundaries. A site is defined as where a hazardous substance has been “deposited, stored, disposed, or placed, or otherwise come to be located.” Generally, HRS scoring and the subsequent listing of a release merely represent the initial determination that a certain area may need to be addressed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be refined as more information is developed as to where the contamination has come to be located.

<u>Pathway</u>	<u>Pathway Score</u>
Ground Water Migration	100.00
Surface Water Migration	NS
Soil Exposure	NS
Air Migration	NS
HRS SITE SCORE	50.00

Note:

NS Not scored

WORKSHEET FOR COMPUTING HRS SITE SCORE

	S Pathway	S² Pathway
Ground Water Migration Pathway Score (S_{gw})	100.00	10,000
Surface Water Migration Pathway Score (S_{sw})	NS	NS
Soil Exposure Pathway Score (S_s)	NS	NS
Air Migration Pathway Score (S_a)	NS	NS
$S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		10,000
$(S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2) / 4$		2,500
$\sqrt{(S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2) / 4}$		50.00

Note:

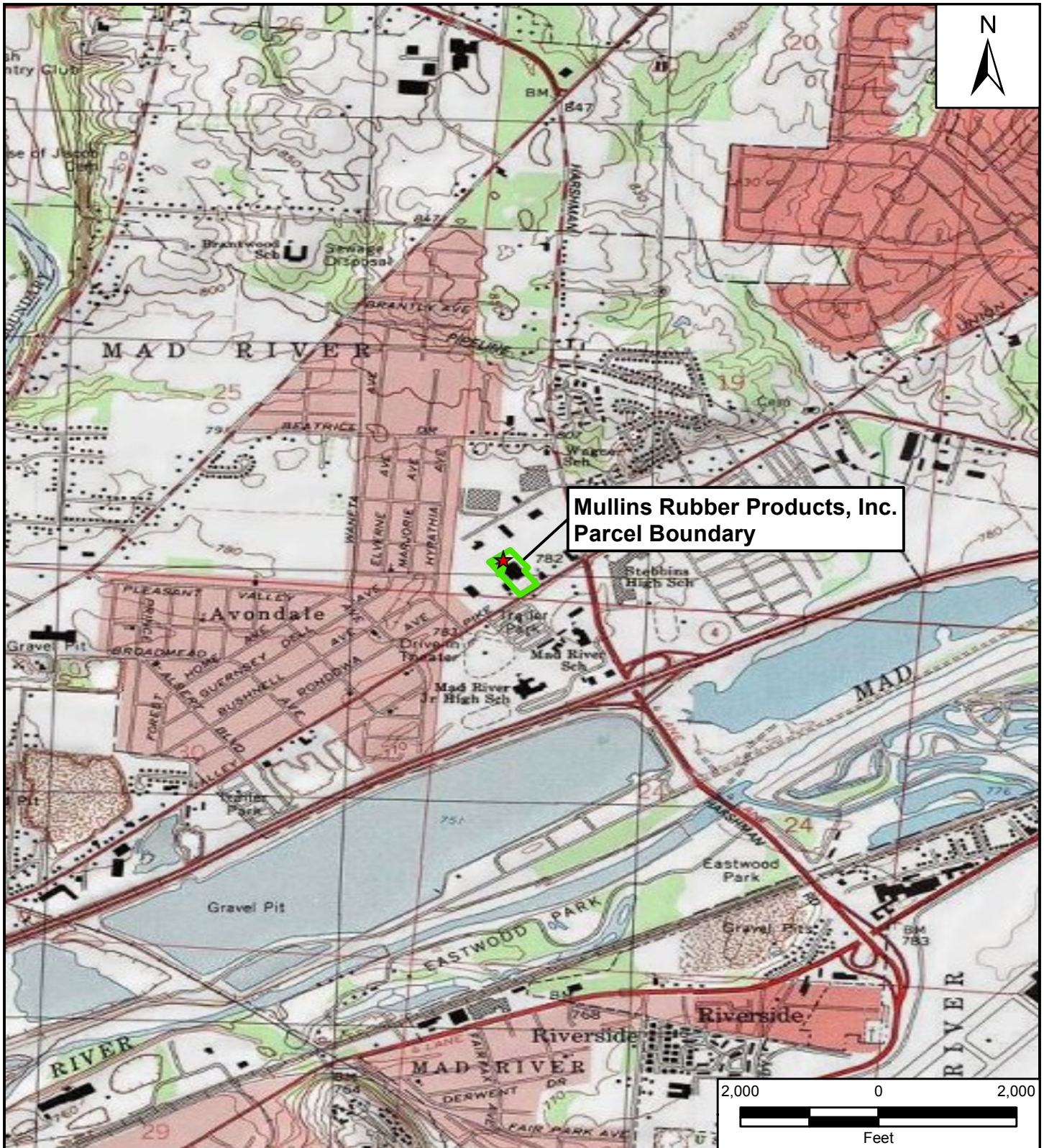
NS Not scored

**HRS Table 3-1 –Ground Water Migration Pathway Scoresheet
Aquifer Evaluated: Great Miami Buried Valley Aquifer System**

Factor Categories and Factors	Maximum Value	Value Assigned
Likelihood of Release to an Aquifer:		
1. Observed Release	550	550
2. Potential to Release:		
2a. Containment	10	NS
2b. Net Precipitation	10	NS
2c. Depth to Aquifer	5	NS
2d. Travel Time	35	NS
2e. Potential to Release [lines 2a x (2b + 2c + 2d)]	500	NS
3. Likelihood of Release (higher of lines 1 and 2e)	550	550
Waste Characteristics:		
4. Toxicity/Mobility	(a)	1,000
5. Hazardous Waste Quantity	(a)	10
6. Waste Characteristics	100	10
Targets:		
7. Nearest Well	50	9
8. Population:		
8a. Level I Concentrations	(b)	0
8b. Level II Concentrations	(b)	0
8c. Potential Contamination	(b)	5,326
8d. Population (lines 8a + 8b + 8c)	(b)	5,326
9. Resources	5	5
10. Wellhead Protection Area	20	5
11. Targets (lines 7 + 8d + 9 + 10)	(b)	5,345
Ground Water Migration Score For An Aquifer:		
12. Aquifer Score [(lines 3 x 6 x 11)/82,500] ^c	100	100.00
Ground Water Migration Pathway Score:		
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated) ^c	100	100.00

Notes:

- (a) Maximum value applies to waste characteristics category
- (b) Maximum value not applicable
- ^c Do not round to nearest integer
- NS Not scored





**Mullins Rubber Products, Inc.
Parcel Boundary**

Reference Map



Legend

-  Source No. 1 Location
-  Mullins Rubber Products, Inc. Parcel Boundary

Valley Pike VOCs
2949 Valley Pike
Dayton, Montgomery County, Ohio

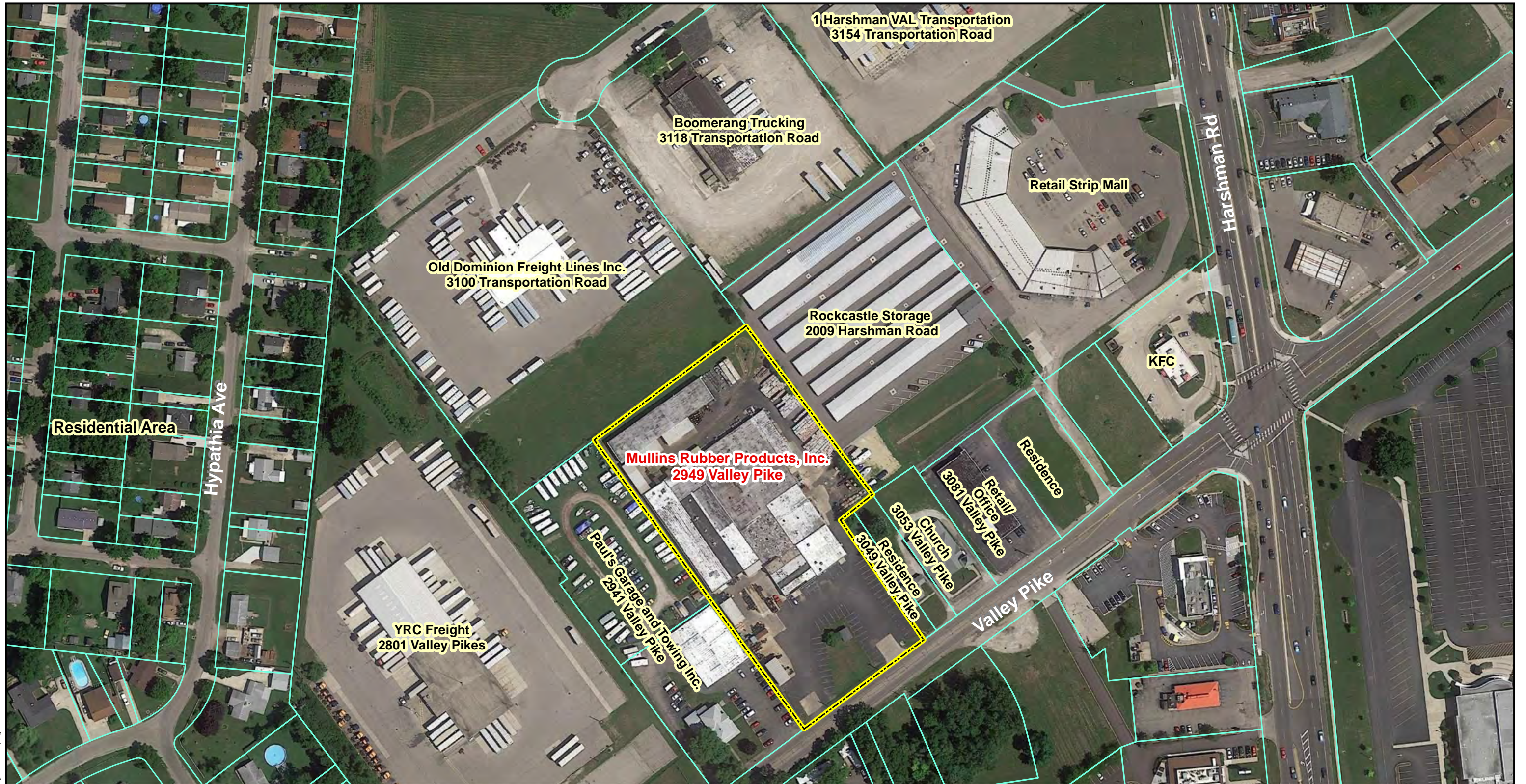
**Figure 1
Site Location**



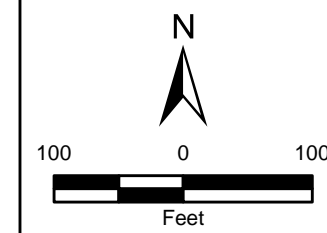
Source: Ref. 15, p. 4.
USGS 7.5 Minute Topographic Quadrangle Map
Dayton North, OH 1996

Prepared For: US EPA

Prepared By: Tetra Tech



Legend
 Mullins Rubber Products, Inc. Parcel Boundary
 Parcel Boundary



Valley Pike VOCs
 2949 Valley Pike
 Riverside, Montgomery County, Ohio

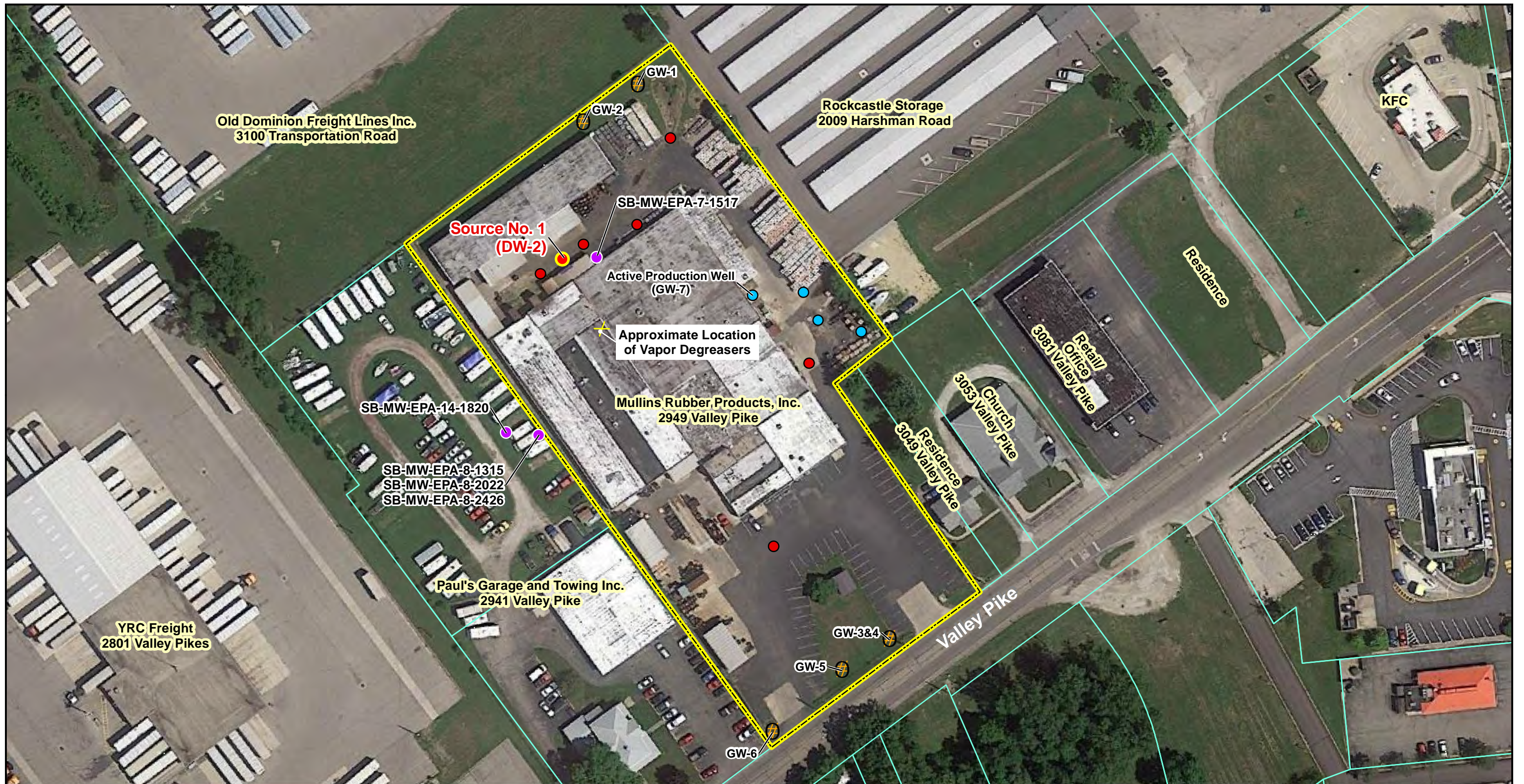
Figure 2
Land Use Map










Prepared For: US EPA | Prepared By: Tetra Tech

Image Source: Aerial Imagery, Bing Maps 2013
 Parcel Source: Montgomery County Auditor's Office, GIS Department

File Path: G:\GIS\2016-START\1\Ohio\Mullins Rubber\mca\2016-01\Fig2_LandUseMap-orig.mxd



Legend

-  OEPA Site Inspection Ground Water Grab Sample Location
-  Dry/Injection Wells
-  Source No. 1 (DW-2)
-  Production Wells
-  Other Possible Soil Source
-  Mullins Rubber Products, Inc. Parcel Boundary
-  Parcel Boundary

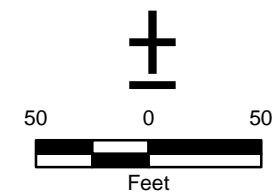


Image Source: Aerial Imagery, Bing Maps 2013.
 Parcel Source: Montgomery County Auditor's Office, GIS Department.
 Well Location Source: Ref. 15, p.41.
 Other Possible Soil Source: Ref. 15, p. 30, 95, 97, 99, 118, 126.

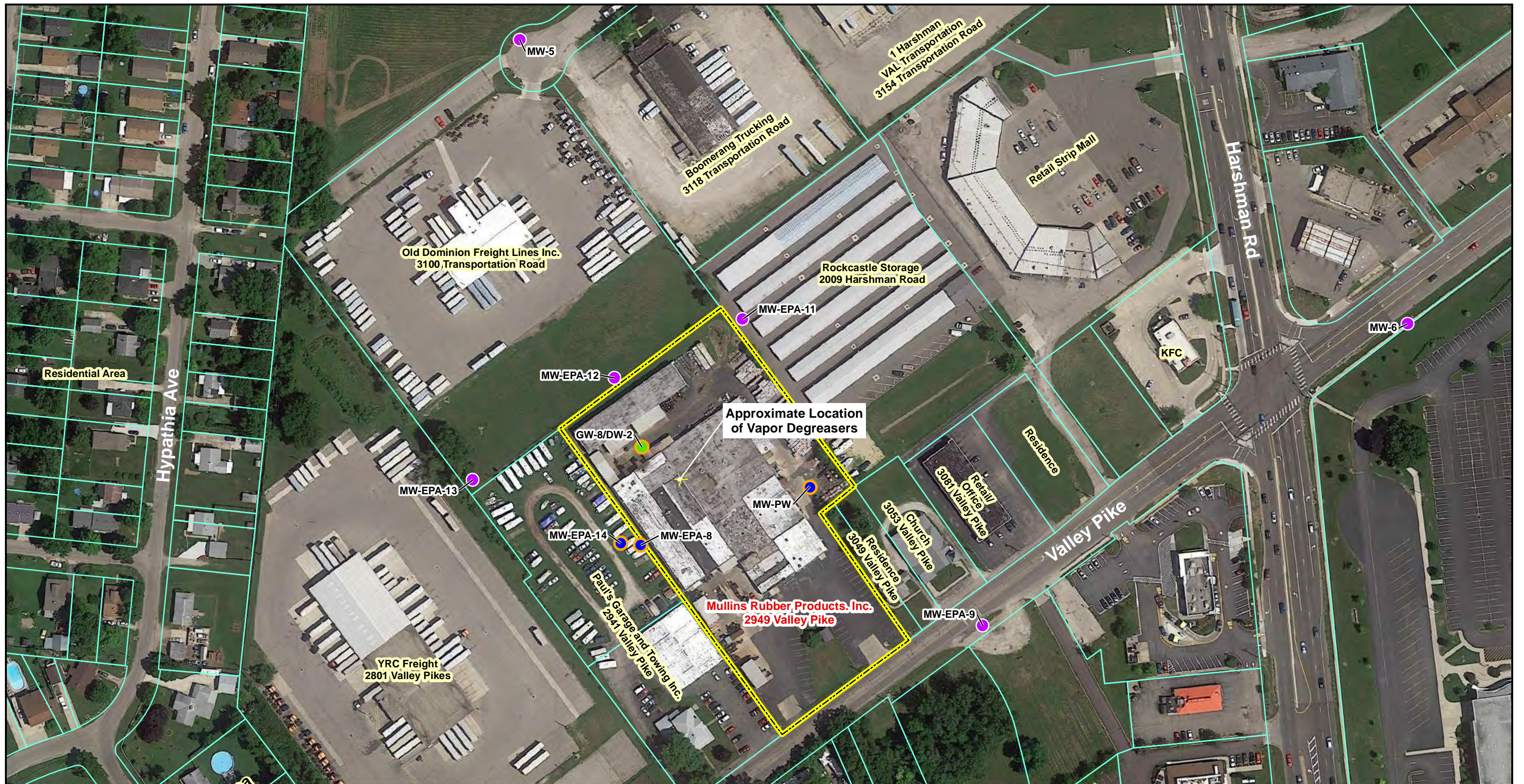
Valley Pike VOCs
 2949 Valley Pike
 Riverside, Montgomery County, Ohio

Figure 3
Source Locations
Dry/Injection Well DW-2 and
Other Possible Soil Source



Prepared For: US EPA

Prepared By: Tetra Tech



Legend

- Background Wells
- Observed Release by Chemical Analysis Wells
- Observed Release by Direct Observation Well
- Mullins Rubber Products, Inc. Parcel Boundary
- Parcel Boundary

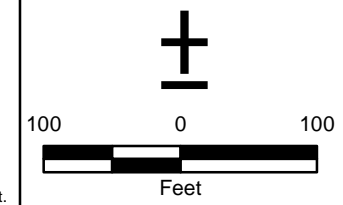


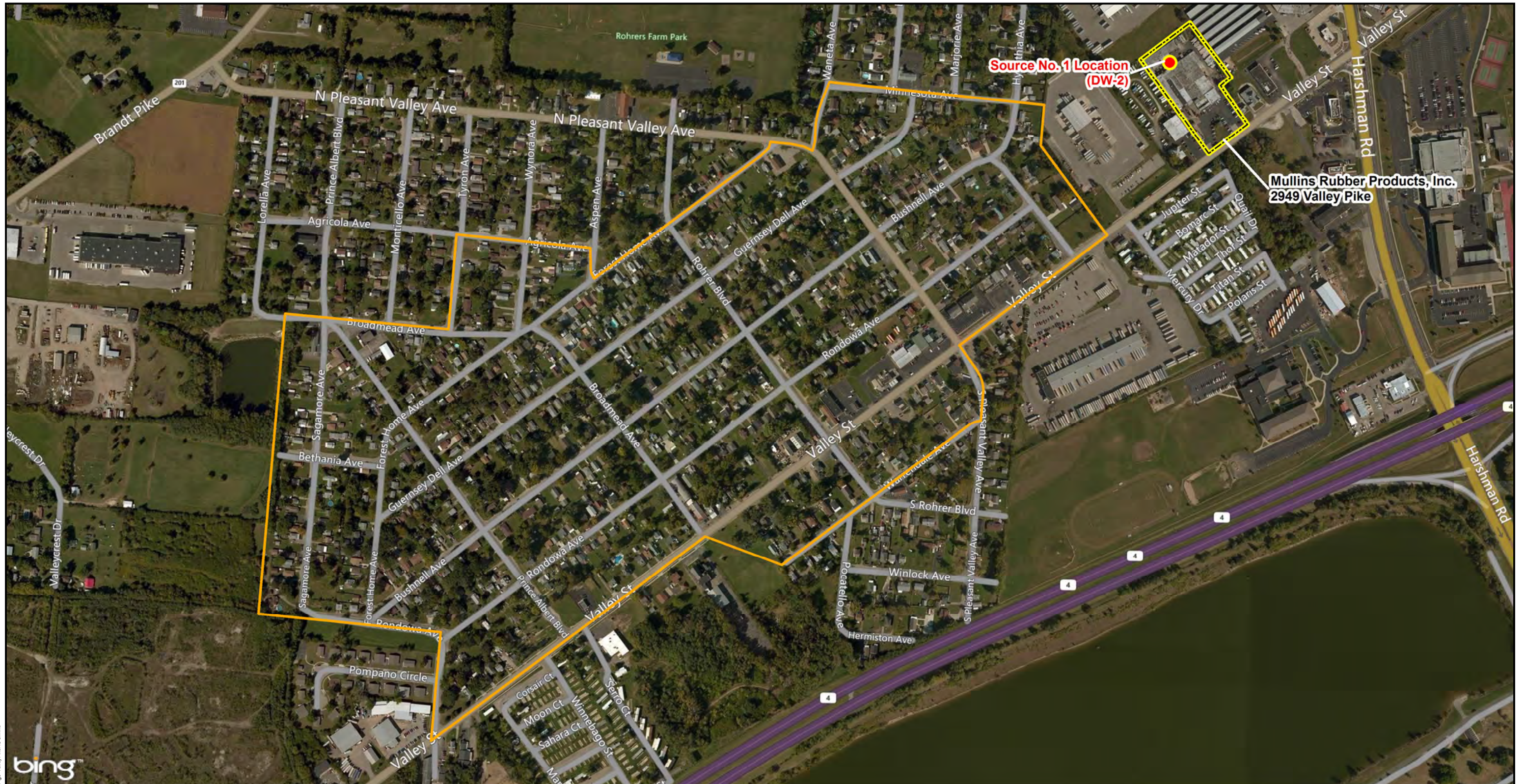
Image Source: Aerial Imagery, Bing Maps 2013.
 Parcel Source: Montgomery County Auditor's Office, GIS Department.
 Refs. 9; 15, p. 32.

Valley Pike VOCs
 Riverside, Montgomery County, Ohio

Figure 4
Ground Water Observed Release
Well Locations



Prepared For: US EPA | Prepared By: Tetra Tech



Legend

- Source No. 1 (DW-2)
- Mullins Rubber Products, Inc. Parcel Boundary
- Approximate Valley Pike VOC Boundary

Image Source: Aerial Imagery, Bing Maps 2013
 Parcel Source: Montgomery County Auditor's Office, GIS Department
 Valley Pike VOC AOC Boundary Source: Ref. 50, p. 31
 Source No. 1 Location Source: Ref. 15, p.41.

N

300 0 300
Feet

Valley Pike VOCs
 2949 Valley Pike
 Riverside, Montgomery County, Ohio

Figure 5
Valley Pike VOC Area of Concern

TETRA TECH

Prepared For: US EPA Prepared By: Tetra Tech

File Path: G:\GGR266-START\1\0\0\0\Mullins Rubber\mxd\2016-07\Figs-ValleyPikeAOC.mxd

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SITE DESCRIPTION

For HRS scoring purposes, the Valley Pike VOCs site is composed of Source No. 1 (dry/injection well DW-2) located on the Mullins Rubber Products, Inc. (MRP) property, and an observed release of the volatile organic compounds (VOCs) tetrachloroethylene (PCE) and trichloroethylene (TCE) to the shallow sand and gravel zone of the Great Miami Buried Valley Aquifer System (GMBVAS) (Refs. 8, pp. 144, 150, 153, 219, 234, 237; 15, pp. 152, 165, 167, 169, 171, 184, 186, 199, 201; 17, pp. 29, 30, 37, 103, 122, 128; 33).

The Valley Pike VOCs site is located at 2949 Valley Pike in Riverside, Montgomery County, Ohio (Ref. 4, p. 1). Figure 1 of this HRS documentation record shows the location of the Valley Pike VOCs site. More specifically, the geographic coordinates, as measured from observed release ground water sampling location MW-EPA-8 (see section 3.1.1 of this HRS documentation record), located on the west edge of MRP, are latitude 39° 47' 50" north and longitude 84° 7' 57" west (Refs. 9; 10). The MRP property consists of one parcel of land covering 3.675 acres (Ref. 5). The Valley Pike VOCs site is located on the MRP property in a mixed industrial and residential area and is bordered to the north by Old Dominion Freight Lines, Inc., to the east by Rock Castle Storage and a single residence, to the south by Valley Pike, and to the west by Paul's Garage and Towing (Ref. 8, p. 7) (see Figure 2 of this HRS documentation record). The EPA identification number, as recorded in the Superfund Enterprise Management System (SEMS) database, is OHN000510489 (Ref. 4, p.1).

MRP is an active manufacturing facility presently producing molded heavy-duty truck trailer suspension bushings (Refs. 6, p. 2; 11, p. 2). MRP's manufacturing process uses, and has historically used, TCE since 1968 (Refs. 14, p. 3; 15, p. 4). Prior to 2012, MRP used production wells completed in the deep zone of the sand and gravel aquifer as the water supply for non-contact cooling water for facility degreasers (Refs. 17, pp. 2, 12, 126, 127; 14, p. 4). Following circulation through the system, MRP pumped the used non-contact cooling water into dry/injection wells completed in the shallow zone of the sand and gravel aquifer (Refs. 17, pp. 2, 12, 128; 14, p. 4). Sampling data indicated that water from a deep production well used in the facility's process as non-contact cooling water was contaminated with PCE and TCE. Sampling data further indicated that the same contaminants are present in water samples collected from Source No. 1, dry/injection well DW-2 located at MRP, that received the contaminated non-contact cooling water.

An observed release of PCE and TCE to ground water is documented in the shallow zone of the GMBVAS by both direct observation and chemical analysis (see section 3.1.1 of this HRS documentation record) (Refs. 8, pp. 150, 153, 234, 237; 15, pp. 152, 165, 167, 169, 171, 184, 186, 199, 201; 17, pp. 29, 30, 37, 103, 122, 126, 128; 33). Ground water underlying Source No. 1 became contaminated, at least in part, as a result of MRP discharging contaminated non-contact cooling water from the vapor degreasers into its dry/injection wells, including DW-2 (Refs. 8, pp. 144, 152, 153, 219, 237; 17, pp. 29, 30, 37).

During September 2014, as part of the U.S. EPA Contaminant Source Area Investigation for Valley Pike VOCs site, six sub-slab vapor samples, VP-EPA-1, -2, -3, -4, -5, and -6, were collected below the MRP manufacturing building (Refs. 7, pp. 9, 10; 15, pp. 16, 17). PCE and TCE were detected at all six locations (Ref. 15, pp. 16, 17). The highest concentrations of both PCE and TCE were detected at sample locations VP-EPA-4, VP-EPA -5, and VP-EPA -6, located closest to the MRP degreaser area (Ref. 15, pp. 17, 36). Specifically, the highest concentration of TCE detected was 44,400 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) in sample VP-EPA-5; and the highest concentration of PCE detected in sub-slab vapor samples was 3,550,000 $\mu\text{g}/\text{m}^3$ in sample VP-EPA-4 (Refs. 7, pp. 10, 22; 15, pp. 17, 29, 36). Lower concentrations of PCE and TCE were detected at sample locations VP-EPA-1, VP-EPA-2, and VP-EPA-3, located farther west, downgradient and sidegradient of the MRP degreaser area, towards the Paul's Garage property line (Ref. 15, p. 17). The reported concentrations in several sub-vapor samples significantly exceeded Ohio Department of Health (ODH)/Agency for Toxic Substances and Disease

Registry (ATSDR) commercial sub-slab screening levels for PCE (250 µg/m³) and TCE (20 µg/m³) (Ref. 15, p. 17).

In addition, the highest concentrations of TCE and PCE were detected during the same investigation in soil and ground water samples collected at MW-EPA-8, which is downgradient from the MRP vapor degreaser area (see Figure 4 of this HRS documentation record) (Refs. 15, pp. 30, 99; 21, p. 2).

OPERATIONAL AND REGULATORY HISTORY

MRP began operations in 1942 as the Mullins Tire and Rubber Company (Refs. 6, p. 2; 11, p. 2). The primary operation at that time was retreading used tires (Refs. 6, p. 2, 7, p. 4). In 1954, the business expanded from tires into molding different types of rubber products (Ref. 6, p. 2). Since the mid-1960s, the company has focused on molding heavy-duty truck trailer suspension bushings (Ref. 6, p. 2). The MRP facility is currently owned by Mullins Land Company, Inc. (Ref. 14, p. 3).

As part of MRP's manufacturing process, metal parts are degreased with TCE in two vapor degreasers before they are bonded with rubber parts (Refs. 6, p. 4; 14, p. 3). The vapor degreasers are located in the northwestern portion of the manufacturing area, near the north end of the building (Ref. 15, p. 4) (see Figure 3 of this HRS documentation record). Since 1968, MRP has used TCE for degreasing parts (Ref. 14, pp. 3, 4). In 1994, MRP installed two vapor degreasers; non-contact cooling water from degreasing tanks associated with the manufacturing process discharged into a series of dry/injection wells on the northern portion of the MRP facility (Refs. 8, p. 24; 14, pp. 3, 4; 15, p. 41). In 2012, Ohio EPA told MRP that it could no longer use the dry/injection wells to receive the non-contact cooling water because of the presence of PCE in local ground water (Ref. 14, p. 4). In 2012, MRP installed a chiller unit and non-contact cooling water holding tanks for their closed-loop system (Ref. 40, pp. 1, 2).

MRP used a total of seven wells, including the Source No. 1 dry/injection well DW-2, (referred to as "dry" wells) to manage non-contact cooling water, storm drainage, and boiler blowdown water (Ref. 15, pp. 4, 41). Although MRP refers to all of these structures as "dry wells," a log for well DW-2 indicates that this well extended to 50 feet below ground surface (bgs), through an upper clay layer and into the sand and gravel aquifer below, and thus discharged water directly into the local aquifer (Refs. 15, p. 42; 16, p. 1; 33, p. 4). This type of well (commonly referred to as an injection well) differs in construction from other wells known as "dry" wells in the site area that are used solely for stormwater management and that collect and allow surface drainage to infiltrate directly into the shallow subsurface through the vadose zone (Refs. 15, p. 4; 38). The MRP wells were considered Class V injection wells under the Ohio Underground Injection Control (UIC) Program (Refs. 14, p. 4; 15, p. 4). Permits were not issued, but the wells were registered with Ohio EPA (Ref. 15, p. 4).

There are four production wells at MRP that are or have been used for non-contact cooling water for MRP's rubber mixing mills and vapor degreasers (Refs. 8, pp. 2, 7, 467 to 469; 14, p. 4). The MRP active deep production well (130 feet deep, but cased to 120 feet bgs), at the east/central part of the property, formerly produced about 250 to 300 gallons per minute for 8 hours a day (Refs. 7, p. 3; 8, pp. 2, 467). Currently, this production well is used infrequently to "top off" the closed loop system (Ref. 7, p. 3). Two additional deep production wells are on standby (Ref. 7, p. 3). A fourth shallow well (50 feet deep) is damaged and is no longer used, but remains in place (Ref. 7, p. 3). All production wells are on the eastern side of the MRP building (Ref. 7, p. 3).

MRP is required to report TCE usage annually to the Regional Air Pollution Control Agency (RAPCA) (Ref. 7, p. 4). After an anonymous source alleged the company was under-reporting the amount of solvents used, the Ohio EPA and RAPCA performed an unannounced inspection on May 14, 2001 (Ref. 7, p. 4). RAPCA and Ohio EPA determined that MRP had under-reported its TCE usage, kept false records, and knowingly reported false data from 1995 to 2000 (Ref. 7, p. 4). From 1995 to 1999, the

combined emissions permit limit was 10,000 pounds per year (Ref. 7, p. 4). However, actual emissions were calculated and ranged from 17,679 pounds in 1996 to 38,556 pounds in 1997 (Ref. 7, pp. 4, 5). In January 2004, a seven-count criminal indictment was filed against MRP by the U.S. Attorney's Office in Dayton, Ohio (Ref. 7, p. 5).

Later the same year, William R. Mullins, President of MRP, pled guilty to making false statements in reporting airborne discharges of TCE and failing to submit a Title V air permit by the October 1996 deadline (Ref. 7, p. 5). Mr. Mullins was fined, sentenced to home confinement followed by probation, and ordered to perform 100 hours of community service (Ref. 7, p. 5). MRP now holds a Clean Air Act Title V operating permit that was issued January 16, 2008 (Ref. 7, p. 5). In accordance with MRP's Title V permit, TCE usage is now a facility-wide 12-month limit of 15.54 tons (Ref. 7, p. 5).

PREVIOUS INVESTIGATIONS

Ohio EPA has conducted several investigations at the MRP facility and surrounding area between 2008 and 2013 (Ref. 7, p. 5). Site assessment work conducted during the Valley Pike VOCs investigation in July 2013 identified migration of contaminated ground water that may present potential hazards to nearby residences and businesses from subsurface migration of solvent vapors into indoor air (Ref. 7, p. 1). Chemicals of concern included PCE and TCE (Ref. 7, p. 1). As a result, in December 2013, EPA initiated a time-critical removal action, known as the Valley Pike VOC Site (Ref. 7, p. 1), which encompassed the larger Valley Pike area, including the Valley Pike VOCs site as scored in this HRS documentation record. The removal action included sub-slab vapor and indoor air sampling of residences and installing mitigation systems at residences exceeding the ATSDR/ODH screening levels for PCE and TCE (Ref. 7, p. 1; 15, pp. 6, 7). In March 2014, additional ground water samples were collected beyond the initial investigation area (Ref. 52, p. 11). March 2014 ground water sampling results indicated PCE and TCE contamination that led to an expansion to the southwest of the residential area of investigation for vapor intrusion sampling (see Figure 5 of this HRS documentation record) (Ref. 52, p. 11). As of January 20, 2015, 83 of approximately 300 residences sampled exceeded the ODH screening levels for PCE and/or TCE (Ref. 7, p. 1). As of April 2015, vapor intrusion mitigation systems have been installed at 75 residences (Ref. 7, p. 1).

Of the various locations that have been sampled in the Valley Pike VOC Site area, the highest concentrations of PCE and TCE in soil, ground water, and sub-slab vapor have been detected in samples collected at the MRP facility, adjacent to and immediately southwest and downgradient of the MRP vapor degreaser and dry/injection well areas (Ref. 7, p. 2).

The ODH has determined that a completed exposure pathway exists through vapor intrusion from ground water to indoor air in the residential neighborhood downgradient of the MRP facility (Ref. 7, p. 3). In November 2014, U.S. EPA expanded the area of investigation for the removal action to include additional residential areas. Vapor intrusion sampling and mitigation activities are ongoing (Ref. 7, p. 3).

As of January 2016, EPA and MRP signed an Administrative Settlement Agreement and Order on Consent for Removal Action (Settlement Agreement) (Ref. 51, pp. 28, 29, 30). Though not included as part of the site for HRS scoring purposes, the Settlement Agreement identified the Valley Pike VOC Site (see Figure 5 of this HRS documentation record) as containing a residential area with documented vapor intrusion from a PCE- and TCE-contaminated, shallow ground water plume (Ref. 51, p. 4). The residential area includes about 500 residences and is located approximately 900 feet southwest of MRP (Ref. 51, p. 4). The Settlement Agreement identifies the MRP facility as the source of the ground water plume (Ref. 51, p. 4).

2.2 SOURCE CHARACTERIZATION

2.2.1 SOURCE IDENTIFICATION

Number of source: 1

Name of source: Dry/Injection Well DW-2

Source Type: Other

Description and Location of Source (see Figure 3 of this HRS documentation record):

MRP used four production wells to pump ground water for use as non-contact cooling water for its rubber mixing mills and vapor degreasers (Refs. 8, pp. 2, 7, 467 to 469; 14, p. 4). The deep production well (130 feet deep), located in the east-central portion of the MRP property, produced about 250 to 300 gallons of water per minute for 8 hours a day (Refs. 7, p. 3; 8, p. 2; 33). Based on the boring log, the deep production well is 130 feet deep but is cased to 120 feet bgs (Ref. 8, p. 467). Prior to 2012, non-contact cooling water from MRP's rubber mills and degreasing tanks associated with the manufacturing process previously discharged into a series of "dry" wells on the property (Refs. 8, p. 24; 14, p. 4; 15, p. 42; 17, p. 12; 40, pp. 1, 2). Seven dry wells, including Source No. 1, reportedly were used to manage non-contact cooling water, storm drainage, and boiler blowdown water (Refs. 7, pp. 3, 4; 15, pp. 4, 41; 17, p. 12).

Source No. 1 is dry well 2 (DW-2) located in the northwestern portion of the MRP property (Ref. 15, pp. 4, 41). DW-2 is the only dry well that has been sampled during previous investigations conducted at MRP (Refs. 8, pp. 11, 19, 98; 16, p. 1; 17, pp. 5, 12, 13, 37). Although MRP refers to DW-2 as a "dry well," a well log for DW-2 indicates that this well extends to 50 feet bgs, through an upper clay layer and into an underlying water bearing gravel layer (within the shallow sand and gravel zone of the GMBVAS) (Refs. 14, p. 48; 15, p. 42; 17, p. 128; 33). Therefore, DW-2 discharged water directly into an underlying aquifer (Refs. 15, p. 42; 17, p. 128; 33). This type of well (commonly referred to as an injection well) differs in construction from other wells referred to as "dry" wells in the area that are used solely for storm water management and that collect and allow surface drainage to infiltrate directly into the shallow subsurface through the vadose zone (Refs. 15, p. 4; 38). MRP's DW-2 is considered a Class V injection well under the Ohio UIC Program (Refs. 14, p. 4; 15, p. 4; 38). A permit was not issued, but DW-2 along with the other dry wells at MRP were registered with Ohio EPA (Ref. 15, p. 4). DW-2 and other MRP dry wells will be referred to as "dry/injection wells" in this HRS documentation record.

From about 1994 to 2012, MRP disposed of non-contact cooling water (withdrawn from the deep zone of the sand and gravel aquifer using the 130-foot-deep production well) into DW-2, a 50-foot dry/injection well that discharged into the shallow sand and gravel zone of the GMBVAS (Refs. 7, p. 3; 14, p. 3; 26, p. 2-1). During Ohio EPA and U.S. EPA investigations, ground water samples collected from the 130-foot-deep production well contained TCE (up to 6.18 micrograms per liter [$\mu\text{g/L}$]) and PCE (up to 156 $\mu\text{g/L}$) (Refs. 17, pp. 103, 122, 126; 33). In 2010 and 2011, MRP collected ground water samples from DW-2; PCE (up to 105 $\mu\text{g/L}$) and TCE (up to 2.72 $\mu\text{g/L}$) were detected in the samples (Refs. 14, pp. 4, 14, 24, 26, 31, 35, 40, 47, 48, 53). Therefore, DW-2 is evaluated as a source into which PCE- and TCE-contaminated ground water was discharged (Refs. 8, pp. 150, 153; 14, pp. 26, 53; 17, pp. 29, 30).

As a result of this contamination, in February 2012, Ohio EPA, Division of Drinking and Ground Waters requested that MRP collect and provide analysis of the non-contact cooling water immediately prior to the non-contact cooling water entering the dry/injection wells (Refs. 41, pp. 1, 2; 43, p. 1). In May 2012, MRP notified Ohio EPA that MRP planned to install a closed loop system that will eliminate the need for using the dry wells for non-contact cooling water (Ref. 44).

Subsequently in October 2012, MRP vice president indicated in a letter to Ohio EPA that MRP was aware that they were drawing cooling water from a well that contained PCE- and TCE-contaminated ground water (Ref. 40, p. 1). In the same letter, MRP stated that the operational processes reduced the PCE and TCE concentrations in the ground water prior to MRP discharging the process water to the dry/injection wells but that Ohio EPA has demanded that MRP “cease and desist” this long standing operational practice (Ref. 40, pp. 1, 2). MRP also stated that in order to be in regulatory compliance as directed by Ohio EPA, they had removed one of the dry/injection wells and the remaining dry/injection wells no longer received cooling water discharge and only manage storm water (Ref. 40, pp. 2, 3, 4). Also, MRP confirmed the installation of a chiller unit and underground holding tanks for non-contact cooling water for its closed loop system (Ref. 40, p. 2). Because MRP abandoned the dry/injection wells and installed a chiller system, Ohio EPA determined that sampling and analysis of the non-contact cooling water entering the dry/injection wells, which included DW-2, was no longer necessary (Ref. 43, p. 1).

Currently, the active production well, which previously supplied the contaminated PCE- and TCE-contaminated water, is used infrequently to “top off” the closed loop system (Ref. 7, p. 3). Two additional deep production wells are on standby (Ref. 7, p. 3).

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

Table 1 lists ground water samples collected from Source No. 1, DW-2, that contained PCE and TCE (Refs. 8, pp. 150, 153; 14, pp. 26, 53; 17, pp. 29, 30). Ground water sample E2699/E2699DL was collected during the Ohio EPA 2010 Site Inspection (SI) and ground water sample E5LB2/E5LB2DL was collected during the Ohio EPA 2011 Expanded Site Inspection (ESI) (Refs. 8, pp. 150 to 153, 212; 14, pp. 31, 62; 17, pp. 29, 30, 37). Ground water samples DTK0125-07 and DUJ0707-01 were collected by MRP in 2010 and 2011, respectively (Ref. 14, pp. 31, 33 to 35, 40, 51, 62).

Chain-of-custody records for samples presented in Table 1 are included in References 8, p. 212; 14, pp. 31, 62; and 17, p. 37. The locations of ground water samples listed in Table 1 are provided in Figure 3 of this HRS documentation record (Refs. 8, p. 19; 14, p. 40; 17, p. 12, 13).

TABLE 1: Source No. 1 Samples					
Sample ID	Aquifer	Well Screen Interval (feet msl)	Date Sampled	Location	References
SI—November 2010					
E2699/E2699DL	GMBVAS	745 to 732	11/2/2010	Sample GW-8 collected from DW-2	3; 16, p. 1; 17, pp. 12, 13, 17, 37, 128; 33
DTK0125-07	GMBVAS	745 to 732	11/2/2010	Split sample from GW-8 collected from DW-2	14, pp. 25, 26, 31, 33 to 35, 40, 48; 19; 33
MRP Sampling Event—October 2011					
DUJ0707-01	GMBVAS	745 to 732	10/18/2011	UIC DRY WELL Collected from DW-2	14, pp. 4, 51, 62; 19; 33
ESI—December 2011					
E5LB2/E5LB2DL	GMBVAS	745 to 732	12/13/2011	Dry Well (DW-2)	8, pp. 11, 19, 98, 144, 212, 469; 15, p. 23; 17, p. 12; 33

Notes:

DL	Diluted sample
DW	Dry well
GMBVAS	Great Miami Buried Valley Aquifer System
ID	Identification number
msl	Mean sea level
UIC	Underground Injection Control

Table 2 presents analytical results of ground water samples collected from Source No. 1 (Refs. 8, pp. 150, 153; 14, pp. 26, 53; 17, pp. 29, 30). Ground water sample E2699/E2699DL was collected during the Ohio EPA November 2010 SI and was analyzed for VOCs by ALS Laboratory Group in accordance with U.S. EPA CLP SOW SOM01.2 (6/2007) (Ref. 17, pp. 17, 18). The analytical results were reviewed in accordance with the National Functional Guidelines (NFG) for SOM01.2 and the SOP for ESAT 5/TechLaw Validation of Contract Laboratory Program Organic Data (Version 2.4) (Ref. 17, pp. 17, 18). The data validation effort shows the overall data quality to be acceptable (Ref. 17, pp. 18 to 24). The analytical data sheets are provided in Appendix B of Reference 17. The sample specific contract required quantitation limits (CRQL) are adjusted for sample volume and dilution and are provided in Reference 45, p. 2.

Ground water sample E5LB2/E5LB2DL was collected during the Ohio EPA December 2011 ESI and was analyzed for VOCs by Mitkem Laboratories in accordance with U.S. EPA CLP SOW SOM01.2 (6/2007) (Ref. 8, p. 144, 145). The analytical results were reviewed in accordance with the National Functional Guidelines (NFG) for SOM01.2 and the SOP for ESAT 5/TechLaw Validation of Contract Laboratory Program Organic Data (Version 2.6) (Ref. 8, p. 145). The data validation effort shows the overall data quality to be acceptable (Ref. 8, pp. 144 to 149). The analytical data sheets are provided in Appendix D of Reference 8. The adjusted sample-specific CRQLs are adjusted for sample volume and dilution and are provided in Reference 45, p. 2.

Samples DTK0125-07 and DUJ0707-01 were collected by MRP in November 2010 and October 2011, respectively (Ref. 14, pp. 31, 62). The samples were analyzed by Test America (Ref. 14, pp. 14, 49). Sample DTK0125-07 was analyzed for VOCs and sample DUJ0701-01 was analyzed for PCE and TCE using EPA Method SW 8260B (Ref. 14, pp. 14, 26, 53). The reporting limits are listed on pages 26 and 53 of the analytical data sheets in Reference 14. The reporting limits are adjusted for sample characteristics that may affect quantitation, such as dilutions (Ref. 47, p. 1). The reporting limits are equivalent to sampling quantitation limits (SQLs) as defined in Section 1.1, Definitions of the HRS (Refs. 1, p. 51586; 47, p. 1).

TABLE 2: Source No. 1 Concentrations				
Sample ID/ Location	Hazardous Substance	Concentration (µg/L)	Adjusted CRQL/SQL (µg/L)	References
SI—November 2010				
E2699DL (GW-8 from DW-2)	PCE	82	5.0	17, pp. 23, 30, 82; 45, pp. 1, 2, 4, 6, 7; 46, p. 2
E2699 (GW-8 from DW-2)	TCE	2.2	0.5	17, pp. 29, 79; 45, pp. 2, 5; 46, p. 2
DTK0125-07 (GW-8 from DW-2)	PCE	89.5	1.0	14, p. 26; 47
	TCE	2.72	1.0	14, p. 26; 47
October 2011				
DUJ0707-01 (UIC DRY WELL/DW-2)	PCE	105	1.0	14, p. 53; 33; 47
ESI—December 2011				
E5LB2DL/ Dry Well (DW-2)	PCE	76	4.0	8, pp. 148, 152, 153, 219, 237; 45, pp. 1, 2, 4, 12, 13; 46, p. 2
E5LB2/ Dry Well (DW-2)	TCE	1.4	0.5	8, pp. 150, 234; 45, pp. 1, 2, 4, 9, 13; 46, p. 2

Notes:

µg/L Micrograms per liter
CRQL Contract required quantitation limit
DW Dry well
EPA U.S. Environmental Protection Agency
GW Ground water
ID Identification
PCE Tetrachloroethylene
SQL Sample quantitation limit
TCE Trichloroethylene

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

Samples collected from Source No. 1 contained PCE and TCE (see Table 2 of this HRS documentation record). Source No. 1 consists of an MRP dry/injection well into which contaminated non-contact cooling water was discharged (see Tables 1 and 2 and Figure 3 of this HRS documentation record). Analytical results for ground water samples collected from the GMBVAS underlying and in the vicinity of Source No. 1 indicate that a release of hazardous substances has occurred to the ground water migration pathway, as documented in Section 3.0 of this HRS documentation record.

Based on the intended use of Source No. 1 as a dry/injection well, a liner would not be expected to be present. In addition, a well log for a “dry well” at MRP does not indicate that a liner was included as part of the installation (Refs. 14, p. 48; 15, p. 42). Additional logs for soil borings and monitoring wells installed in 2014, indicate a liner was not observed in the vicinity of Source No. 1 (Ref. 15, pp. 44 to 59). Therefore, a containment factor value of 10, as noted in Table 3 of this HRS documentation record, was assigned for the ground water migration pathway (Ref. 1, Section 3.1.2.1, Table 3-2).

List of Hazardous Substances

Tetrachloroethylene
Trichloroethylene

TABLE 3: Containment Factors for Source No. 1		
Containment Description	Containment Factor Value	References
Gas release to air	NS	NA
Particulate release to air	NS	NA
Release to ground water: No liner	10	1, Section 3.1.2.1, Table 3-2; 15, pp. 44 to 59
Release via overland migration and/or flood	NS	NA

Notes:

NA Not applicable
NS Not scored

2.4.2.1 HAZARDOUS WASTE QUANTITY

Insufficient information exists to evaluate Hazardous Constituent Quantity. The hazardous waste quantity value is calculated using Tier C, Volume of contaminated non-contact cooling water (Ref. 1, pp. 51590, 51591).

2.4.2.1.1 Hazardous Constituent Quantity – Tier A

The hazardous constituent quantity for Source No. 1 could not be adequately determined according to the HRS requirements; that is, the total mass of all CERCLA hazardous substances in the source and releases from the source is not known and cannot be estimated with reasonable confidence (Ref. 1, pp. 51590-51591 [Section 2.4.2.1.1]). There are insufficient historical and current data (manifests, potentially responsible party [PRP] records, State records, permits, waste concentration data, etc.) available to adequately calculate the total or partial mass of all CERCLA hazardous substances in the source and the associated releases from the source. Therefore, there is insufficient information to evaluate the associated releases from the source to calculate the hazardous constituent quantity for Source No. 1 with reasonable confidence. Scoring proceeds to the evaluation of Tier B, Hazardous wastestream quantity (Ref. 1, p. 51591).

Hazardous Constituent Quantity Assigned Value: NS
Are the data complete for hazardous constituent quantity for this area? No

2.4.2.1.2 Hazardous Wastestream Quantity – Tier B

The hazardous wastestream quantity for Source No. 1 could not be adequately determined according to the HRS requirements; that is, the mass of all hazardous wastestreams plus the mass of any CERCLA pollutants and contaminants in the source and releases from the source is not known and cannot be estimated with reasonable confidence (Ref. 1, p. 51591 [Section 2.4.2.1.2]). There are insufficient historical and current data (manifests, PRP records, State records, permits, waste concentration data, etc.) available to adequately calculate the total or partial mass of the wastestream plus the mass of all CERCLA pollutants and contaminants in the source and the associated releases from the source. Therefore, there is insufficient information to evaluate the associated releases from the source to calculate the hazardous wastestream quantity for Source No. 1 with reasonable confidence. Scoring proceeds to the evaluation of Tier C, Volume (Ref. 1, p. 51591).

Hazardous Wastestream Quantity Assigned Value: NS
Are the data complete for hazardous constituent quantity for this area? No

2.4.2.1.3 Volume – Tier C

For the migration pathways, the source is assigned a value for volume using the appropriate Tier C equation from Table 2-5 (Ref. 1, p. 51591 [Section 2.4.2.1.3]). Due to a lack of available records, monitoring data and discharge information, the volume capacity of the dry/injection well is unknown, as is the quantity of contaminated process water that was discharged to Source No. 1. Therefore, the volume of Source No. 1 will be designated as unknown, but contaminated source samples are present, so the quantity is greater than zero.

Volume Assigned Value: unknown, but >0
Are the data complete for volume quantity for this area? No

2.4.2.1.4 Area – Tier D

The area measure (Tier D) is not evaluated for source type “other” (Ref. 1, Table 2-5).

Area Assigned Value: 0
Are the data complete for area quantity for this area? No

2.4.2.1.5. Source Hazardous Waste Quantity Value

The source hazardous waste quantity value for Source No. 1 was evaluated based on volume, Tier C. However, insufficient data is available to determine the volume of PCE- and TCE-contaminated non-contact cooling water discharged to Source No. 1, DW-2. Therefore, the source hazardous waste quantity value for Source No. 1 is unknown, but greater than 0.

Source HWQ Value: unknown, but >0

SUMMARY OF SOURCE DESCRIPTIONS

TABLE 4: Summary of Source Descriptions						
Source No.	Source Hazardous Waste Quantity Value	Source Hazardous Constituent Quantity Complete? (Yes/No)	Containment Factor Value by Pathway			
			Ground Water (Table 3-2)	Surface Water Overland/ Flood (Table 4-2)	Air	
					Gas (Table 6-3)	Particulate (Table 6-9)
1	>0	No	10	NS	NS	NS

Notes:

> Greater than
 NS Not scored

Description of Other Possible On-Site Sources

Contaminated Soil

An area of PCE- and TCE-contaminated soil exists on the MRP property and extends into the adjacent property (Refs. 15, pp. 30, 95, 97, 99, 118, 126; 21, pp. 2, 3). During various investigations, Ohio EPA and U.S. EPA have collected subsurface soil and sub-slab soil-vapor samples at and in the vicinity of the MRP property (Refs. 7, p. 2; 8, p. 1). Analytical results of the subsurface soil and sub-slab vapor samples indicate the presence of PCE and TCE at the MRP facility (Ref. 7, pp. 22, 23).

Subsurface soil samples collected downgradient of the former degreaser and DW-2 (Source No. 1) contained PCE and TCE. PCE concentrations ranged from 0.014 milligrams per kilogram (mg/kg) to 2,040 mg/kg (Refs. 15, pp. 30, 95, 99, 118, 126; 21, pp. 2, 3). More specifically, PCE was detected at the following concentrations in subsurface soil samples: at 0.043 mg/kg in a sample collected from MW-EPA-7, collected in the vicinity of the former degreaser at a depth of 15 to 17 feet bgs; at 0.032 mg/kg and 2,040 mg/kg in samples collected from MW-EPA-8, collected on the western side of the MRP building and downgradient of Source No. 1 at depths of 13 to 15 feet bgs and 24 to 26 feet bgs, respectively; and at 0.014 mg/kg in subsurface soil sample SB-MW-14-1820, collected downgradient of Source No. 1 at 18 to 20 feet bgs (Ref. 15, pp. 30, 95, 99, 118, 126; 21, pp. 2, 3). In addition, TCE was detected at the following concentrations in subsurface soil samples collected from MW-EPA-8 as follows: at 2.6 mg/kg between 20 to 22 feet bgs and at 411 mg/kg between 24 to 26 feet bgs (Ref. 15, pp. 30, 97, 99). Soil sampling locations are shown on Figure 4 of this HRS documentation record.

During installation of a monitoring well at MW-EPA-8 located along the western property boundary of the MRP property, PID readings from field screening of soil cores were as high as 3,700,000 ppb at 25 feet bgs--the bottom foot of the glacial till layer (Ref. 15, pp. 10, 46, 47). No other PID readings were noted above 2,000 ppb at any location upgradient of the MRP property (Ref. 15, pp. 10, 48 to 55).

A large portion of the MRP property is covered with structures that prevent the collection of soil samples (Ref. 15, p. 8). For this reason, sub-slab vapor samples were collected at six locations beneath the floor slabs in the MRP main building in September 2014 (Ref. 15, p. 8). Samples were collected by using a hammer drill to drill completely through the floor slab and extending several inches past the bottom of the slab (Ref. 15, p. 9). A permanent stainless steel sample port was installed so that the port would extend less than 1 inch beyond the bottom of the slab (Ref. 15, p. 9). Analysis of these sub-slab vapor samples revealed high levels of PCE and TCE (Ref. 7, p. 2). PCE was detected between 44.1 and 3,550,000 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) and TCE between 104 and 44,400 $\mu\text{g}/\text{m}^3$ (Ref. 7, pp. 9, 10, 22). The highest detection of PCE was in a sub-slab sample collected near the degreaser (Ref. 7, p. 2). Information provided by MRP states that MRP has historically used and currently uses TCE (Ref. 14, pp. 1, 3).

Based on the contamination detected in the soil samples collected from locations shown on Figure 3 of Reference 15, an approximate contaminated soil source area of 2,500 square feet was identified between samples SB-MW-EPA-7, SB-MW-EPA-8, and SB-MW-EPA-14 (Ref. 15, p. 25). However, it should be noted that the extent of soil contamination under the buildings is not known, therefore, the actual area of on-site soil contamination may be greater.

As discussed in the Attribution section, a Settlement Agreement between U.S. EPA and MRP was signed in January 2016 and identified the (larger) Valley Pike VOC Site containing a residential area with documented vapor intrusion of PCE- and TCE contamination. The Settlement Agreement includes provision for conducting vapor screening and mitigation and for design, installation and operation of a soil vapor extraction (SVE) system at the MRP facility (Ref 51, p. 7, 8).

No other possible on-site sources have been identified.

3.0 GROUND WATER MIGRATION PATHWAY

3.0.1 GENERAL CONSIDERATIONS

Ground Water Migration Pathway Description

Regional Geology

The Valley Pike VOCs site is located in Riverside, Montgomery County, Ohio, and lies on the Till Plains Section of the Central Lowland physiographic province (Refs. 4; 22, p. 6). The topography of the Till Plains is the result of continental glaciation; bedrock features formed by preglacial drainage systems are buried under glacial deposits. The land surface is flat to gently rolling (Refs. 22, p. 6; 23, p. 2). The elevation at the MRP property is about 782 feet above mean sea level (msl) (Ref. 3) (see Figures 1 and 3 of this HRS documentation record). Montgomery County is underlain in descending stratigraphic order by all or some of the following units: Quaternary glacial deposits and Ordovician sedimentary rocks (Ref. 25, pp. 13, 14, 16, 17, 19).

The glacial deposits consist of two generalized types, differentiated primarily by the principal grain size content: outwash, also known as valley train material, that was deposited by glacial meltwater and consists chiefly of gravel and sand size sediments; and till deposited directly by the glaciers as they advanced over the area and consists of clay-rich materials (Ref. 26, p. 2-1). Six units compose the glacial deposits and include, in descending order: top soil/surficial clay, shallow sand and gravel, shallow subsurface till, intermediate sand and gravel, intermediate subsurface till, and deep sand and gravel (Ref. 26, p. 2-2). These units are not consistently observed in all locations within the region because of the complex nature of the geologic system (Ref. 26, p. 2-2). These glacial deposits range in thickness from about 150 to 300 feet (Ref. 22, p. 6). A generalized description of the glacial deposits, in descending order, is presented below.

Top soil/surficial clay – Consists of silt or clay and is discontinuous. Where present, it is generally 10 feet thick with an approximate range of thickness of between 5 and 40 feet (Ref. 26, p. 2-2).

Shallow sand and gravel – Consists of sand, gravel, or both and is horizontally continuous with a general thickness of 60 feet and a range of thickness of between 10 and 100 feet (Ref. 26, p. 2-2).

Shallow subsurface till – Primarily consists of silt or clay and is horizontally discontinuous. Where present, the unit is generally 20 feet thick with an approximate range of thickness of between 0 and 40 feet (Ref. 26, p. 2-2).

Intermediate sand and gravel – Primarily consists of sand, gravel or both, is horizontally discontinuous, and varies in thickness with lenses of silt and clay deposits. Where present, the unit is generally 50 feet thick with a range of thickness of between 0 and 80 feet (Ref. 26, p. 2-2).

Intermediate subsurface till – Consists primarily of silt or clay, is horizontally discontinuous, and varies in thickness with lenses of sand and gravel deposits. Where present, the unit is generally 30 feet thick with a range of thickness of between 0 and 50 feet (Ref. 26, p. 2-2).

Deep sand and gravel – Consists primarily of sand, gravel, or both, is horizontally discontinuous, and directly overlies basal clays or bedrock. The general thickness is 70 feet with a range of thickness of between 0 and 140 feet (Ref. 26, p. 2-2).

Underlying the glacial deposits are Ordovician-age sedimentary rocks containing limestone and shale (Refs. 24, p. 4; 25, p. 16). These rocks were derived from marine sediments that formed thick beds of shale interbedded with thin beds of coarse fossiliferous limestone (Ref. 25, p. 16). The thin limestone beds constitute approximately 20 percent of the sequence and are most common in the uppermost part of the Ordovician sequence (Ref. 25, p. 16). These rocks are more than 1,000 feet thick (Ref. 23, p. 5).

Regional Aquifer Description

Overview Narrative – Aquifers in the Dayton area are considered to be part of the GMBVAS (Ref. 26, p. 2-1). The GMBVAS is a buried valley system that follows the general trend of the present-day Great Miami, Mad, Stillwater, and Wolf Creek Rivers and is the result of valleys cut into the bedrock (shale and limestone) by river and glacial erosion followed by filling with glacial deposits (clay, silt, sand, and gravel) (Ref. 26, p. 2-1). This aquifer system supplies the greatest quantity of water in the Dayton area and southwestern Ohio and has been designated by EPA as a sole-source aquifer (Refs. 25, pp. 1, 4, 34; 26, p. 2-1).

Great Miami Buried Valley Aquifer System – The GMBVAS consists of unconsolidated sand and gravel units that are partially- to fully-saturated with ground water. The hydrogeologic system is complex because of variations in thickness and extent (Ref. 26, p. 2-3). The deposits range in thickness from 0 to 400 feet; however, typical thickness is 150 to 200 feet (Ref. 25, p. 34). Based on well logs in the vicinity of the site, confining layers locally separate the units of the aquifer but are not continuous or consistently present (Ref. 15, pp. 15, 23, 25 to 28, 45 to 59).

Ground water is encountered at about 15 feet bgs and elevations range from 840 feet above msl in the northeastern and southeastern extent of the region to 717 feet above msl in the southwestern extent of the region (Refs. 22, p. 7; 26, p. 2-3). The aquifer is confined to semi-confined by the overlying subsurface clay and silt unit (Refs. 15, pp. 23, 25 to 27; 26, p. 2-3).

Underlying the GMBVAS is the bedrock aquifer (composed of Richmond Shales of the late Ordovician Period), which yields significantly less water than the overlying sand and gravel aquifer system (Refs. 26, p. 2-3; 31, p. 18). The Ordovician shales are virtually impermeable. The limestone layers are dense and not very porous, and the fine-grained shales are generally less permeable (Ref. 31, p. 27). The bedrock aquifer is not evaluated in this HRS documentation record.

Ground water within the GMBVAS primarily is recharged through percolation from precipitation, area streams, and the Great Miami River. The river recharges the GMBVAS during high river flow periods, which generally occurs from November through April (Ref. 27).

The hydrogeology of the buried-valley aquifer is highly heterogeneous, with extreme lithologic variation over short distances with depth. Clay and silt-rich zones are interbedded with sand and gravel deposits but are laterally discontinuous (Refs. 22, pp. 5, 8; 29).

Site Geology/Hydrogeology

During the 2014 EPA Contaminant Source Area Investigation, eight borings were advanced on and adjacent to the MRP property (Ref. 15, pp. 9, 25). Based on the borings, subsurface materials were found to consist of varying thicknesses of fill materials and overlying glacial-derived, unconsolidated deposits. The glacial-derived materials consisted of mixed and interbedded sand, gravel, silt, and clay (Ref. 15, p. 15). Generally, sands and gravels are the predominant deposits. A layer of dense glacial till (blue clay or gray silty clay with varying amounts of fine to coarse gravel and cobbles) was encountered in most borings, separating the overlying silt, sand, and gravel from coarser sands and gravels below (Ref. 15, pp. 15, 42 to 59). Well borings installed on the MRP property, as well as within a 2-mile radius of Source No. 1, show that clay and silt-rich zones are not continuous (Refs. 8, pp. 25, 467 to 503; 15, pp. 15, 23, 25 to 28, 42 to 59). Where present, the till layer was encountered at depths ranging from 15 to 35 feet bgs (767 to 747 feet above msl) (Ref. 15, pp. 15, 42 to 59). The thickness of the till appears to decrease from north to south in the vicinity of the MRP property and the Rockcastle property (located adjacent and northeast (upgradient) of the MRP property), and is absent on the south side of Valley Pike in boring MW-EPA-9 (Ref. 15, pp. 15, 48, 49). Boring MW-EPA-9 is located about 560 feet south of Source No. 1 (Ref. 15, p. 25). Below the till, fine to coarse sand and gravel were encountered at all boring locations (Ref. 15, pp. 42 to 59).

The boring log for the active production well (ODNR Well Log Number: 693135) installed in 1989 about 180 feet southeast of Source No. 1 (approximate elevation of 782 feet above msl; see Figures 1 and 3 of this HRS documentation record), indicates that the property is underlain by: topsoil from 0 to 3 feet bgs (782 to 779 feet above msl); dry gravel from 3 to 32 feet bgs (779 to 750 feet above msl); sand and gravel from 32 to 51 feet bgs (750 to 731 feet above msl); blue clay from 51 to 116 feet bgs (731 to 666 feet above msl); and sand and gravel from 116 to 130 feet bgs (666 to 652 feet above msl) (Refs. 8, p. 467; 19; 33, p. 2). Ground water was encountered at 51 feet bgs (731 feet above msl) and 130 feet bgs (652 feet above msl) (Refs. 8, p. 467; 19; 33, p. 2). According to the boring log, the well is screened within the sand and gravel aquifer between 116 and 130 feet bgs (666 to 652 feet above msl) (Refs. 8, p. 467; 17, p. 13; 19). Based on the boring log for the active production well (ODNR Well Log Number: 693135), ground water in the site area is divided into two zones, shallow and deep, separated by an approximately 65-foot layer of blue clay (Refs. 8, pp. 19, 467; 19).

The boring log for the old production well (ODNR Well Log Number: 388390) installed in 1969 about 200 feet southeast of Source No. 1 (approximate elevation of 782 feet above msl (see Figures 1 and 3 of this HRS documentation record), shows the presence of a blue clay layer between 47 and 111 feet bgs (735 to 671 feet above msl) (Refs. 8, pp. 5, 468; 17, p. 13; 19; 33, p. 2). According to the boring log, the well is screened within the gravel aquifer at 36 to 47 feet bgs (746 to 735 feet above msl) (Refs. 8, pp. 5, 468; 19; 33, p. 2).

The boring log for the Source No. 1 (DW-2, ODNR Well Log Number 438258) installed in 1972 in the northwestern portion of the MRP (approximate elevation of 782 feet above msl), shows the presence of a blue clay layer between 25 and 37 feet bgs (757 and 745 feet above msl). The well is screened within the gravel aquifer at 37 to 50 feet bgs (745 to 732 feet above msl) (Refs. 8, p. 469; 15, p. 23; 17, p. 13; 19; 33, p. 4).

A boring log (MR-102D) for a well, installed in 1986, about 1.6 miles west southwest of the MRP property (see Reference 28 for approximate location) shows coarse sand and fill from 0 to 10 feet bgs (754.4 to 744.4 feet above msl), gray sandy clay from 10 to 17 feet bgs (744. to 737.4 feet above msl), well rounded fine to coarse sand from 17 to 42 feet bgs (737.4 to 712.4 feet above msl), medium gravel and coarse sand from 42 to 56 feet bgs (712.4 to 698.4 feet above msl), silty sand with lenses of gravel from 56 to 91 feet bgs (698.4 to 663.4 feet above msl), medium to coarse sand and gravel from 91 to 111 feet bgs (663.4 to 643.4 feet above msl), gray sandy clay from 111 to 115 feet bgs (643.4 to 639.4 feet above msl), medium to coarse sand and gravel with large boulders from 115 to 154 feet bgs (639.4 to 600.4 feet above msl), and large boulders and cobbles with occasional thin layers of clay from 154 to 162 feet bgs (600.4 to 592.4 feet above msl) (Refs. 8, pp. 491 to 495; 19; 28). This well is screened between 124 and 146 feet bgs (628.4 to 608.4 feet above msl) (Refs. 8, pp. 491 to 495; 19).

These borings show that the unconsolidated glacial deposits vary greatly in thickness and extent across short lateral distances. The absence of a clay layer that is present in the MRP property borings shows that this clay layer is not continuous throughout a 2-mile radius of Source No. 1. This great lithologic variation also can be seen in a boring log (MR-103D) from a well installed about 0.95 mile southwest of Source No. 1 (see Reference 28 for approximate location) (Refs. 8, pp. 484 to 488; 28). This boring shows the presence of light gray clay with sand and gravel from 42 to 66 feet bgs (721.8 to 697.8 feet above msl) and 68 to 98 feet bgs (697.8 to 665.8 feet above msl) (Refs. 8, pp. 484 to 488; 19).

Saturated material is generally first encountered at depths ranging from approximately 24 to 30 feet bgs (758 to 752 feet above msl) (Refs. 15, pp. 16, 42 to 59; 19). Typically, saturated material was not present above the till; however, minor amounts of moisture indicative of a low-yielding seasonal or “perched” zone were encountered in some borings (Ref. 15, pp. 10, 46, 47, 52, 53, 58, and 59). At other locations, saturation was generally encountered immediately below the dense till in coarse sands and gravels (Ref. 15, pp. 16, 44, 45, 48 to 51, and 54 to 57). Ground water levels in completed monitoring wells in the Valley Pike VOCs site area ranged from 18.48 feet bgs (763.79 feet above msl) to 25.61 feet bgs (758.71 feet above msl) (Refs. 15, p. 35; 19). The presence of ground water above the till is sporadic and associated with localized conditions. The till was not observed at some boring locations and varied in

thickness where encountered (Ref. 15, p. 16).

During the 2014 EPA Contaminant Source Area Investigation, ground water elevation data was collected from 16 wells in the Valley Pike VOCs site vicinity (Ref. 15, pp. 16, 35). Based on the ground water elevation data, ground water flow in the site vicinity is southwestward and runs approximately parallel to Valley Pike (Ref. 15, pp. 16, 35).

Aquifer Interconnectivity and Discontinuity

The GMBVAS is a sole-source aquifer system and thus the most important aquifer in southwest Ohio, which was formed by glacial erosion followed by filling with glacial deposits (clay, silt, sand, and gravel) (Refs. 26, p. 2-1; 30, p. 1). The hydrogeology of the aquifer is highly heterogeneous, with extreme lithologic variations over short distances and with depth (Ref. 22, pp. 5, 8). Clay and silt-rich zones are interbedded with sand and gravel deposits but are not laterally continuous within a 2-mile radius of Source No. 1 (Ref. 22, pp. 5, 8). Well borings installed on the MRP property as well as within a 2-mile radius of Source No. 1 show that the clay and silt-rich zones are not continuous (Refs. 8, pp. 25, 467 to 503; 15, pp. 15, 23, 25 to 28, 42 to 59). Therefore, the GMBVAS underlying the MRP facility is a single interconnected aquifer within a 2-mile radius of Source No. 1 at MRP. The GMBVAS is continuous within a 4-mile radius of Source No. 1 at the MRP property (Refs. 22, p. 5; 29).

SUMMARY OF AQUIFERS BEING EVALUATED

TABLE 5: Summary of Aquifers Being Evaluated				
Aquifer Name	Is Aquifer Interconnected with Upper Aquifer within 2 Miles? (Yes/No/NA)	Is Aquifer Continuous within 4-mile TDL? (Yes/No)	Is Aquifer Karst? (Yes/No)	References
Great Miami Buried Valley Aquifer System (sole-source aquifer)	NA	Yes	No	1, Section 3.0.1.1; 8, p. 4; see Section 3.1.1 of this HRS documentation record

Notes:

- NA Not applicable
- TDL Target distance limit

3.1 LIKELIHOOD OF RELEASE

3.1.1 OBSERVED RELEASE

Aquifer Being Evaluated: Great Miami Buried Valley Aquifer System

Hazardous Substances in Release: PCE and TCE

Direct Observation

Prior to 2012, MRP used production wells as a water supply for non-contact cooling water for the facility's degreasers (Refs. 17, pp. 2, 12; 14, p. 4). After non-contact cooling water had circulated through the MRP vapor degreasers, MRP pumped the non-contact cooling water into DW-2 and other dry/injection wells on the property (Refs. 14, p. 4; 17, pp. 2, 12, 128). A well log from MRP dry/injection well DW-2 installed in 1972 was completed at 50 feet bgs (732 feet above msl) in a shallow sand and gravel zone of the GMBVAS (Refs. 17, p. 128; 19; 26, p. 2-1; 33). The water level in this dry/injection well was at 50 feet bgs (732 feet above msl) (Refs. 17, p. 128; 19).

The Ohio EPA UIC program describes dry/injection wells (class V wells) as being completed in the vadose (unsaturated) zone of the subsurface and are used for stormwater management (Ref. 38). However, the well log for Source No. 1, located on the north side of the facility building, indicates that this dry/injection well was completed at about 50 feet bgs and is completed within a shallow sand and gravel zone of the aquifer (Refs. 17, p. 128; 8, pp. 24, 469).

During the Ohio EPA November 2010 SI and December 2011 ESI, ground water samples collected from the MRP active production well contained PCE and TCE (Refs. 8, pp. 11, 164, 167, 214; 17, pp. 4, 5, 12, 13, 100, 103; 33). Analytical results for a sample collected from Source No. 1 (DW-2) contained PCE and TCE (Refs. 17, pp. 5, 12, 13, 29, 30, 37, 103, 128; 33). In 2012, MRP indicated that PCE- and TCE-contaminated ground water pumped from the production well was used for non-contact cooling water. After passing through the vapor degreasers, the non-contact cooling water was then discharged into Source No. 1 (DW-2) and other dry/injection wells on the property (Ref. 14, p. 4). The dry/injection wells were employed before a closed loop system was installed at MRP (Ref. 14, p. 4). The PCE and TCE detected in DW-2, which was used for non-contact cooling water, and is screened in a shallow sand and gravel zone of the GMBVAS represents an observed release by direct observation in accordance with the HRS, Section 3.1.1 (Refs. 1, p. 51595; 14, pp. 1, 4). Table 6 below provides the depth to water in Source No. 1 (DW-2) and the concentrations of PCE and TCE detected during the Ohio EPA November 2010 SI.

TABLE 6: Observed Release by Direct Observation

Well Description	Sample ID	Date Sampled	Well Screen Interval (feet msl)	Hazardous Substance	Hazardous Substance Concentration (µg/L)	Adjusted CRQL/SQL (µg/L)	References
Dry Well GW-8 (DW-2)	E2699DL	11/2/2010	745 to 732	PCE	82	5.0	16, p. 1; 17, pp. 5, 12, 13, 29, 30, 37, 128; 33; 45, pp. 2 to 7
	E2699			TCE	2.2	0.5	

Notes:

- CRQL Contract required quantitation limit
- DW Dry well
- GW Ground water
- ID Identification
- msl Mean sea level

PCE	Tetrachloroethylene
SQL	Sample quantitation limit
TCE	Trichloroethylene

Chemical Analysis

An observed release by chemical analysis is established by showing that the hazardous substances in release samples are significantly greater in concentration than background level and by documenting that at least part of the significant increase is attributable to a release from the site being evaluated. The significant increase can be documented in one of two ways for HRS purposes. If the background concentration is not detected (or is less than the SQL), an observed release is established when the sample measurement equals or exceeds the appropriate SQL. If the background sample concentration equals or exceeds the SQL, an observed release is established when the sample measurement is 3 times or more above the background concentration and above the appropriate SQL (Ref. 1, p. 51589 [Table 2-3]). An observed release of PCE and TCE is documented in the following sections by comparing the concentrations of the hazardous substances in similar background and contaminated ground water samples (see Tables 9, 10, 11, and 12 in this section, Section 3.1.1, of this HRS documentation record) and by attributing the increase to the site. During the EPA October 2014 sampling event, background ground water samples collected from permanent monitoring wells MW-5, MW-6, MW-EPA-9, MW-EPA-11, MW-EPA-12, and MW-EPA-13, located north, northeast, east, and southeast (upgradient and sidegradient) of Source No. 1, did not exhibit detectable concentrations of PCE and TCE (Refs. 15, pp. 32, 152, 165, 167, 169, 171, 199; 21, pp. 5, 6, 8). Contaminated ground water samples collected from permanent monitoring wells MW-EPA-8 and MW-EPA-14, located downgradient of Source No. 1, have been found to contain PCE and TCE significantly above background levels (Refs. 15, pp. 32, 184, 201; 21, pp. 7, 8).

2014 EPA Sampling Event

Background Samples

To establish background levels, ground water samples collected during the EPA October 2014 sampling event were evaluated (from permanent monitoring wells MW-5, MW-6, MW-EPA-9, MW-EPA-11, MW-EPA-12, and MW-EPA-13 installed north, northeast, east, and southeast (upgradient and sidegradient) of Source No. 1 (Ref. 15, p. 32). Ground water samples collected from these wells did not exhibit detectable concentrations of PCE (Ref. 15, pp. 152, 165, 167, 169, 171, 199). These permanent monitoring wells were selected to establish background levels and to encapsulate the PCE ground water contamination downgradient of Source No. 1 (Ref. 15, p. 32) (see Figures 3 and 4 of this HRS documentation record).

The background wells are installed within a sand and gravel zone of the GMBVAS aquifer, are screened between 754.04 to 732.03 feet above msl (Refs. 15, pp. 35, 48, 49, 52 to 57; 18, pp. 179, 183, 206, 207, 211, 212; 21, pp. 5, 6, 8) and will be compared with contaminated permanent monitoring well samples collected from the sand and gravel unit of the GMBVAS at similar screened intervals (751.8 to 741.57 feet above msl) (Refs. 15, pp. 42, 46, 47, 58, 59; 33) (see Tables 7 and 8 of this HRS documentation record).

The background samples were collected in accordance with the EPA-approved field sampling and analysis plan (SAP) dated September 2014 (Ref. 15, p. 8). The locations of the background ground water samples are contained in Reference 15, pp. 25, 32 (see Figure 4 of this HRS documentation record). Well construction diagrams are provided in Appendix B of Reference 15. Chain-of-custody forms (which provide the sample identification numbers and date and time of sample collection) are provided in Reference 21, pages 5, 6, 8.

The background monitoring well samples and contaminated monitoring well samples were collected from permanent monitoring wells that withdraw water from the sand and gravel unit of the GMBVAS, at similar screened intervals, during the same sampling event, and in accordance with the same sampling

procedures (Ref. 15, pp. 8, 10, 11, 12, 42, 48, 49, 52 to 57) (see Tables 7 and 8 of this HRS documentation record).

Sample ID	GMBVAS Zone	Top of Casing Elevation (feet msl)	Well Screen Interval (feet msl)	Date Sampled	Location	References
GW-MW-5-101414	Shallow	780.66	748.74 to 743.74	10/14/2014	MW-5	9; 18, pp. 179, 183, 206, 207; 21, p. 6
GW-MW-6-101414	Shallow	779.48	747.98 to 742.98	10/14/2014	MW-6	9; 18, pp. 179, 183, 211, 212; 21, p. 6
GW-MW-9-101614	Shallow	781.5	751.5 to 741.5	10/16/2014	MW-EPA-9	9; 15, pp. 48, 49; 21, p. 8
GW-MW-11-101314	Shallow	783.04	750.72 to 740.72	10/13/2014	MW-EPA-11	9; 15, pp. 52, 53; 21, p. 5
GW-MW-12-101414	Shallow	782.22	751.12 to 741.12	10/14/2014	MW-EPA-12	9; 15, pp. 54, 55; 21, p. 6
GW-MW-13-101414	Shallow	780.03	742.03 to 732.03	10/14/2014	MW-EPA-13	9; 15, pp. 56, 57; 21, p. 6

Notes:

EPA U.S. Environmental Protection Agency
 GMBVAS Great Miami Buried Valley Aquifer System
 GW Ground water
 ID Identification number
 msl Mean sea level
 MW Monitoring well

Background Concentrations

The background ground water samples listed in Table 8 of this HRS documentation record were collected during the EPA October 2014 sampling event (Ref. 21, pp. 5, 6, 8). The background ground water samples were collected north, northeast, east, and southeast (upgradient and sidegradient) of Source No. 1 (see Figure 3 of this HRS documentation record). The background ground water samples were analyzed for VOCs by Pace Analytical using the EPA SW-846 Method 8260B (Ref. 15, pp. 152, 157, 165, 167, 169, 171, 189, 199). The EPA conducted a Stage 4 data validation of the Pace analytical data package in accordance with the EPA Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use and the EPA Contract Laboratory Program (CLP) NFG for Superfund Organic Methods Data Review (Ref. 15, pp. 82, 108, 157, 174). The data validation effort shows the overall data quality to be acceptable (Ref. 15, pp. 142 to 146, 157 to 161, 189 to 193).

The analytical data results are provided in Appendix D of Reference 15. The reporting limits are listed on the analytical data sheets in Reference 15. The reporting limits are adjusted for sample characteristics that may affect quantitation, such as dilutions and concentration (Refs. 15, pp. 152, 165, 167, 169, 171, 199; 35). The reporting limits are equivalent to SQLs as defined in Section 1.1, Definitions of the HRS (Refs. 1, p. 51586; 35).

Sample ID	Hazardous Substance	Concentration (mg/L)	Reporting Limit (mg/L)	References
GW-MW-5-101414	PCE	0.005 U	0.005	15, p. 165
GW-MW-6-101414	PCE	0.005 U	0.005	15, p. 167
GW-MW-EPA-9-101614	PCE	0.005 U	0.005	15, p. 199
GW-MW-EPA-11-101314	PCE	0.005 U	0.005	15, p. 152
GW-MW-EPA-12-101414	PCE	0.005 U	0.005	15, p. 169
GW-MW-EPA-13-101414	PCE	0.005 U	0.005	15, p. 171

Notes:

EPA U.S. Environmental Protection Agency
 ID Identification
 mg/L Milligrams per liter
 MW Monitoring well
 PCE Tetrachloroethylene
 U Compound was analyzed for, but not detected at or above the associated value (report limit) (Ref. 15, p. 66)

Contaminated Samples

Ground water samples listed in Table 9 of this HRS documentation record were collected during the EPA October 2014 sampling event from permanent monitoring wells completed within the sand and gravel unit of the GMBVAS located downgradient of Source No. 1 (Refs. 15, pp. 32, 46, 47, 58, 59; 21, pp. 7, 8) (see Figures 3 and 4 of this HRS documentation record). All ground water samples were collected in accordance with the EPA-approved field SAP dated September 2014 (Ref. 15, p. 8).

The contaminated ground water samples and their corresponding top of casing elevations and screened intervals are provided in Table 9 of this HRS documentation record. Results for contaminated ground water samples collected downgradient of Source No. 1 were compared with background samples completed within the sand and gravel unit of the GMBVAS at similar screened intervals (Refs. 15, pp. 10, 32, 35, 48 to 58; 18, pp. 179, 183, 206, 207, 211, 212; 33) (see Tables 9 and 10 of this HRS documentation record).

The locations of the contaminated ground water samples are contained in Reference 15, pp. 25, 32 (see Figure 4 of this HRS documentation record). Well construction diagrams are provided in References 9 and 15, p. 35, Appendix B, pp. 46, 47, 58, and 59. Chain-of-custody forms (which provide the sample identification numbers and date and time of sample collection) are provided in Reference 21, pages 7 and 8.

Sample ID	GMBVAS Zone	Top of Casing Elevation (feet msl)	Well Screen Interval (feet msl)	Date Sampled	Location	References
GW-PW-101514	Shallow	784.32	745.35 to 735.35	10/15/2014	MW-PW (Old PW)	9; 15, p. 35; 21, p. 7
GW-MW-EPA-8-101414	Shallow	781.5	751.8 to 741.8	10/15/2014	MW-EPA-8	9; 15, pp. 35, 46, 47; 21 p. 7
GW-MW-EPA-14-101614	Shallow	780.57	751.07 to 741.07	10/16/2014	MW-EPA-14	9; 15, pp. 35, 58, 59; 21 p. 8

Notes:

EPA U.S. Environmental Protection Agency
 ID Identification number
 GMBVAS Great Miami Buried Valley Aquifer System
 msl Mean sea level
 MW Monitoring well
 PW Production well

Contaminated Concentrations

The contaminated ground water samples listed in Table 10 of this HRS documentation record were collected during the EPA October 2014 sampling event (Refs. 15, pp. 184, 186, 201; 21, pp. 7, 8). The contaminated ground water samples were collected from permanent monitoring wells located downgradient of Source No. 1 (see Figure 4 of this HRS documentation record). The contaminated ground water samples were analyzed for VOCs by Pace Analytical using the EPA SW-846 Method 8260B (Ref. 15, pp. 174 to 178, 185, 186, 189 to 193, 201).

EPA conducted a Stage 4 data validation of the Pace Analytical data package in accordance with the EPA Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use and the EPA CLP NFG for Superfund Organic Data Review (Ref. 15, pp. 174, 189). The data validation effort shows the overall data quality to be acceptable (Ref. 15, pp. 174 to 178, 184, 186, 189 to 193, 201).

The reporting limits are listed on the analytical data sheets in Reference 15. The reporting limits are adjusted for sample characteristics that may affect quantitation, such as dilutions and concentration (Refs. 15, pp. 184, 186, 201; 35). The reporting limits are equivalent to SQLs as defined in Section 1.1, Definitions of the HRS (Refs. 1, p. 51586; 35).

Sample ID	Hazardous Substance	Concentration (mg/L)	Reporting Limit (mg/L)	References
GW-PW-101514	PCE	0.028	0.005	15, p. 186; 21, p. 7
GW-MW-EPA-8-101514	PCE	19.3	0.50	15, p. 184; 21, p. 7
GW-MW-EPA-14-101614	PCE	2.5	0.10	15, p. 201; 21, p. 8

Notes:

EPA U.S. Environmental Protection Agency
 ID Identification
 mg/L Milligrams per liter
 MW Monitoring well
 PCE Tetrachloroethylene
 PW Production well

Attribution

For HRS scoring purposes, the Valley Pike VOCs site is composed of Source No. 1, dry/injection well DW-2, and an observed release of PCE and TCE to the shallow sand and gravel zone of the GMBVAS (Refs. 8, pp. 144, 150, 153, 219, 234, 237; 15, pp. 152, 165, 167, 169, 171, 184, 186, 199, 201; 17, pp. 29, 30, 37, 103, 122, 128; 33). The MRP property is located at 2949 Valley Pike in Riverside, Ohio (Ref. 14, p. 3). MRP began operations at this location in 1942 and continues to operate at the property (Refs. 6, p. 2; 11, p. 2; 14, p. 3). MRP has informed EPA that TCE has been used at the facility since approximately 1968 (Ref. 14, p. 4). Currently, as part of the MRP manufacturing process, metal and steel parts are degreased with TCE in two vapor degreasers before they are bonded with rubber parts (Refs. 6, p. 4; 14, pp. 3, 4; 15, p. 4). The vapor degreasers are located in the northwestern portion of the manufacturing area, near the north end of the building (see Figure 3 of this HRS documentation record) (Ref. 15, p. 4). According to MRP, since the vapor degreasers were installed in 1994, TCE has been used and continues to be used in the vapor degreasers (Ref. 14, pp. 3, 4). MRP currently purchases TCE in 55-gallon drums for use in its vapor degreasers (Ref. 14, p. 3). Spent TCE that can no longer be used for degreasing parts is stored in sealed drums for disposal on a quarterly basis (Ref. 14, p. 3).

As a result of its TCE use, MRP is required to report TCE usage annually to RAPCA. After an anonymous source alleged that MRP was under-reporting the amount of solvents used, Ohio EPA and RAPCA performed an unannounced inspection on May 14, 2001 (Ref. 7, p. 4). RAPCA and Ohio EPA determined that MRP had under-reported its TCE usage, kept false records, and knowingly reported false data from 1995 to 2000 (Ref. 7, p. 4). In January 2004, a seven-count criminal indictment was filed against MRP by the U.S. Attorney's Office in Dayton, Ohio (Ref. 7, p. 5). From 1995 to 1999, the combined emissions permit limit was 10,000 pounds per year (Ref. 7, p. 4). However, actual emissions were calculated and ranged from 17,679 pounds in 1996 to 38,556 pounds in 1997 (Ref. 7, pp. 4, 5). Later the same year, William R. Mullins, president of MRP, pled guilty to making false statements in reporting airborne discharges of TCE and failing to submit a Title V air permit by the October 1996 deadline (Ref. 7, p. 5). MRP now holds a Clean Air Act Title V operating permit that was issued January 16, 2008 (Ref. 7, p. 5). In accordance with MRP's Title V permit, the facility's TCE usage is a rolling 12-month limit of 15.54 tons (Ref. 7, p. 5).

MRP was aware that they were drawing cooling water from a well that contained PCE- and TCE-contaminated ground water (Ref. 40, p. 1). A ground water sample collected from an MRP production well located on the eastern side of the MRP building contained PCE at 156 mg/L (Ref. 17, pp. 4, 13, 103). After circulating through the vapor degreasers, the water was discharged into dry/injection wells on the property (Refs. 14, p. 4; 40, pp. 1, 2). Until 2012, MRP used seven dry/injection wells, including Source No. 1, to manage non-contact cooling water, storm drainage, and boiler blowdown water (Refs. 7, p. 4; 15, p. 4). Based on the dates of installation, the dry/injection wells were used as early as 1972 (Refs. 14, pp. 35, 48; 15, p. 42; 17, p. 128). A log for dry/injection well, DW-2, installed on MRP property indicates that the 50-foot well is a "return dry well, used for returning water back to ground;" however, the well is completed at 50 feet bgs through an upper clay layer and into the shallow zone of the underlying sand and gravel zone of the GMBVAS (Refs. 14, pp. 35, 48; 15, p. 42; 17, p. 128). Therefore, DW-2 discharged water directly into the underlying aquifer (Refs. 14, pp. 4, 48; 17, pp. 5, 12, 13).

Some of the MRP dry/injection wells were reportedly interconnected (Ref. 15, pp. 4, 41). The MRP wells were considered Class V injection wells under the Ohio UIC Program (Refs. 7, p. 4; 8, pp. 2, 3; 38). Permits were not issued, but the wells were registered with Ohio EPA (Refs. 7, p. 4; 8, pp. 2, 3). In 2012, Ohio EPA required MRP to terminate use of the wells based on the presence of PCE in local ground water (Refs. 8, p. 3; 14, p. 4). Also in 2012, MRP installed a closed loop chiller system that eliminated the need to discharge non-contact cooling water into the injection wells (Ref. 14, pp. 3, 4).

PCE and TCE were detected in samples collected from Source No. 1 (Refs. 8, pp. 152, 153, 160 to 167; 17, pp. 27, 28, 100, 103, 126; 33). These detections were documented before the closed loop system was installed in 2012 (Refs. 8, pp. 98, 153, 237; 17, pp. 29, 30, 37) (see Tables 1 and 2 of this HRS documentation record).

Analysis of samples collected in the vicinity of the Valley Pike VOCs site has indicated the presence of PCE or TCE in ground water, soil, and sub-slab vapor (Ref. 7, pp. 2, 9). Sub-slab vapor samples collected beneath the MRP main building in September 2014 had high levels of PCE and TCE (Ref. 7, p. 2). PCE was detected between 44.1 and 3,550,000 $\mu\text{g}/\text{m}^3$ and TCE between 104 and 44,400 $\mu\text{g}/\text{m}^3$ (Ref. 7, pp. 9, 10, 22). The highest detection of PCE (3,550,000 $\mu\text{g}/\text{m}^3$) was in a sub-slab sample collected near the degreaser (Ref. 7, p. 2). Information provided by MRP states that MRP has historically used and currently uses TCE (Ref. 14, pp. 1, 3).

Subsurface soil samples collected downgradient of Source No. 1 (dry/injection well DW-2) and the former degreaser contained PCE and TCE. PCE concentrations ranged from 0.014 milligrams per kilogram (mg/kg) to 2,040 mg/kg (Refs. 15, pp. 30, 95, 99, 118, 126; 21, pp. 2, 3). More specifically, PCE was detected at the following concentrations in subsurface soil samples: at 0.043 mg/kg in sample SB-MW-EPA-7-1517, collected in the vicinity of the former degreaser at a depth of 15 to 17 feet bgs; at 0.032 mg/kg and 2,040 mg/kg in samples SB-MW-EPA-8-1315 and SB-MW-EPA-8-2426, collected on the western side of the MRP building and downgradient of Source No. 1 at depths of 13 to 15 feet bgs and 24 to 26 feet bgs, respectively; and at 0.014 mg/kg in subsurface soil sample SB-MW-EPA-14-1820, collected downgradient of Source No. 1 at 18 to 20 feet bgs (Ref. 15, pp. 30, 95, 99, 118, 126; 21, pp. 2, 3). In addition, TCE was detected in subsurface soil samples collected from SB-MW-EPA-8-2022 at 2.6 mg/kg between 20 to 22 feet bgs and SB-MW-EPA-8-2426 at 411 mg/kg between 24 to 26 feet bgs (Refs. 15, pp. 30, 97, 99; 21, p. 2).

An observed release to the shallow zone of the GMBVAS is documented in ground water samples collected from permanent monitoring wells located downgradient of Source No. 1 (see Tables 9, 10, 11 and 12 in Section 3.1.1 of this HRS documentation record). The highest detection of PCE in ground water was 19.3 milligrams per liter (mg/L) in sample GW-MW-EPA-8-101514 collected from permanent monitoring well MW-EPA-8 (Ref. 15, pp. 32, 184). Further, PCE (up to 300 $\mu\text{g}/\text{L}$) and TCE (up to 22 $\mu\text{g}/\text{L}$) were detected in a ground water sample collected from permanent monitoring well MW-3 located on the southwestern corner (crossgradient of Source No. 1) of the MRP property (Ref. 8, pp. 11, 23, 346, 347, 362).

In addition, grab ground water samples were collected during the SI (Ref. 17, pp. 5, 6, 13). The highest detections of PCE (58 $\mu\text{g}/\text{L}$) and TCE (11 $\mu\text{g}/\text{L}$) were detected in grab ground water sample GW-6, located south and sidegradient of Source No. 1 on the southwestern corner of the MRP property (Ref. 17, pp. 13, 27, 28).

The MRP facility is located in a commercial and industrial area of Riverside, Ohio (Ref. 8, p. 7) (see Figures 1 and 2 of this HRS documentation record). The properties located between the MRP property and Harshman Road to the northeast and Hypathia Avenue to the west include a church, retail and restaurant properties, and trucking, freight, and auto repair businesses (Ref. 15, pp. 2, 24).

During the EPA October 2014 sampling event, properties in this area were evaluated as possible sources of VOC contamination. Properties where VOC contamination was detected included: MRP, Paul's Garage, and Rockcastle Storage (Ref. 15, p. 5).

Paul's Garage is an automotive service facility and long-term storage facility for recreational vehicles (Ref. 15, p. 5). PCE was detected in a ground water sample collected from well MW-EPA-14 at 2.5 mg/L (Ref. 15, pp. 32, 201). Well MW-EPA-14 is located on the northeastern edge of the Paul's Garage property, bordering the MRP property, and is downgradient from Source No. 1 (see Figure 4 of this HRS documentation record). The facility includes a metal building, a residence, and an area for storing large campers and boats (Ref. 15, p. 5). Paul's Garage began operations in the 1960s (Ref. 15, p. 5). The property was originally part of the same property as MRP but does not appear to have been used for MRP operations (Ref. 15, p. 5). According to information provided by Paul's Garage, a 500-gallon underground storage tank (UST) that contained waste oil was present off the northwest corner of the building (Ref. 15, p. 5). The UST was used from 1973 to 1985 and was subsequently removed with State

of Ohio oversight (Ref. 15, p. 5). According to the information provided, a ground water monitoring well installed directly downgradient of the UST was sampled and no further action was required (Refs. 15, p. 5; 36). Analytical results of the sample collected are not provided (Ref. 15, p. 5). Available information does not indicate the presence of any dry wells or production wells at the Paul's Garage property. Based on its operations, it is possible that solvents such as PCE and TCE were used to degrease automobile parts (Refs. 15, p. 5; 36; 37).

Rockcastle Storage, located northeast and crossgradient of the Valley Pike VOCs site, is shown in Figure 2 of this HRS documentation record. PCE was detected in October 2014 at 0.034 mg/L in ground water sample GW-MW-EPA-10-101314 collected from permanent monitoring well MW-EPA-10, located east and crossgradient of Source No. 1 on the Rockcastle Storage property (Ref. 15, pp. 9, 32, 148). Rockcastle Storage was constructed in the 1980s (Ref. 15, p. 5). Historical aerial photographs show that the land was undeveloped before that time (Ref. 15, p. 5). The facility includes a front office at the east end of the property that is also used as a residence by the site manager (Ref. 15, p. 5). Six rows of storage structures are west of the office and, together with the access driveways, cover most of the property (Ref. 15, p. 5). A large dry well/stormwater basin is within the only unpaved area, at the southern end of the property (Ref. 15, p. 5). Based on its operations, it is unlikely that Rockcastle Storage is a contributor to ground water contamination. During the same EPA 2014 investigation, PCE concentrations in ground water downgradient of Source No. 1 were more than 500 times higher (19.3 mg/L) than that detected at Rockcastle Storage (Ref. 15, pp. 32, 148, 184).

TCE was used at MRP for metal degreasing operations (Ref. 14, pp. 3, 4). PCE and TCE have been detected in samples collected from Source No. 1 (Ref. 15, p. 30) (see Tables 1 and 2 of this HRS documentation record). In addition, an observed release of PCE and TCE by direct observation and chemical analysis has been detected in ground water samples collected from permanent monitoring wells completed in the sand and gravel unit of the GMBVAS (Ref. 15, pp. 31 and 32) (see Tables 9, 10, 11 and 12 in Section 3.1.1, Observed Release of this HRS documentation record). The hazardous substances listed below have been documented in Source No. 1 on the MRP property (see Tables 1 and 2 in Section 2.2.2, Source No. 1 and Tables 6 through 10 in Section 3.1.1, Observed Release of this HRS documentation record).

No NPL sites are located within 1 mile of the Valley Pike VOCs site (Ref. 39, pp. 1 to 6). VOCs have been detected in ground water at the Wright Patterson Air Force Base and the Behr Dayton Thermal System VOC NPL site, located approximately 1.5 miles east-southeast and 2 miles northeast from Source No. 1 at the Valley Pike VOCs site, respectively (Ref. 39, pp. 1 to 6). However, low or non-detect results of PCE and TCE in ground water, soil, and sub-slab vapor samples collected from the eastern and southern portions of the MRP property indicate that an off-site source of PCE and TCE is not influencing Source No. 1 and ground water downgradient of Source No. 1 at MRP (Ref. 39, pp. 1 to 6).

Though not scored as part of this site, a Settlement Agreement signed in January 2016, between U.S. EPA and MRP identified the (larger) Valley Pike VOC Site as containing a residential area with documented vapor intrusion from a PCE- and TCE-contaminated, shallow ground water plume (Ref. 51, p. 4). The residential area includes about 500 residences and is located approximately 900 feet southwest of MRP (Ref. 51, p. 4). The Settlement Agreement identifies the MRP facility as the source of the ground water plume (Ref. 51, p. 4).

Hazardous Substances in the Release

The following substances have been documented in an observed release to the ground water migration pathway by direct observation and/or by chemical analysis.

PCE
TCE

Ground Water Observed Release Factor Value: 550.00

3.1.2 POTENTIAL TO RELEASE

Potential to release was not evaluated because an observed release to the shallow sand and gravel zone of the GMBVAS, which includes the sand and gravel unit, has been documented (see Section 3.1.1 of this HRS documentation record).

3.2 WASTE CHARACTERISTICS

3.2.1 TOXICITY/MOBILITY

The toxicity and mobility factor values for the hazardous substances detected in the source samples with containment factor values of greater than 0 are summarized in Table 11 of this HRS documentation record. The combined toxicity and mobility factor values are assigned in accordance with Reference 1, Section 3.2.1. Hazardous substances detected in the observed release to ground water are assigned a mobility factor value of 1 (Ref. 1, Section 3.2.1.2).

TABLE 11: Ground Water Toxicity/Mobility						
Hazardous Substance	Source No.	Toxicity Factor Value	Mobility Factor Value	Does Hazardous Substance Meet Observed Release? (Yes/No)	Toxicity/Mobility (Ref. 1, Table 3-9)	Reference
PCE	1	100	1 ¹	Yes	100	2, p. 1
TCE	1	1,000	1	Yes	1,000	2, p. 3

Notes:

¹ Tetrachloroethylene was detected in Source No. 1 and as an observed release in ground water. Therefore, a mobility factor value of 1 was assigned in accordance with the HRS (Ref. 1, p. 51601, Section 3.2.1.2).

No. Number

Toxicity/Mobility Factor Value: 1,000
(Ref. 1, Table 3-9)

3.2.2 HAZARDOUS WASTE QUANTITY

TABLE 12: Hazardous Waste Quantity		
Source No.	Source Type	Source Hazardous Waste Quantity
1	Other	>0

Based on HRS Section 2.4.2.2, if there has been no removal action, a factor value from Table 2-6 or a value of 10, whichever is greater, is assigned as the Hazardous Waste Quantity Factor Value for that pathway (Ref. 1, pp. 51591, 51592 [Section 2.4.2.2]). This factor is assigned because the Hazardous Constituent Quantity is not adequately determined for Source No. 1, none of the targets for the ground water migration pathway is subject to Level I or Level II concentrations, and there has been no removal action.

Hazardous Waste Quantity Factor Value: 10
(Ref. 1, Section 2.4.2.2, Table 2-6)

3.2.3 WASTE CHARACTERISTICS FACTOR CATEGORY VALUE

For waste characteristics, TCE has the highest toxicity/mobility factor value (Ref. 2, p. 3). The waste characteristics factor category value was obtained by multiplying the toxicity/mobility and HWQ factor values, subject to a maximum product of 1×10^8 . Based on this product, a value was assigned in accordance with Reference 1, Table 2-7.

Toxicity/Mobility Factor Value: 1,000
Hazardous Waste Quantity Factor Value: 10

Toxicity/Mobility Factor Value \times
Hazardous Waste Quantity Factor Value: 1×10^4

Waste Characteristics Factor Category Value: 10
(Reference 1, Table 2-7)

3.3 TARGETS

Residents within a 4-mile radius of Source No. 1 at the Valley Pike VOCs site are provided drinking water by the City of Dayton Water Department (Refs. 3; 12, p. 1). The Dayton Water Department supplies drinking water to about 400,000 people (Ref. 12, p. 1). This population includes water sold by the City of Dayton Water Department to Montgomery County, and the cities of Brookville, Trotwood, and Oakwood water departments (Ref. 12, p. 1). The Dayton Water Department maintains 109 wells in two well fields, the Mad River Well Field and Miami Well Field (Refs. 3; 12, p. 3; 20, pp. 1, 2).

Water from the Mad River Well Field is treated at the Ottawa Water Treatment Plant and serves residents on the south side of Dayton (Ref. 12, p. 3). Water from the Miami Well Field is treated at the Miami Water Treatment Plant and serves residents on the north side of Dayton (Ref. 12, p. 3). Water from each well field is mixed at the respective water treatment plant and distributed (Ref. 12, pp. 1, 3). During distribution, water from the two water treatment plants mixes in the water distribution lines, forming a blended system (Refs. 12, pp. 1, 3). None of the municipal wells produce more than 40 percent of the total Dayton water supply (Ref. 12, p. 3). The locations of the City of Dayton Water Department municipal wells in the Mad River and Miami well head protection areas are depicted on Reference 3. The number of wells in each distance ring of the 4-mile radius of Source No. 1 is presented in Table 14 of this HRS documentation record. The Dayton Water Department does not maintain additional emergency or standby wells (Ref. 12, p. 3).

The City of Dayton Water Department municipal wells withdraw drinking water from the GMBVAS, a federally designated “Sole Source Aquifer,” which implies that it serves as a sole or principal source of drinking water for the area and which, if contaminated, would significantly increase risk to the public (Refs. 12, p. 3; 13, p. 4). Wellhead protection areas are delineated around the City of Dayton Water Department well fields, which is part of a multi-jurisdictional Well Field Protection Program (Refs. 12, p. 3; 20; 32).

3.3.1 NEAREST WELL

Well ID: PW-06, City of Dayton Water Department well located northeast of Eastwood Lake and Harshman Road (Refs. 3; 48)

Level of Contamination (I, II, or potential): Potential

If potential contamination, distance from source in miles: 0.53 mile

Nearest Well Factor Value: 9
(Refs. 1, Table 3-11; 48)

3.3.2 POPULATION

3.3.2.1 Level of Contamination

3.3.2.2 Level I Concentrations

Level I concentrations were not scored in this HRS documentation record.

3.3.2.3 Level II Concentrations

During the December 2011 Ohio EPA ESI, ground water samples were collected from nine City of Dayton Water Department municipal wells located down-gradient of Source No. 1 (Ref. 8, pp. 12, 13, 21). PCE, TCE, and other volatile organic compounds were detected in six of the nine wells (Ref. 8, pp. 12, 13, 99, 100, 177, 180, 181, 186, 187, 188, 189, 191, 193, 213, 214, 215, 271, 276, 277, 285, 286, 288,

289, 292, 295). Based on available data, attribution of this contamination to Source No. 1 cannot be established at this time. Therefore, Level II concentrations were not scored in this HRS documentation record. The population served by the City of Dayton Water Department are evaluated under Section 3.3.2.4 of this HRS documentation record.

3.3.2.4 Potential Contamination

Potential contamination targets for the ground water migration pathway include the population served by the City of Dayton Water Department (Ref. 12, pp. 1, 2). This population includes residents in the City of Dayton as well as Montgomery County, and the nearest cities of Brookville, Trotwood, and Oakwood (Ref. 12, p. 1). According to the City of Dayton Water Department, the department provides water to 400,000 residents from a blended system of 109 wells (Refs. 3; 12, p. 1; 20).

Population served per well is 3,669.72 people (400,000 residents ÷ 109 wells = 3,669.72 people per well) (Refs. 3; 12, pp. 1, 3; 20).

Distance-weighted population values for potential contamination ground water targets for the GMBVAS are presented in Table 13 of this HRS documentation record (Refs. 1, Section 3.3.2.4; 3; 12, pp. 1, 2).

TABLE 13: Distance-Weighted Population Values – Non-Karst Aquifers				
Distance Category (Miles)	Number of Wells	Population (Number of wells x 3,669.72)	Distance-Weighted Population Value (Ref. 1, Table 3-12)	References
Greater than 0 to 0.25	0	0	0	3; 12, p. 1; 20
Greater than 0.25 to 0.5	0	0	0	3; 12, p. 1; 20
Greater than 0.5 to 1	27	99,082.44	16,684	3; 12, p. 1; 20
Greater than 1 to 2	63	231,192.36	29,384	3; 12, p. 1; 20
Greater than 2 to 3	17	62,385.24	6,778	3; 12, p. 1; 20
Greater than 3 to 4	2	7,339.44	417	3; 12, p. 1; 20
Sum of Distance Weighted Population Value			53,263	

Sum of Distance-Weighted Population Values: 53,263

Sum of Distance-Weighted Population Values ÷ 10: 5,326 (rounded to nearest integer)

Potential Contamination Factor Value: 5,326

3.3.2.5 CALCULATION OF POPULATION FACTOR VALUE

The total population factor value is the sum of the potential contamination factor, the Level I actual contamination, and the Level II actual contamination factor values (Ref. 1, Section 3.3.2.5). A value of 5,326 is assigned for the population factor value.

Population Factor Value: 5,326

3.3.3 RESOURCES

Municipal water obtained from the City of Dayton Water Department is used to fill swimming pools including the Forest Ridge Association Pool (Ref. 49). A value of 5 is assigned for the resources factor value (Ref. 1, Section 3.3.3).

TABLE 14: Resources			
Area	Use	Value	References
City of Dayton, Miami and Mad River Well Fields	Supply for a major or designated water recreation area, excluding drinking water use. Municipal water obtained from wells maintained by the City of Dayton Water Department that are used to fill swimming pools at local recreational centers	5	32

Resources Factor Value: 5

3.3.4 WELLHEAD PROTECTION AREA

Wellhead Protection Areas for the Miami and Mad River Well Fields are located within a 4-mile radius of Source No. 1 (Refs. 3; 12, p. 3; 20; 32). The City of Dayton Well Field Protection Program provides restrictions on zoning and water use regulations within the well field protection area and is in accordance with Section 1428 of the Safe Drinking Water Act, as amended (Refs. 32; 34; 42). A value of 5 is assigned for the wellhead protection area factor value (Ref. 1, Section 3.3.4).

Wellhead Protection Area Factor Value: 5