HRS DOCUMENTATION RECORD COVER SHEET

Site Name: Nockamixon TCE

Contact Person

PA Department of Environmental Protection, Southeast Regional Office:

Dustin A. Armstrong, DEP Project Officer, (484)250-5723

Investigation: Project Investigation Report for the Nockamixon TCE Site, March 2014, Leidos Engineering, LLC

Addendum to March 2014 Project Investigation Report, June 2014, Leidos Engineering, LLC.

Site Characterization Report for the Nockamixon TCE Site, December 2015, Tetra Tech, Inc.

Vapor Intrusion Investigation Technical Memorandum, May 31, 2018, PADEP.

Site Characterization Report Addendum 1 - Nockamixon TCE Site, February 2020, Tetra Tech, Inc.

Technical Memorandum, January 7, 2022, Groundwater & Environmental Services, Inc.

Final Screening Evaluation Memorandum – Nockamixon TCE Site, November 17, 2023, Groundwater Environmental Services, Inc.

Final Remedial Alternatives Analysis, July 23, 2024, Groundwater Environmental Services, Inc.

Pathways, Components, or Threats Not Evaluated

The surface water pathway was not evaluated. Though volatile organic compounds have been detected in apparent spring seeps located on and near the source property, established Ambient Water Quality Criteria (for aquatic life) for primary contaminants of concern, are higher than detected concentrations in surface water (Ref 10., pp 6 – 7). Additionally, based on return visits to the apparent spring seeps, these features are intermittent. The surface water migration pathway was not anticipated to significantly contribute to the site score.

The air migration was not scored, based on the nature of the primary site contaminants which are expected to dissipate rapidly in the atmosphere. Dust migration is not expected to be a concern at the Site. The air migration pathway was not anticipated to significantly contribute to the site score.

The soil exposure pathway was not scored. While soil impacts have been identified in the contaminant source area, these impacts are present in the sub surface (Ref. 9, Figs. 2-3 & 2-4). Because soil contamination was not identified in surface soil (i.e., 0 – 2 ft.), the soil exposure pathway is not a

concern for residents or visitors to the source area. The soil exposure was not expected to contribute significantly to the site score.

The ground water migration and sub surface intrusion pathways were considered the major pathways of concern at this Site due primarily to the documentation of an observed release and Level I contamination.

HAZARD RANKING SYSTEM (HRS)
SCORE SUMMARY SHEET

Site Name: NOCKAMIXON TCE HSCA SITE

Region: PADEP Southeast Region

Municipality/County: Nockamixon Twp/Bucks

Evaluator: Dustin A. Armstrong

Primary Facility ID#: 728005

Date: 12/27/2024

Lat/Long: 40.4998", -75.1773"

Scenario Name: Groundwater and soil contamination affecting water supplies and indoor air quality

Description: Contaminants released at source area has migrated to multiple private wells used for drinking water.

	S pathway	S^2 pathway
Ground Water Migration Pathway Score (S_{gw})	100.0	10000.0
Surface Water Migration Pathway Score (S_{sw})	Not Scored	Not Scored
Soil Exposure and Subsurface Intrusion Pathway Score (S_{sessi})	13.05	170.3
Air Migration Score (S_a)	Not Scored	Not Scored
$S^2_{gw} + S^2_{sw} + S^2_s + S^2_a$		10170.3
$(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4$		2542.575
$\sqrt{(S^2_{gw} + S^2_{sw} + S^2_{sessi} + S^2_a)/4}$		50.42

Pathways not assigned a score (explain):

Surface water migration pathway not scored based on intermittent surface water flow conditions.

Air migration pathway not scored based on low migration potential and high dilution factor.

TABLE 3-1 --GROUND WATER MIGRATION PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned	
Aquifer Evaluated: Migration to private wells within Brunswick Bedrock Formation			
Likelihood of Release to an Aquifer:			
1. Observed Release	550	550.0	
2. Potential to Release:			
2a. Containment	10	0.0	
2b. Net Precipitation	10	0.0	
2c. Depth to Aquifer	5	1.0	
2d. Travel Time	35	1.0	
2e. Potential to Release [lines 2a(2b + 2c + 2d)]	500	0.0	
3. Likelihood of Release (higher of lines 1 and 2e)	550		550.0
Waste Characteristics:			
4. Toxicity/Mobility	(a)	1000.0	
5. Hazardous Waste Quantity	(a)	100.0	
6. Waste Characteristics	100		18.0
Targets:			
7. Nearest Well	(b)	50.0	
8. Population:			
8a. Level I Concentrations	(b)	1210.0	
8b. Level II Concentrations	(b)	0.0	
8c. Potential Contamination	(b)	0.0	
8d. Population (lines 8a + 8b + 8c)	(b)	1210.0	
9. Resources	5	0.0	
10. Wellhead Protection Area	20	0.0	
11. Targets (lines 7 + 8d + 9 + 10)	(b)		1260.0
Ground Water Migration Score for an Aquifer:			
12. Aquifer Score [(lines 3 x 6 x 11)/82,500][c]	100		100.0
Ground Water Migration Pathway Score:			
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated)[c]	100		100.0

[a] Maximum value applies to waste characteristics category

[b] Maximum value not applicable

[c] Do not round to nearest integer

TABLE 5-11 --SUBSURFACE INTRUSION COMPONENT SCORESHEET

Factor Categories and Factors	Maximum Value	Value Assigned	
Likelihood of Exposure:			
1. Observed Exposure	550	550.0	
2. Potential for Exposure			
2a. Structure Containment	10	0.0	
2b. Depth to contamination	10	0.0	
2c. Vertical Migration	15	1.0	
2d. Vapor Migration Potential	25	0.0	
3. Potential for Exposure (lines 2a * (2b+2c+2d), subject to a maximum of 500)	500	0.0	
4. Likelihood of Exposure (higher of lines 1 or 3)	550		550.0
Waste Characteristics:			
5. Toxicity/Degradation	(a)	1000.0	
6. Hazardous Waste Quantity	(a)	100.0	
7. Waste Characteristics (subject to a maximum of 100)	100		18.0
Targets:			
8. Exposed Individual	50	50.0	
9. Population:			
9a. Level I Concentrations	(b)	58.80	
9b. Level II Concentrations	(b)	0	
9c. Population within an Area of Subsurface Contamination	(b)	0.0	
9d. Total Population (lines 9a + 9b + 9c)	(b)	58.80	
10. Resources	5	0.0	
11. Targets (lines 8 + 9d + 10)	(b)		108.80
Subsurface Intrusion Component Score:			
12. Subsurface Intrusion Component (lines 4 x 7 x 11)/82,500[c] (subject to a maximum of 100)	100		13.05
Soil Exposure and Subsurface Intrusion Pathway Score:			
13. Soil Exposure Component + Subsurface Intrusion Component (subject to a maximum of 100)	100		13.05

[a] Maximum value applies to waste characteristics category

[b] Maximum value not applicable

[c] No specific maximum value applies to factor. However, pathway score based solely on terrestrial sensitive environments is limited to a maximum of 60

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8. Tetra Tech, Inc., Site Characterization Report for the Nockamixon TCE Site, December 2015.

9. Tetra Tech, Inc., Site Characterization Report Addendum I, February 2020.

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11. Groundwater Environmental Services, Inc., Final Screening Evaluation Memorandum, November 17, 2023.

12. Groundwater Environmental Services, Inc., Final Remedial Alternatives Analysis, July 23, 2024

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35. National Cooperative Soil Survey, Croton Soil Series Description. February 2008.

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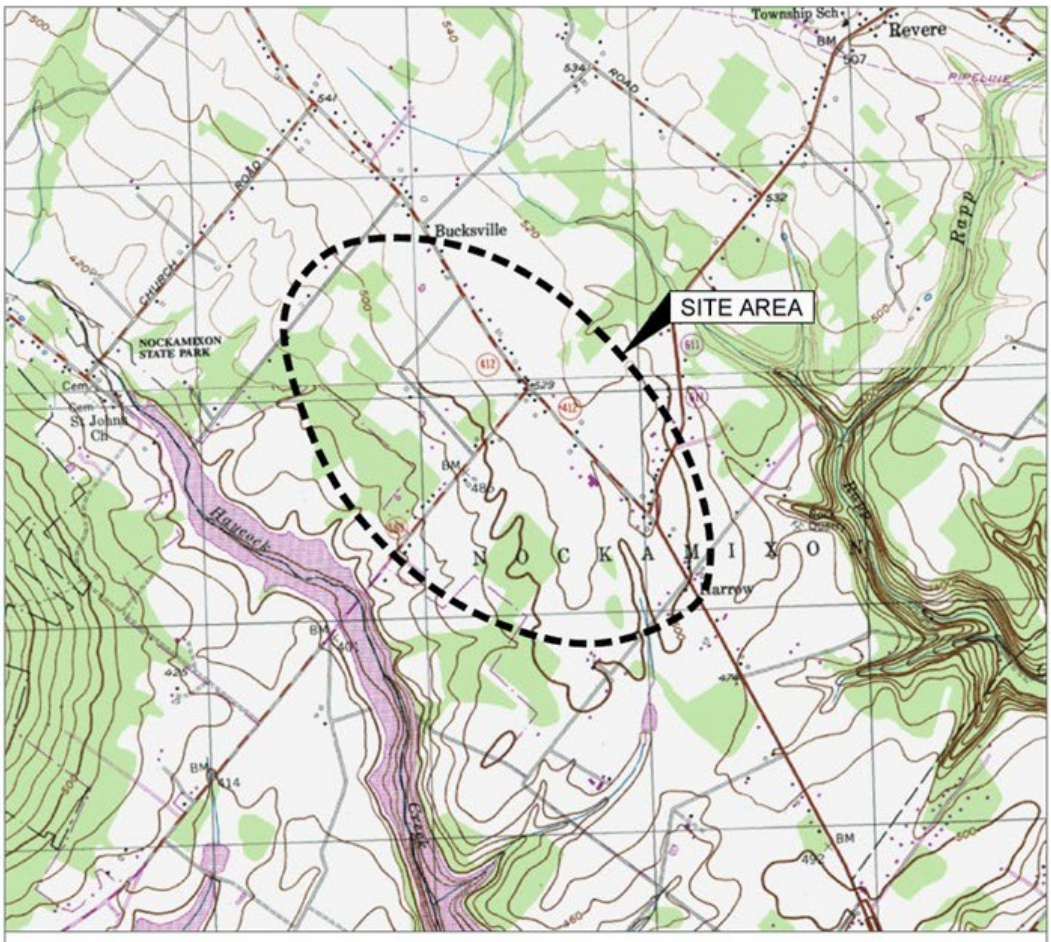
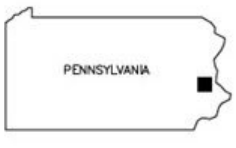
Figure 1
Site Location



Source:
USGS 7.5 Minute Series
Topographic Quadrangle, 1997
Riegelsville, Pennsylvania
Bedminster, Pennsylvania
Contour Interval = 20'



QUADRANGLE LOCATION

Site Location Map

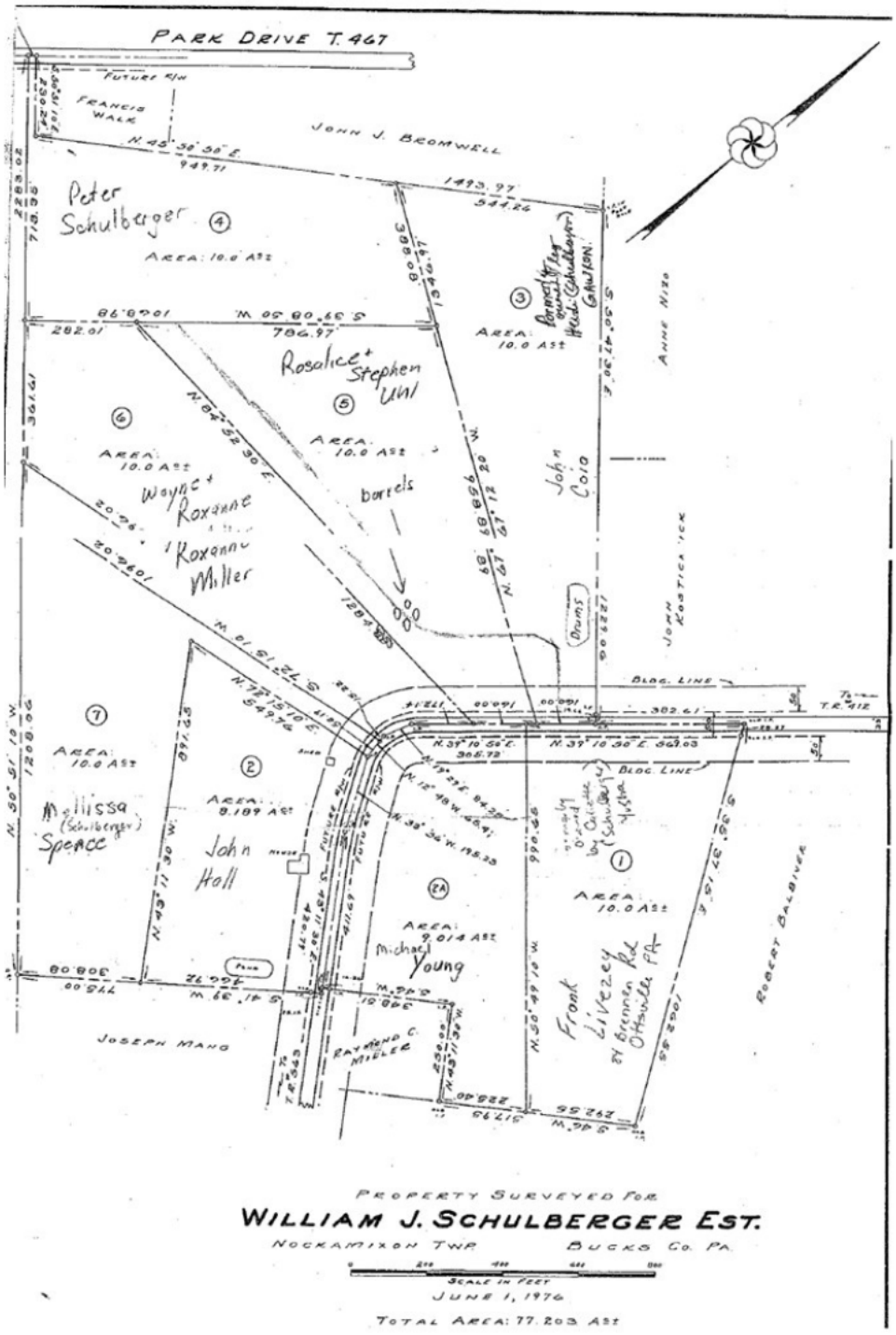
Pennsylvania Dept of Environmental Protection
Nockamixon TCE Site
84 Brennan Road, Nockamixon Township
Ottsville, Pennsylvania

Drawn
T.P.
Designed
M.E.T.
Approved
T.F.U.

Date
08/27/21
Figure
1

Ref. 12, Fig. 1

Figure 2
Schulberger Estate Parcel Map



Ref. 17

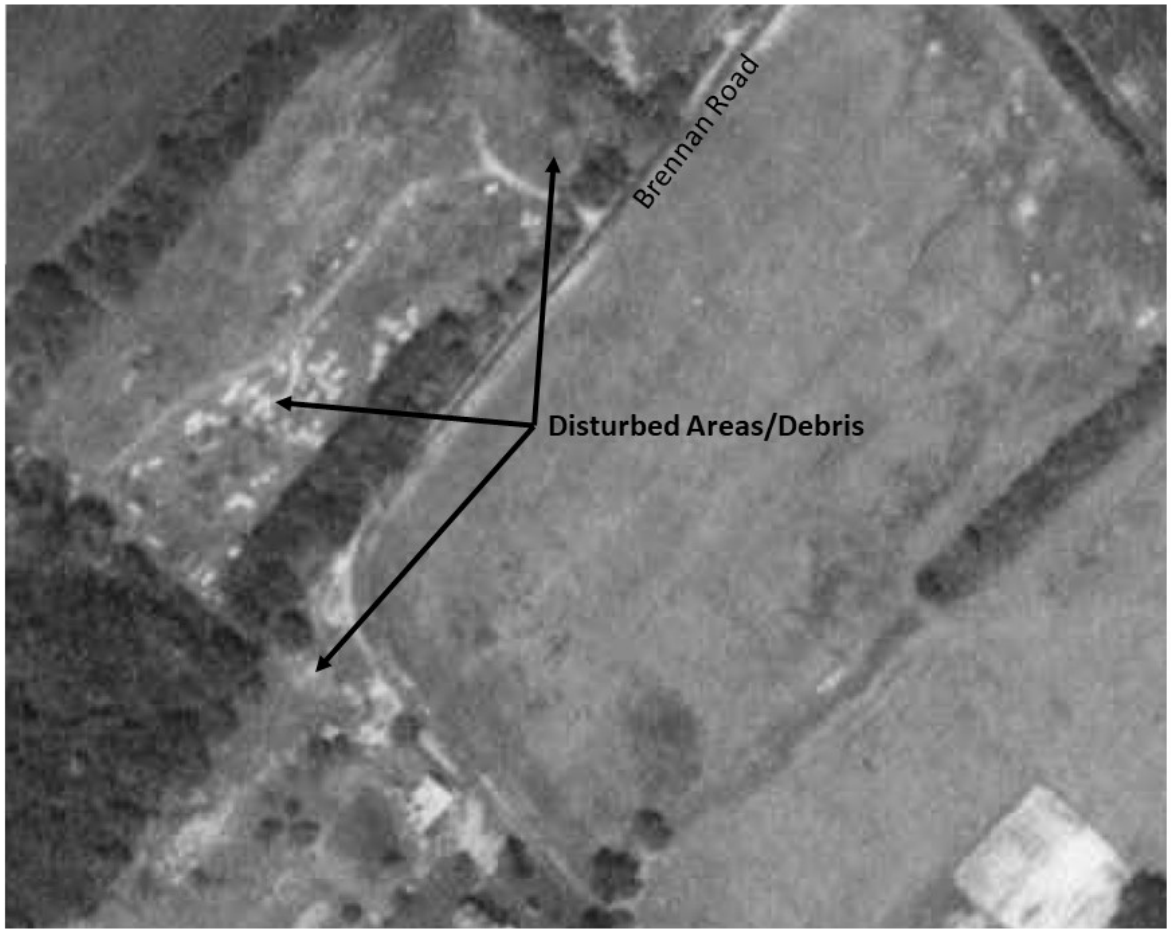


Figure 3
Nockamixon TCE Site
1971 Aerial Photo

Ref. 6, Appendix A (Historical EDR Materials)

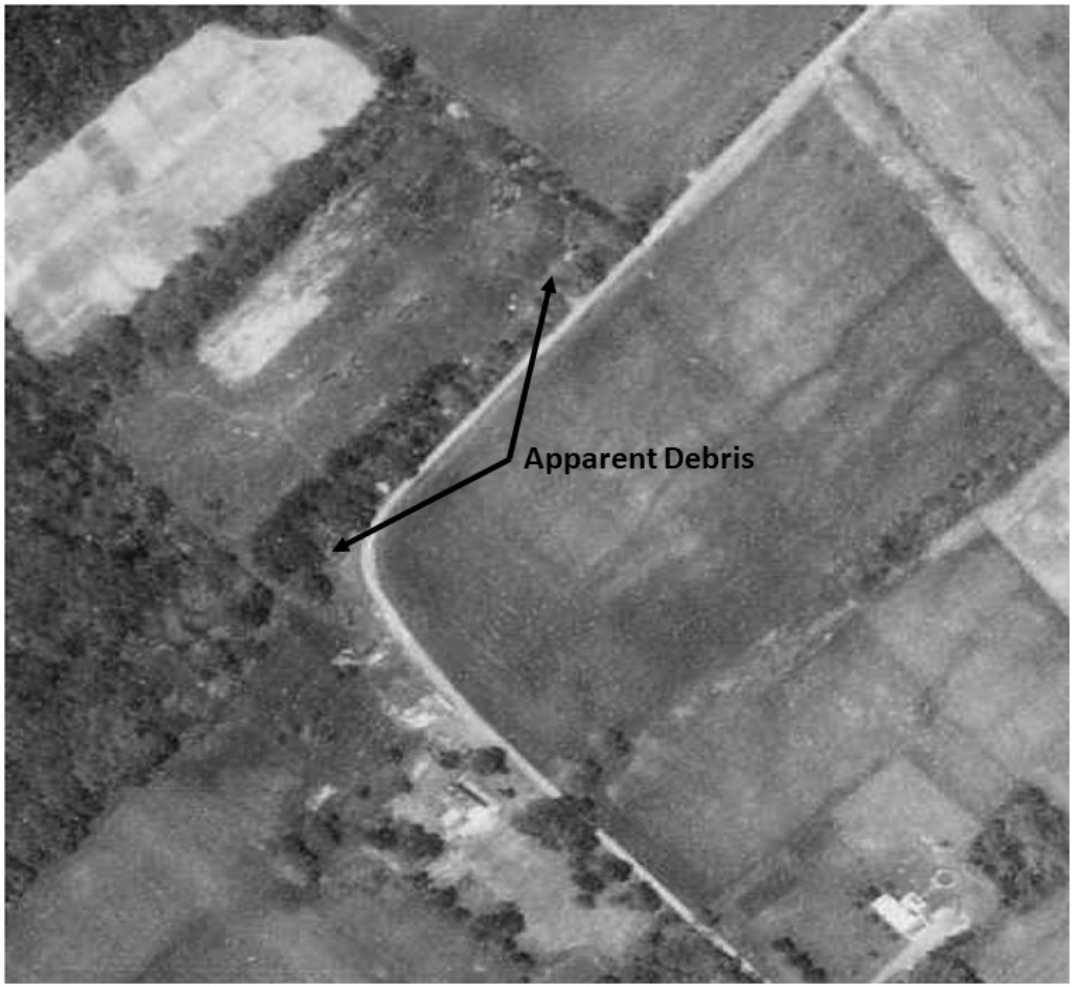


Figure 4
Nockamixon TCE Site
1978 Aerial Photo

Ref. 6, Appendix A (Historical EDR Materials)

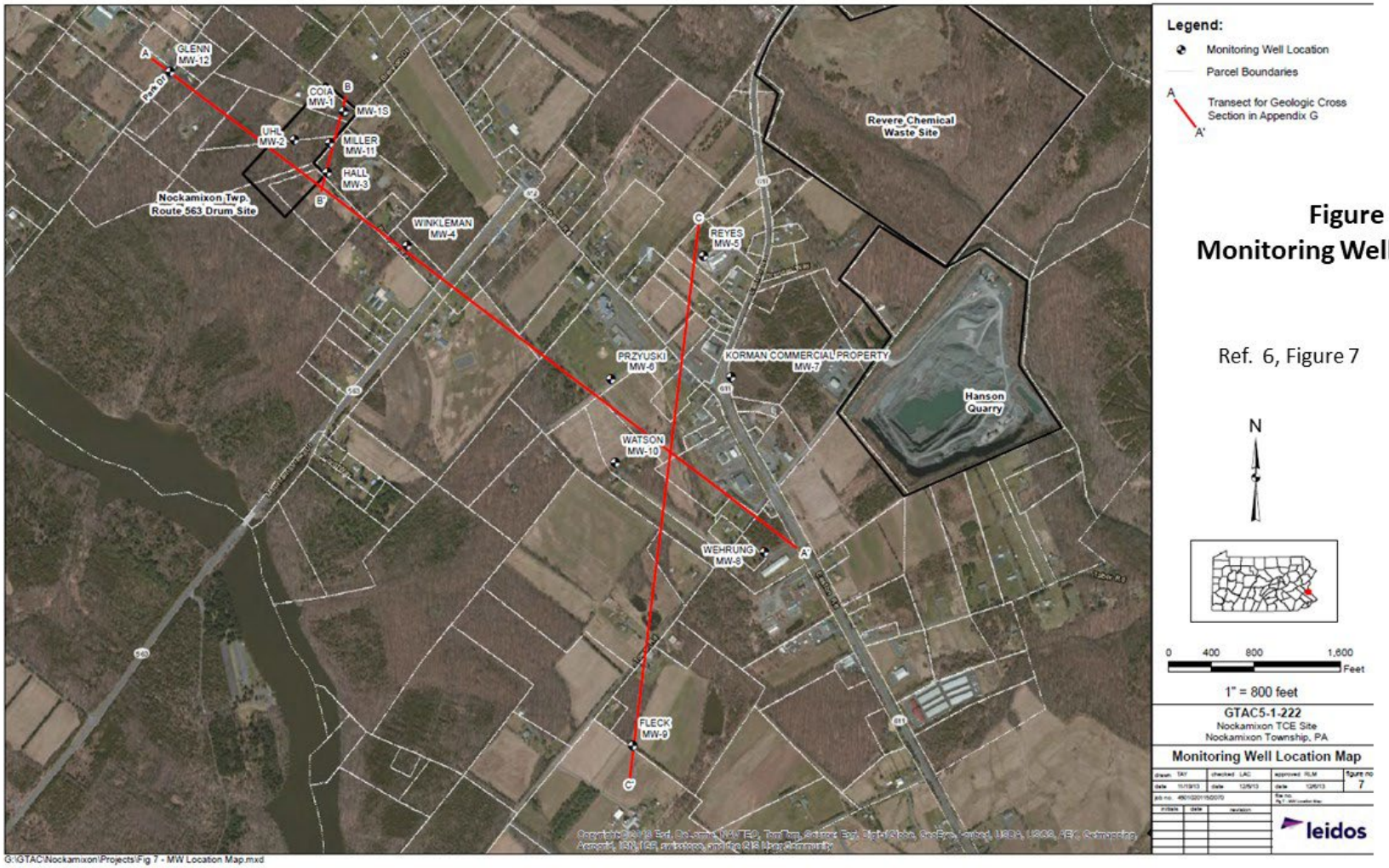


Figure 5
Monitoring Well Locations

Ref. 6, Figure 7

G:\GTAC\Nockamixon\Projects\Fig 7 - MW Location Map.mxd

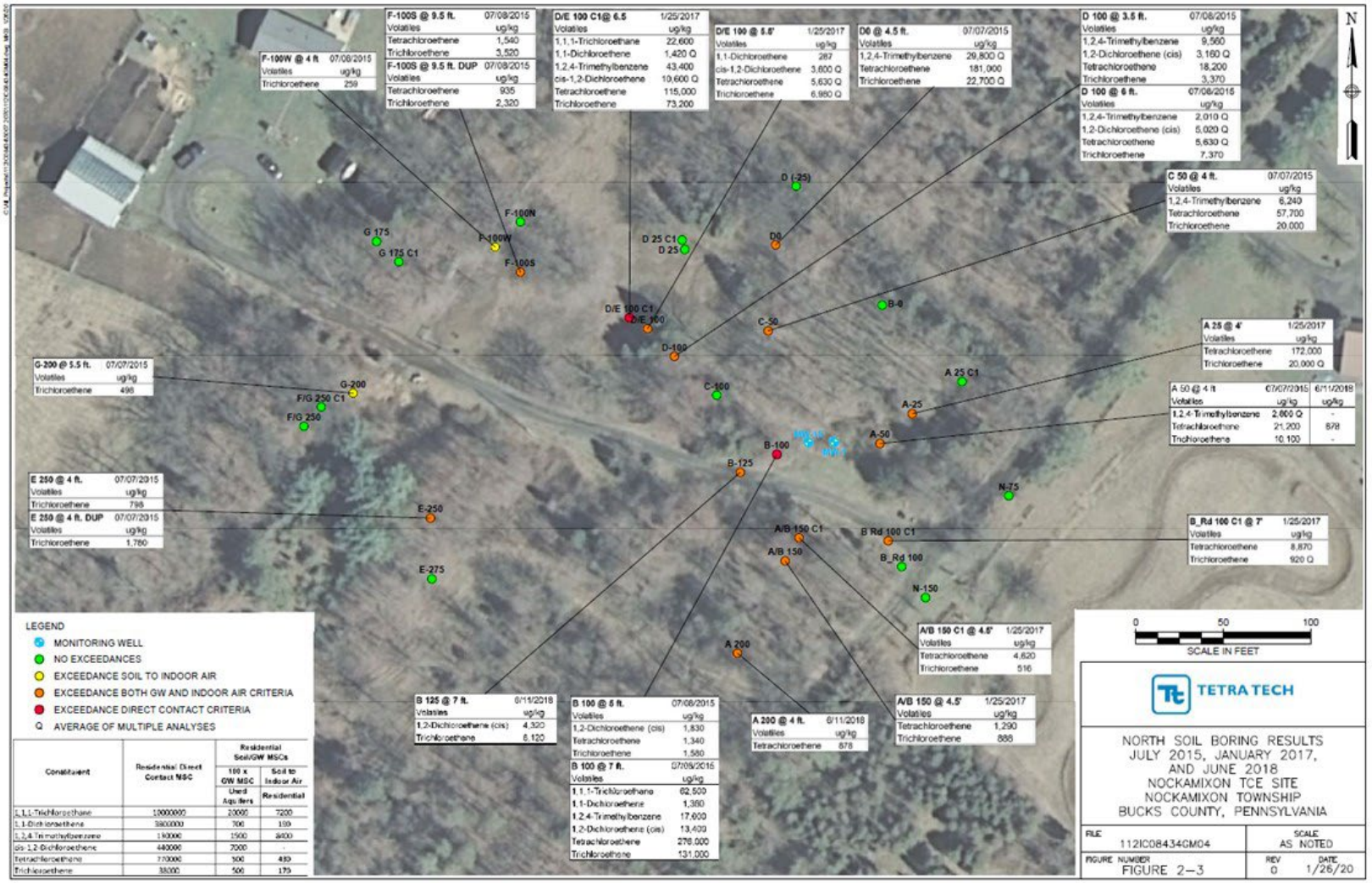


Figure 6
Soil Sample
Results
North Hotspot

Ref. 9, Fig. 2-3

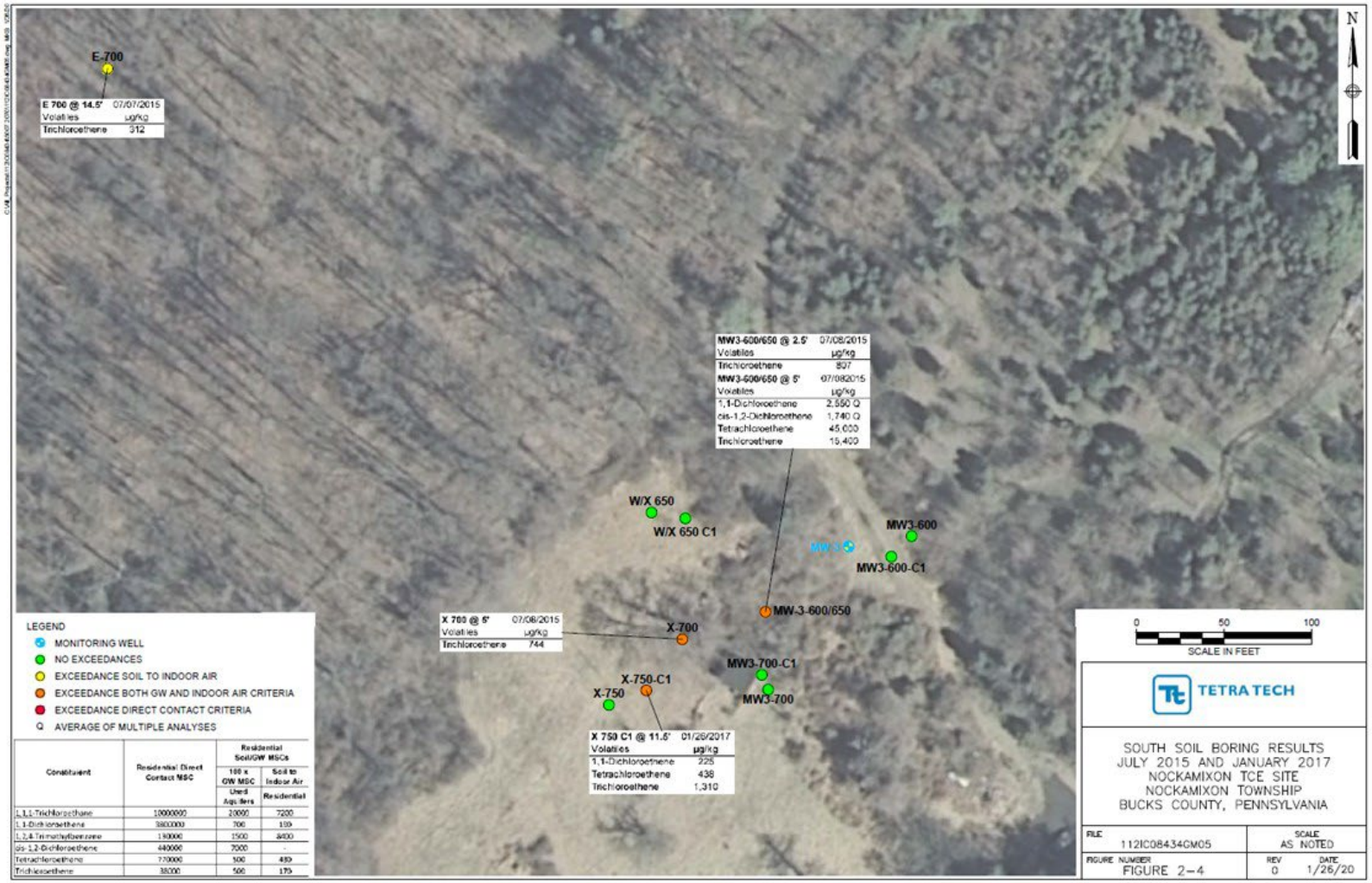


Figure 7
Soil Sample
Results
South Hotspot

Ref. 9, Fig. 2-4

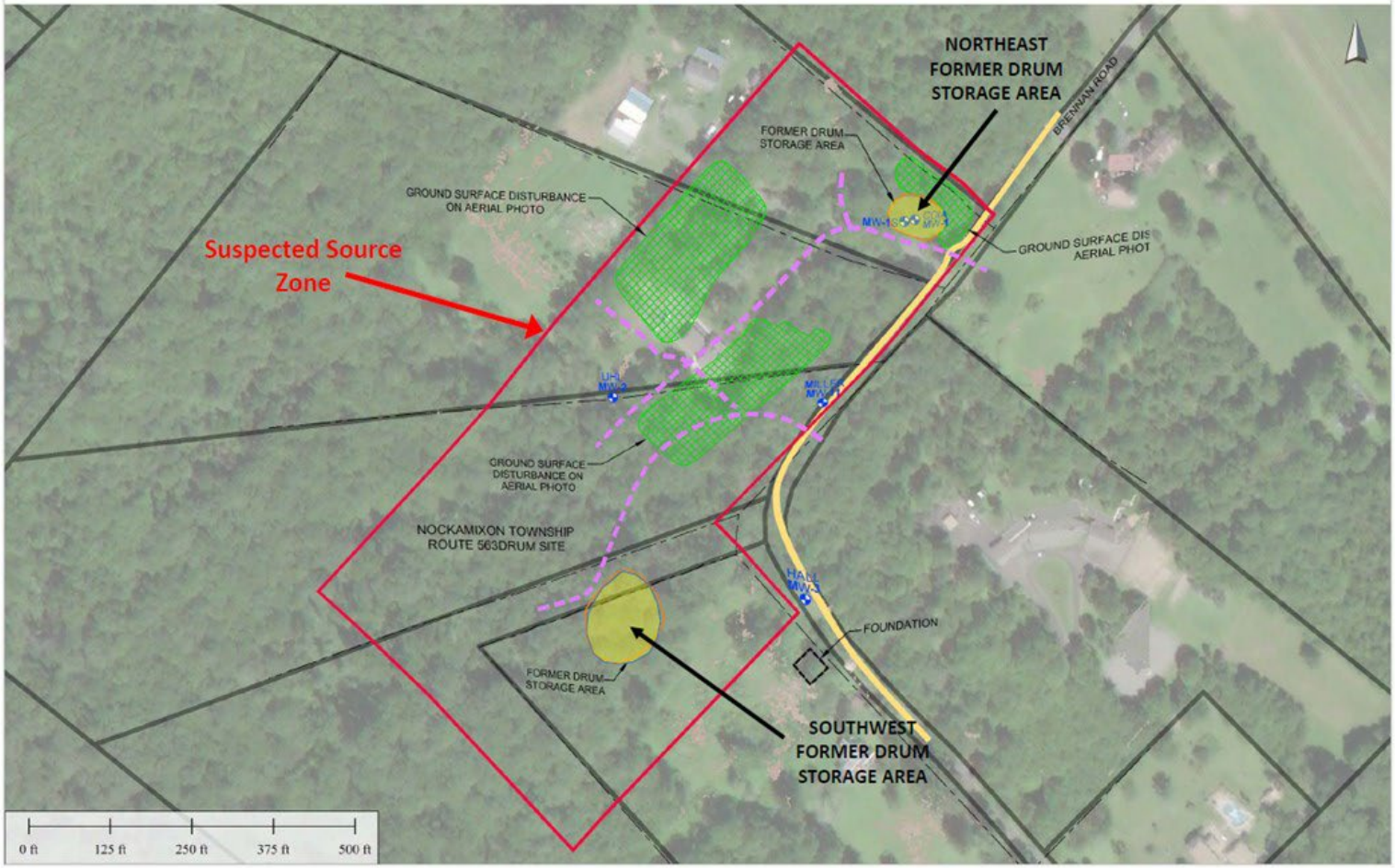


Figure 8
Suspected Source Zone

Ref. 12, Appendix E, Fig. E-2

Figure 9
Nockamixon TCE Site
Fmr. Schulberger Farm Area
TCE & PCE Concentrations
In Groundwater Samples

○ Residential Well
△ Monitoring Well

Notes:
TCE – Trichloroethene
PCE – Tetrachloroethene

All results are expressed in Micrograms/liter (ug/l)

Base Map Source: Bucks County Planning Commission. Bucks County Parcel & Floodplain Viewer.
https://bucksgis.maps.arcgis.com/apps/webappviewer/index.html?id=2eda3020dd9847eaa00d1d6c0764a607

Data Ref. 28

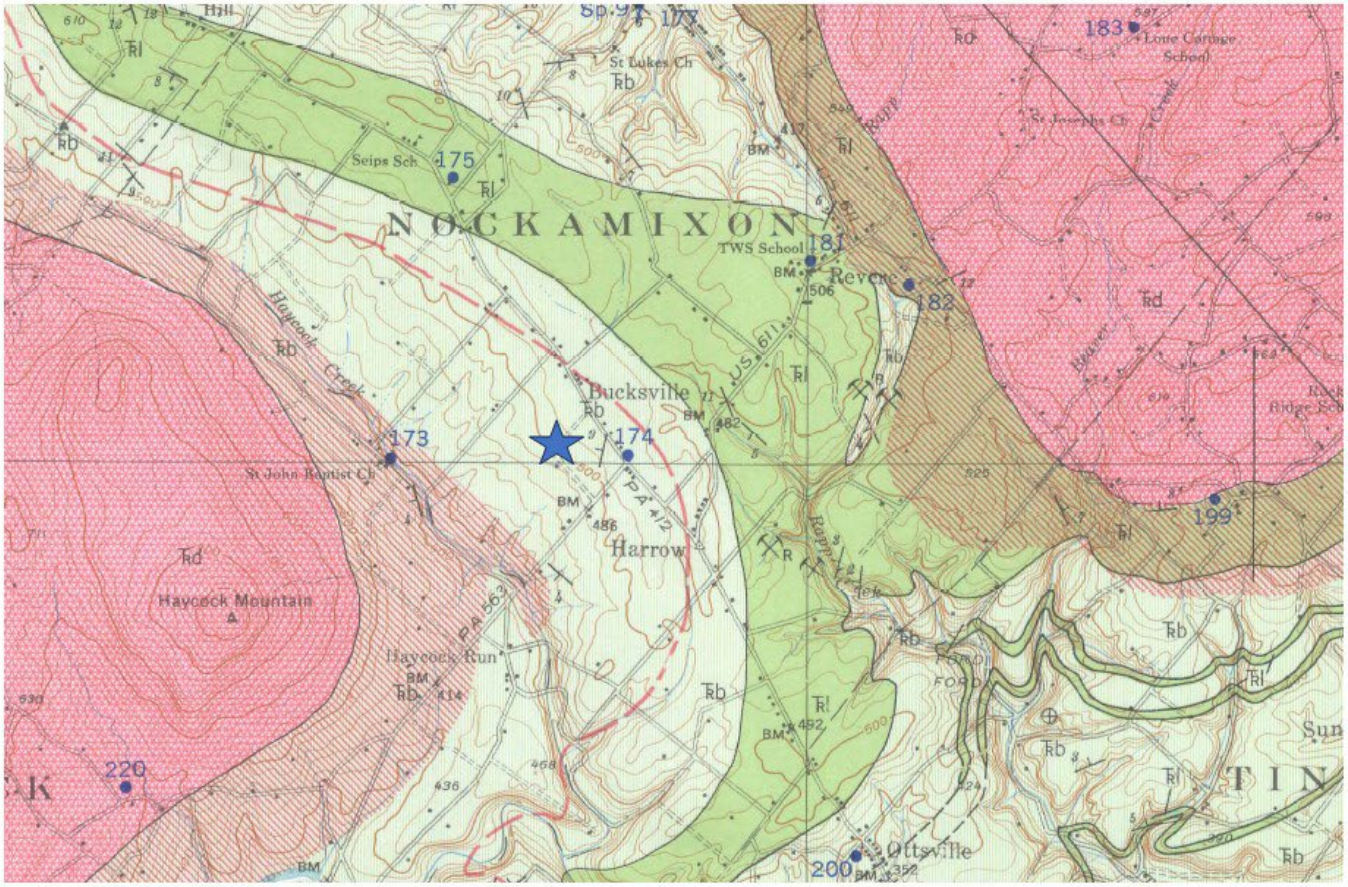


Figure 10
Nockamixon TCE Site
Geologic Map

Trd
Diabase
Igneous sills and dikes intruding Triassic and older sedimentary rocks

Trc Trb Trc
Brunswick lithofacies
Redshales and sandstones grading upward into limestone, Trlc , and quartzite, Trqc , fanglomerates along the northwest margin. Altered to black, hornfels adjacent to diabase intrusives

Trl
Lockatong lithofacies
Gray to black argillite, grades laterally into Brunswick. Altered to black hornfels adjacent to diabase intrusives

Trs
Stockton lithofacies
Red, gray and brown shales and arkoses, with local arkosic conglomerates.

★ Site/Source Location

Ref. 29, Plate 1

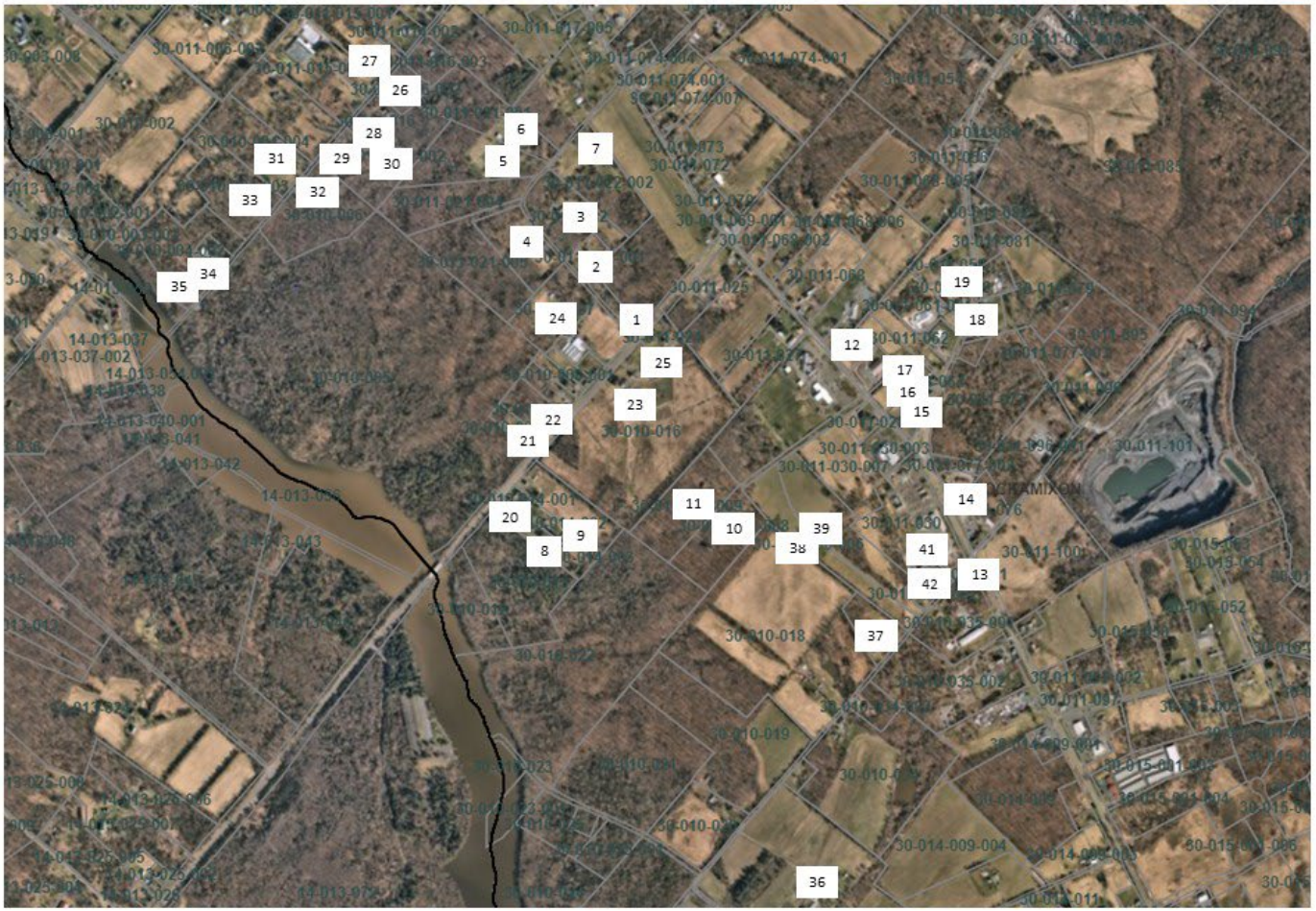


Figure 11
Nockamixon TCE HSCA Site
Groundwater Migration Pathway
Level 1 Exposures
(See Table 3-2)

Data Ref. 32

Base Map Source: Bucks County Planning Commission. Bucks County Parcel & Floodplain Viewer.
https://bucksgis.maps.arcgis.com/apps/webappviewer/index.html?id=2eda3020dd9847eaa00d1d6c0764a607

Figure 12
Nockamixon TCE HSCA Site
Sub Slab Intrusion Pathway
Observed Exposures
(See Table 5-12)

Base Map Source: Bucks County Planning Commission. Bucks County Parcel & Floodplain Viewer.
https://bucksgis.maps.arcgis.com/apps/webappviewer/index.html?id=2eda3020dd9847eaa00d1d6c0764a607

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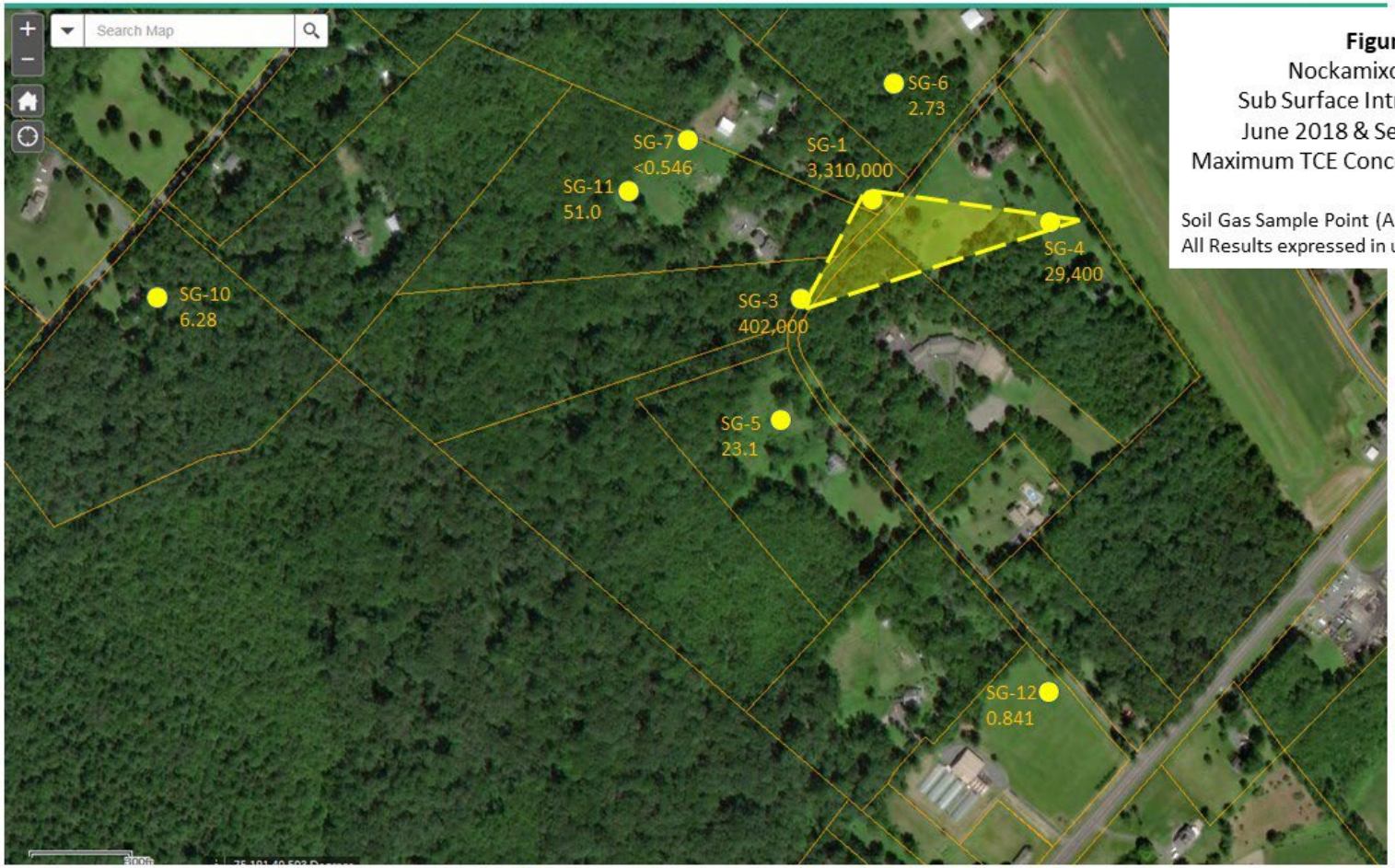


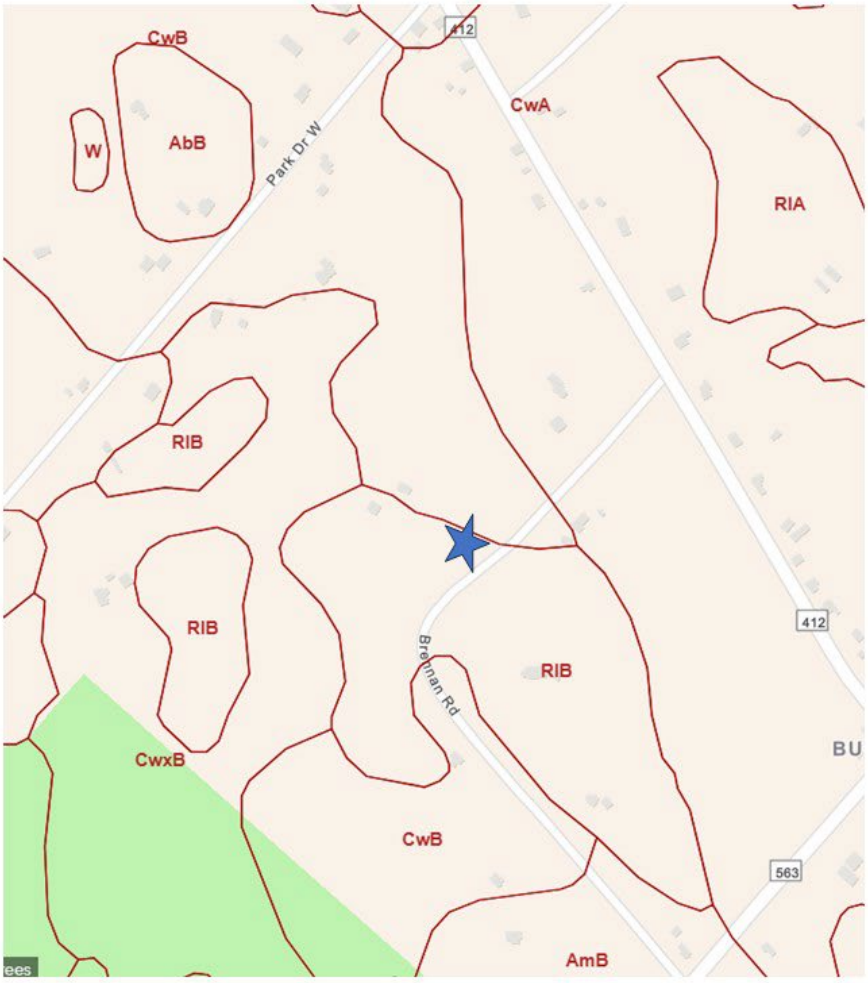
Figure 13
Nockamixon TCE Site
Sub Surface Intrusion Pathway
June 2018 & September 2019
Maximum TCE Concentrations - Soil Gas

Soil Gas Sample Point (Approx.)
All Results expressed in ug/m^3

Base Map Source: Bucks County Planning Commission. Bucks County Parcel & Floodplain Viewer.
https://bucksgis.maps.arcgis.com/apps/webappviewer/index.html?id=2eda3020dd9847eaa00d1d6c0764a607

Data Ref. 37

Figure 14
Nockamixon TCE HSCA Site
Source Area Soil Types



Approximate Center of Source Area

CwB Croton silt loam 3 to 8 percent slopes (Ref. 33, p. 27)

RiB Reaville channery silt loam 3 to 8 percent slopes (Ref. 33, p. 30)

Base Map Source: Bucks County Planning Commission. Bucks County Parcel & Floodplain Viewer.
https://bucksgis.maps.arcgis.com/apps/webappviewer/index.html?id=2eda3020dd9847eaa00d1d6c0764a607

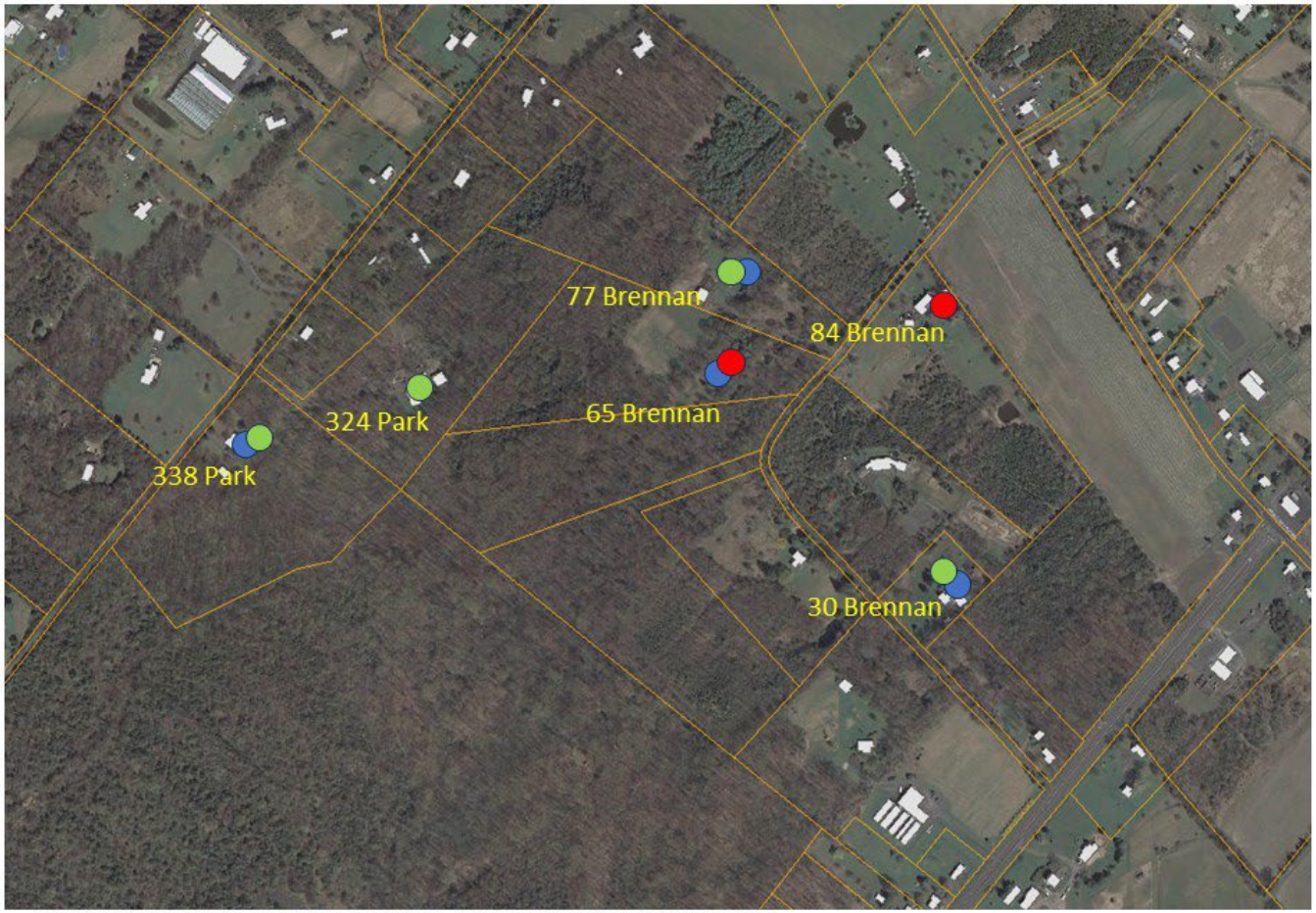


Figure 15
Nockamixon TCE HSCA Site
Sub Surface Intrusion Pathway
Exposure, Background and
Ambient Sample Locations

Confirmed Exposure

Background Location

Ambient Location

Data Ref. 38, 39 & 40

Base Map Source: Bucks County Planning Commission. Bucks County Parcel & Floodplain Viewer.
https://bucksgis.maps.arcgis.com/apps/webappviewer/index.html?id=2eda3020dd9847eaa00d1d6c0764a607

SITE SUMMARY

SITE LOCATION AND LAYOUT

The Nockamixon TCE Site (Site) is located in Nockamixon Township, Bucks County, Pennsylvania in the vicinity of Durham Road (PA Route 412) and Mountain View Drive (PA Route 563). Land use within the Site area is a mix of residential, commercial, and agricultural. A school is located on Durham Road and Nockamixon State Park is located to the west and southwest of the Site (Ref. 10, p. 1). All businesses and residences within a 3-mile radius of the Site obtain water from private supply wells (Ref. 5, p. 3-1). Groundwater contamination associated with the Site has been detected in private water supplies located along Park Drive West, Durham Road, Brennan Road, Mountain View Drive, Cord Way, Tower Road, and Eason Road (Ref. 6, pp. 28 to 29). A source area has been identified along Brennan Road (Ref 9, pp. 3-1 to 3-3) within a 76-acre former farm property (known as the "Schulberger Farm") which was subdivided in 1978 among heirs to the estate of William Schulberger (Figure 2) Ref. 17; Ref. 19).

SITE HISTORY AND OPERATIONS

The Schulberger farm property was reportedly used for the disposal of septic tank wastes and for the storage of drums containing unknown materials in the 1970s (Ref. 5, pp. 2-1 to 2-4). Aerial photographs from the 1970s also revealed nearby land disturbances and debris in a field area near Brennan Road (Figure 3 and Figure 4) (Ref. 6, Appendix A). The Schulberger farm property was subdivided into eight parcels in 1978. After the parcels were passed to the heirs of William Schulberger, the owners/heirs made efforts to consolidate drums, which remained on the ground surface at the Site. Review of historical aerial photos taken between 1964 and 1981 suggests that wastes may have been deposited or buried at several areas on the Schulberger farm property (Ref. 6, p. 9 & 10).

A December 31, 1979, inspection of the property performed by the Pennsylvania Department of Environmental Resources (PA DER) revealed several leaking and deteriorated drums. A letter dated January 2, 1980, from PA DER to the owner of a property located along Brennan Road (Wayne Lee Miller) reported the inspection results and requested removal of the drums and contaminated soil from the property (Ref. 21). According to a confidential interview conducted by a PADEP investigator, these drums were consolidated with several others on a second Brennan Road property (currently 77 Brennan Road) prior to removal by a waste contractor. Offsite shipment of the drummed wastes occurred prior to the effective date of the Resource Conservation and Recovery Act (RCRA), which requires waste analysis and documentation of shipping/disposal.

In 1981 Bucks County Health Department (BCHD) began investigating the Nockamixon Rt. 563 Drum Dump Site related to the Schulberger farm property in response to a complaint. BCHD identified trichloroethene (TCE) and other chlorinated volatile organic compounds (CVOCs) in four residential well samples and one soil sample (Ref. 4, p. 2-4). In 1989, EPA completed a Preliminary Assessment (PA) of the Site (Ref. 4) and a subsequent Site Inspection (SI) in 1990 (Ref. 5). Soil samples taken by EPA in the vicinity of the former drum storage area contained TCE, tetrachloroethene (PCE), and 1,1,1-trichloroethane (1,1,1-TCA) at concentrations as high as 44 milligram per kilogram (mg/kg).

These samples also contained several semivolatile organic compounds (pyrene and chrysene), and one sample contained polychlorinated biphenyls (PCBs) at a concentration of 5.2 mg/kg. However, EPA performed no further investigative or remedial work at the Site.

Based upon groundwater sampling results, aerial photography analysis, and other investigations, the former Schulberger Farm has been identified as the source of contamination for the Site.

The BCHD discovered TCE in 2002 during routine monitoring of the water supply at Przyuski's Family Restaurant on Durham Road. Subsequent sampling of private wells in the area by the BCHD identified the presence of TCE in numerous private supply wells with concentrations as high as 27 micrograms per liter (ug/L) above the Maximum Contaminant Level (MCL) (Ref.13, p. 3). In spring 2009, BCHD referred the Site to DEP (Ref.13, p. 3).

In September 2009, DEP signed a Response Justification Document (RJD) which established the Nockamixon TCE HSCA Site authorizing response actions including further investigation, interim and/or remedial response actions (Ref. 13)

In December 2009, DEP requested the services of a General Technical Assistance Contract (GTAC) contractor with performing residential sampling to identify the extent of residential impacts, provided bottled water to the 6 properties identified by DEP, and source investigation activities. (Ref. 14). Three GTAC contractors have assisted DEP with its site characterization and response actions including SAIC/Benham (later named Leidos Engineering, LLC or Leidos) from 2010 to June 2014; Tetra Tech, Inc. (Tetra Tech) from September 2014 to March 2020; and Groundwater & Environmental Services, Inc. (GES) from May 2020 to present. These GTAC contractors have performed multiple phases of site characterization work, including monitoring well (MW) installation/sampling, geophysical studies, soil gas, soil, indoor/ambient air, bedrock, and surface water sampling; and installed point of entry treatment Systems (POETS) and vapor intrusion (VI) mitigation systems (Refs. 6 through 11)

Initial site characterization activities performed by Leidos, focused on delineating the nature and extent of groundwater contamination and identifying the source(s). In addition to expansion of private well sampling performed by PADEP, monitoring wells were installed at 12 locations in the Site area as shown in Figure 3 (Ref. 6, p. 2 through 4 and Fig. 7). The Project Investigation Report prepared by Leidos concluded that disposal activities, which occurred in the 1970s on the Schulberger Farm (a.k.a. Nockamixon Rte. 563 Drum Site) is a likely source of the groundwater contamination (Ref. 6, pp. 48 and 49) and recommended soil sampling in suspected waste disposal areas identified in historic records and aerial photographs (Ref. 6, p. 50)

Tetra Tech, Inc. continued site characterization activities in 2015, initially focusing of characterizing areas on the former Schulberger Farm, which had been identified by Leidos through surface geophysical and soil gas investigations followed by sub surface soil sampling (Ref. 8, pp. 2-1 through 2-6). Tetra Tech conducted additional subsurface soil sampling in 2017 and 2018 to better define the extent of soils impacted by TCE and other CVOCs (Ref. 9, p. 2-3). Tetra Tech also modified MW-1S, originally installed by Leidos, to isolate and monitor two water-bearing intervals (Ref. 9, pp. 2.4 and 2-5); and performed evaluations of the VI exposure pathway by collecting near-source soil gas, sub slab soil gas, and indoor air samples (Ref. 9, pp. 2-1, 2-2, and 2-5 through 2-8).

DEP tasked GES with evaluating potential remedial alternatives for addressing the contaminant source area. This evaluation included efforts to delineate potential matrix diffusion and the presence of source material (i.e., non-aqueous phase liquids) within the bedrock zone, beneath the previously identified source areas (Ref. 10, p. 9). An updated conceptual site model was also completed and included as an appendix to the Remedial Alternatives Analysis Report prepared by GES (Ref. 12, Appendix E). GES has also assisted DEP with evaluating treatment of 1,4-Dioxane in 3 residential water supplies (Ref. 26). In the past, 1,4-dioxane was commonly used as a stabilizer with chlorinated solvents (Ref. 27, p. 154).

The initial investigation, initiated in 2009 by DEP, included the temporary provision of bottled water to affected homes, and beginning in 2011, DEP installed 40 POETS at 40 homes (homes at 133 and 135 Tower Road are served by a single well) and one school impacted by TCE and/or PCE concentrations above MCLs (Ref. 6 pp. 28 and 29; Ref. 9, p. 1-5: Refs. 21 through 24). In addition to the installation of POETS, institutional controls were placed on property deeds where POETS were required (Ref. 15, p. 7). One additional homeowner with a private well containing TCE in excess of the MCL refused to voluntarily enter into institutional control in the form of and Environmental Covenant and an administrative order was issued pursuant to Section 512 of HSCA (Ref. 25).

In a second interim response action, initiated in 2018, DEP installed vapor intrusion mitigation systems at 65 and 84 Brennan Road (Ref. 9, p. 2-3). The response also included institutional controls for the properties requiring VI mitigation systems (Ref. 16, p. 6).

DEP continues to monitor the protectiveness of each interim response action discussed above.

The following Sections are numbered based on the organization of 40 CFR Part 300 – Hazard Ranking System; Final Rule (Ref. 1).

2.2 SOURCE CHARACTERIZATION

Number of the Source: 1

Name and Description of the Source: Former Schulberger Farm

Evaluation of historical aerial photographs, documents (including the Preliminary Assessment and Site Inspection for the Nockamixon Rte. 563 Drum Dump (Refs, 3 and 4), and results of groundwater sampling led Leidos to recommend characterization of the former Schulberger Farm as a potential source area (Ref. 6, p. 50). Soil samples collected near monitoring wells MW-1 and MW-3 contained TCE at concentrations exceeding DEP's Residential Used Aquifer Soil to Groundwater Medium Specific Concentrations (MSCs) (Ref. 9, Figures 2-3 and 2-4). A residential well at 91 Brennan Road (Soil sampling in areas near highly contaminated wells did not reveal significant soil contamination, at levels exceeding soil-to-groundwater levels (Ref. 5, p. 34). Therefore, groundwater contamination is being attributed to an unallocated source.

Location of the source, with reference to a map of the facility:

Two areas of soil contamination (shown separately in Figures 6 and 7) have been identified as sources of the groundwater contamination. These sources have been combined into a single source area shown on Figure 8 (Ref, 12, Appendix E, Fig. E1). The conceptual site model prepared by GES suggests that chemicals released in the soil hotspot areas may have migrated in bedrock fractures, resulting in a larger source area, which encompasses both soil hotspot areas (Ref, 12, Appendix E, p. 7).

Containment:
As shown on Figure 8, chemical analysis of groundwater samples collected in the vicinity of the source area has demonstrated that TCE and PCE are attributable to disposal activities on the former Schulberger Farm.

Based on Table 3-2 of Reference 1, the demonstrated migration of contaminants from the Former Schulberger Farm source area yields a containment value of 10.

Groundwater Containment Value: 10
Ref 1, Table 3-2

2.4.2 Hazardous Waste Quantity

The estimated volume of contaminated soil is 13,500 yds^3 (Ref. 12, Fig. 3). A Tier C Hazardous Waste Constituent Quantity (Volume) of 13,500 yds^3 has been assigned (Ref. 1, Section 2.4.2.1).

Source Hazardous Waste Quantity Value: 5.4
Reference: 1, Section 2.4.2, Table 2-5

3.0 GROUNDWATER MIGRATION PATHWAY

3.0.1 GENERAL CONSIDERAITONS

Aquifer/Stratum Name: Brunswick Formation/Bedrock Aquifer

Regional Geology
The Site is located within the Triassic Lowland section of the Piedmont Physiographic Province (Ref. 5, p. 3-2). As shown on Figure 10 bedrock underlying the Site is mapped as the Triassic to Jurassic Brunswick Group (Ref. 29, Plate1). The Brunswick Formation is part of the Gettysburg-Newark Basin and consists of reddish-brown shale, siltstone, and mudstone containing a few green and brown shale interbeds (Ref. 6, p. 6). The lower beds of the Brunswick Formation include a considerable thickness of hard, red, thick-bedded argillite and occasional beds of tough gray shale or argillite. Near intrusive bodies, the shale has been altered to a hard, dark-colored hornfels (Ref. 30, p. 227).

The Brunswick Formation contains water under both water-table and semiartesian conditions in the weathered zone, which may extend to depths of 600 feet or more. A water-table aquifer of low permeability, comprising the highly weathered zone occurs to depths of about 250 feet; and one or

more rather permeable artesian aquifers, consisting of beds of partly altered rock rarely more than 20 feet thick, occur to depths of about 600 feet. In both types of aquifers, the saturated voids are believed to be vertical joint fractures enlarged by solution. The water table aquifer contains many more fractures than the semiartesian aquifers, but the near-surface rocks have been so thoroughly decomposed that many of the cracks are filled with clay residual from the weathering of the shale (Ref 29, p. 34).

Local Geology

The soil types are predominantly classified as poorly drained silt loams. Standing water is not unusual during the spring thaw. Based on site boring logs, the typical depth to bedrock ranges between about 5 to 15 feet (Ref 9, p. 1-1). To the north, the initial rock encountered was classified as a gray argillite of the Lockatong Formation. The Lockatong is the lower confining unit at the site. It is encountered at successively greater depths in wells drilled to the south and west (Ref. 5, p. 20)

Based on a review of pertinent hydrogeologic literature, it is expected that groundwater flow in the bedrock aquifer will be dominated by movement through well-developed and regularly spaced secondary porosity features, including movement along bedding plane partitions and through joint development. At the source area, the plumes initial movements are observed to be to the west and southwest following the dip direction of the bedrock in this area. This direction of movement is expected as TCE, PCE, and 1,1-dichloroethene (1,1-DCE) are dense non-aqueous phase liquids (DNAPLS) that are denser than water. Therefore, migration of these compounds is controlled by gravity, the dip direction of the bedding planes within the bedrock formation, and fracture orientation, and not necessarily the direction of groundwater flow. The dissolved phase plume is then subjected to the groundwater flow direction, which changes the direction of the plume and causes it to expand and migrate toward the south and southeast (Ref. 12, Appendix E, p. 7).

3.1 LIKELIHOOD OF RELEASE

3.1.1 OBSERVED RELEASE

An observed release to the bedrock aquifer in the Brunswick Formation has been demonstrated through chemical analysis of groundwater samples collected from residential wells and monitoring wells in the vicinity of the former Schulberger Farm source area.

Site Characterization

In addition to residential wells sampled during the site characterization, monitoring wells, shown on Figure 5 installed at the Site by the Department have been sampled periodically since installation. For the purpose of this analysis, the residential well at 91 Brennan Road is considered to be an upgradient/background well. Monitoring wells MW-1Ss, MW-2L, MW-3L; and residential wells at 65, 55, and 44 Brennan Road are considered source area wells. MW-1Ss and MW-3L are located within soil hot spot areas shown on Figures 6 and 7. Residential wells located at 30 Brennan Road, 324 Park Drive West and 338 Park Drive West and monitoring well MW-4 are considered downgradient wells. The residential wells at 84 and 77 Brennan Road are considered side-gradient to the source area but contain elevated concentrations of TCE and PCE. Sample results from these wells are presented on Figure 9 and laboratory reports utilized to demonstrate the nexus of the former Schulberger Farm source area and the dissolved contaminant plume are presented as Reference 28.

Attribution

After referral of the Site by BCHD, the Department carried out additional investigations beginning in 2009 to further characterize the extent or groundwater contamination and to locate its source. Based on results of residential sampling, interviews, and review of records and aerial photographs, monitoring wells were installed on the former Schulberger Farm, along Brennan Road. Results of groundwater samples collected from groundwater monitoring wells installed on the former Schulberger Farm, located west of the residential wells initially found to be contaminated, revealed elevated concentrations of CVOCs including TCE, PCE, 1,1,1-TCA, and 1,1-DCE. As shown on Figures 6 and 7, soil samples collected on the former Schulberger Farm contained these constituents at levels exceeding DEP's Residential Soil-to-Groundwater MSCs (Ref 9, p. 3-1).

Because of its Superfund Chemical Data Matrix (SCDM) toxicity value of 1000 (Ref. 2, p. 35), DEP has chosen to calculate the Site score based on TCE. The US Department of Health and Human Services (HHS) has classified trichloroethylene as "*known to be a human carcinogen"* based on sufficient evidence of carcinogenicity from humans (Ref 31, p. 11). TCE is a colorless, volatile liquid. TCE evaporates quickly into the air. It is nonflammable and has a sweet odor. (Ref. 31, p. 1). TCE has a molecular weight of 131.4 and a density of 1.4642 (Ref. 31, Table 4-2, p. 297). Historically, the most important use of TCE has been vapor degreasing of metal parts, which is closely associated with the automotive and metals industries Ref. 31, p. 302). Most TCE in surface waters or on soil surfaces evaporates into the atmosphere, although its high mobility in soil may result in it moving into groundwater below the soil surface. In these subsurface environments, TCE is only slowly degraded and may be relatively persistent. (Ref. 31, p. 2).

Since the observed releases described above are documented through sample analyses on the down gradient portion of the former Schulberger Farm and are not detected upgradient, no other potential sources of these releases can be identified.

HAZARDOUS SUBSTANCES RELEASED

Trichloroethene/Trichloroethylene (TCE)

Ground Water Release Factor Value: 550
(Ref. 1, Section 2.3)

3.2 WASTE CHARACTERISTICS

3.2.1 TOXICITY/MOBILITY

Hazardous Substance	Source No.	Toxicity Factor Value	Mobility Factor Value	Toxicity / Mobility	Does hazardous substance meet observed release by chemical analysis? (Y/N)	References
TCE	1	1,000	1	1,000	Y	2, p. 35: 28

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

3.2.2 HAZARDOUS WASTE QUANTITY

Source No.	Source Type	Hazardous Waste Quantity
1	Soil Hotspots	100
		SUM = >0

The hazardous waste quantity factor is assigned a value of 100 because Level 1 contamination of site-attributable constituents has been documented in private wells near the source.

Hazardous Waste Quantity Factor Value: 100
Ref. 1, Section 2.4.2.2 and Table 2-6)

3.2.3 WASTE CHARACTERSTICS FACTOR CATEGORY VALUE

Toxicity/Mobility Factor Value: 1,000
Hazardous Waste Quantity Factor Value: 100

Toxicity/Mobility Factor Value (10,000) X Hazardous Waste Quantity Factor Value (100) = 100,000

Waste Characteristics Factor Category Value: 18
(Ref. 1, Table 2-7)

3.3 TARGETS

To evaluate targets for the groundwater pathway evaluation, DEP utilized the MCL for TCE (5 µg/l) as the benchmark concentration representing Level 1 contamination (Ref. 2, p. 36). Figure 11 of this document provides a summary of all private wells utilized in evaluating targets for the ground water pathway score. For this evaluation, only wells subject to Level 1 contamination were included. Table 3-2 references location reference numbers shown on Figure 11 and summarizes TCE concentrations reported in Reference 32.

3.3.1 NEAREST WELL

The nearest well is located within the boundary of the former Schulberger Farm and within the source area shown on Figure 8 (Ref. 12, Appendix E, Fig. E-2). This well is impacted by Level I concentrations (Refs. 1, Section 3-10; and 32, p. 24). This well corresponds to Well 5 described in Section 3.1.1 above and shown on Figure 11.

Nearest Well Factor Value: 50
(Ref. 1, Table 3-11)

3.3.2 POPULATION

3.3.2.1 Level of Contamination

3.3.2.2 Level I Contamination

Based on analytical data from residential well sampling performed by DEP in the Site area, 40 individual residential wells are known to be affected by Level I concentrations of TCE. Table 3-2 summarizes the :
Post filter samples collected concurrently with these did not contain TCE or other site-related contaminants. These wells were contaminated with TCE and other site-related contaminants for an unknown period of time prior to installation of the POETS. Using census data for Nockamixon Township, the average household population is 2.94 (Ref. 33), a total population of 121 has been exposed to Level I concentrations.

Total Level I Population: 121
Level I Concentration Factor Value: 58.42 X 10 = 1,210
(Ref. 1, Section 3.3.2.2)

Table 3-2
Nockamixon TCE HSCA Site
Groundwater Exposure Pathway Evaluation
Summary of Residential Wells with Level 1 Concentrations

Figure Ref. #	Street #	Street Name	Highest TCE Conc.	Date of Sample
Brennan Road				
1	10	Brennan Rd	386	1/11/2012
2	30	Brennan Rd	211	4/18/2011
3	44	Brennan Rd	365	4/18/2011
4	55	Brennan Rd	344	5/8/2019
5	65	Brennan Rd	1170	8/3/2022
6	77	Brennan Rd	12.1	6/17/2019
7	84	Brennan Rd	16	1/16/2013
Cord Way				
8	9	Cord Way	17	12/12/2012
9	10	Cord Way	5.83	8/26/2015
Durham Road (PA Route 412)				
10	4028	Durham Rd	98.6	11/17/2010
11	4032	Durham Rd	7.08	10/19/2015
12	4051	Durham Rd	26.8	11/17/2010
Easton Road (PA Route 611)				
13	8260	Easton Rd	5.74	8/26/2015
14	8329	Easton Rd	13.1	11/16/2010
15	8374	Easton Rd	11.6	11/16/2010
16	8378	Easton Rd	14.5	12/13/2010
17	8382	Easton Rd	32.3	4/27/2011
18	8426	Easton Rd	10.7	8/10/2015
19	8432	Easton Rd	33.9	8/26/2015
Mountain View Drive (PA Route 563)				
20	2442	Mountain View Dr	69	3/19/2011
21	2465	Mountain View Dr	32.8	12/12/2012
22	2473	Mountain View Dr	14.4	7/20/2016
23	2506	Mountain View Dr	148	4/9/2014
24	2511	Mountain View Dr	185	2/7/2019
25	2526	Mountain View Dr	267	8/10/2016

Table 3-2 (Cont'd)
Nockamixon TCE HSCA Site
Groundwater Exposure Pathway Evaluation
Summary of Residential Wells with Level 1 Concentrations

Figure Ref. #	Street #	Street Name	Highest TCE Conc.	Date of Sample
Park Drive West				
26	282	Park Dr	7.3	6/2/2011
27	287	Park Dr	110	12/28/2011
28	294	Park Dr	9.38	4/25/2013
29	312	Park Dr	15.3	12/2/2015
30	324	Park Dr	12.4	12/29/2011
31	331	Park Dr	47.6	12/5/2019
32	338	Park Dr	315	5/17/2017
33	347	Park Dr	35.2	2/4/2019
34	377	Park Dr	19.5	7/21/2016
35	387	Park Dr	12.9	10/12/2016
Tower Road				
36	24	Tower Rd	10.8	12/13/2012
37	117	Tower Rd	13.7	9/26/2012
38	133	Tower Rd	63.6	4/21/2011
39	135	Tower Rd		
40	149	Tower Rd	6.62	11/15/2010

Notes:
Well locations shown in Figure 11
Level 1 Criteria Ref. 2, p. 36
Level 1 Concentration Data Ref. 32

3.3.2.3 Level II Contaminations

Level II concentrations were not evaluated for the Groundwater Pathway Score.

Population served by Level II Wells: 0
Level II Concentration Factor Value: 0
(Ref. 1, Section 3.3.2.3)

3.3.2.4 Potential Contamination

Wells with Potential Contamination were not evaluated for the Nockamixon TCE Groundwater Pathway Score.

Total Potential Contamination Distance Weighted Population: 0
Potential Contamination Factor Value: 0

3.3.3 RESOURCES

Food crop and livestock groundwater uses were not evaluated.

Resources Factor Value: 0

3.3.4 WELLHEAD PROTECTION AREA

Wellhead Protection Areas were not evaluated.

Wellhead Protection Area Factor Value: 0
(Ref. 1, Section 3.3.4)

3.3.5 Calculation of a Targets Factor Value

The following factor values are added to calculate the Targets Factor Value:

Nearest well factor value:	50
Level I concentrations factor value:	584.2
Level II concentrations factor value:	*
Potential contamination factor value:	*
Resources factor value:	*
Wellhead protection area factor value:	*
Total groundwater migration pathway targets:	634.2

* Not evaluated

5.0 SOIL EXPOSURE AND SUBSURFACE INTRUSION PATHWAY

For the Nockamixon TCE Site, the subsurface intrusion component is scored based on the actual intrusion of hazardous substances into regularly occupied residential structures based on chemical analysis and meeting the criteria for being in an area of observed exposure (Ref. 1, Section 5.2.0).

5.2 SUBSURFACE INTRUSION COMPONENT

The subsurface intrusion component is evaluated based on indoor air samples concentrations of TCE within two residential structures (see Figure 12), which are underlain by subsurface contamination (Ref. 1, Section 5.2.1).

The origin of the indoor air contamination at the Site is subsurface intrusion from an area of soil and groundwater contamination shown on Figures 6 and 9, respectively. An area of subsurface soil vapor contamination is shown on Figure 13.

Soil types in the vicinity of the source area are shown on Figure 12. Croton silt loam and Reaville channery silt loam are poorly and somewhat poorly drained soils respectively (Ref. 33, pp. 27 and 30). The croton series soils are upland soils, mainly formed over siltstone or shale and support forest vegetation of pin oak, white oak, ash, beech and red maple or agricultural pasture or hay land. Excess water is perched above the fragipan in late winter and early spring (Ref. 34, pp. 1 & 2). Reaville series soils are moderately well to somewhat poorly drained, formed from weathered red Triassic, interbedded shale, siltstone, and fine-grained sandstone, and are often used for general or dairy farming. Native vegetation in uncleared areas is comprised of mixed hardwoods, predominantly oaks (Ref. 35, pp. 1 & 2). Soil thickness at the Site ranges from 1 to 14.5 ft. with an average 5.8 ft. (Ref.12, Appendix E). The depth to groundwater beneath the site is typically 50 feet or greater, so the regional water table is encountered well below the top of bedrock (Ref. 9, p. 1-2).

5.2.0 General Considerations

At the Site, there is one documented area of exposure (AOE) where two residential structures are subject to indoor air contamination resulting from subsurface intrusion, as shown on Figure 13. The AOE is delineated based on residential structures that had observed exposures of site attributable TCE, as documented through indoor air sampling (see Observed Exposure by Chemical Analysis below and Figure 13). The occupied residential structures are located at 65 and 84 Brennan Road and are located above the area of soil gas and/or groundwater contamination described above. Based upon concentrations of TCE detected in these residences vapor mitigation systems were activated at 84 and 65 Brennan Road on December 10, 2018, and March 14, 2019, respectively (Ref. 9, p. 2-8).

<u>Observed Exposure by Direct Observation</u>

Observed exposure by direct observation is not evaluated.

<u>Observed Exposure by Chemical Analysis</u>

DEP collected indoor air and ambient outdoor air samples on February 25 and April 1, 2016, at several occupied residences along Brennan Road and Park Drive West. During the initial sample event, indoor air samples were collected from basements at 30 Brennan Road, 65 Brennan Road, 84 Brennan Road, 324 Park Drive West, and 338 Park Drive West. Locations of these residences are shown on Figure 15. Elevated concentrations of site-related CVOCs were identified in indoor air samples collected at 65 and 84 Brennan Road. DEP collected follow up indoor air samples at 65 and 84 Brennan Road on April 1, 2016, and an initial round of indoor air samples at 77 Brenan Road on April 6,2016 (Ref. 41, p. 4). Results of indoor air samples collected at the 2 occupied residential structures with observed exposures are summarized in Table 5-12, below.

Table 5-12
Nockamixon TCE HSCA Site
Summary of Confirmed Exposures by Chemical Analysis

Sample Location	Sample Start Date/Time	Sample Collection Date/Time	TCE (ug/m^3)	MDL (ug/m^3)	Ref.
65 Brennan Road Air	2/24/2016 @ 10:40	2/25/2016 @ 10:30	27	1.1	38, p. 6
65 Brennan Road Basement Air	3/31/2016 @ 10:40	4/1/2016 @ 10:42	31	1.1	39, p. 3
84 Brennan Road Air	2/24/2016 @ 10:10	2/25/2016 @ 10:10	4.0 J	1.1	38, p. 5
84 Brennan Road Basement Air	3/31/2016 @ 10:00	4/1/2016 @ 09:42	1.9 J	1.1	39, p. 7
84 Brennan Road Basement Duplicate Air	3/31/2016 @ 10:00	4/1/2016 @ 09:42	2.6 J	1.1	39, p. 8

Notes:
J – Estimated Value
$\mu g/m^3$ – micrograms per cubic meter
MDL – method detection limit

Samples collected by DEP on February 25 and April 1, 2016 (including samples discussed below, in "Establishment of Background Levels") were collected using evacuated SUMMA canisters equipped with dedicated 24-hour flow controllers provided by the laboratory. Samples were analyzed for a list of CVOCs by EPA Method TO-15 (Ref. 41, p. 4).

Attribution

To establish that indoor air concentrations of TCE at the Site constitute an observed exposure they must be attributable to subsurface contamination (Ref. 1, Table 2-3). As shown on Figure 4, a maximum TCE concentration of 131,000 micrograms per kilogram (µg/kg) was detected in soil boring B-100, collected at a depth of 7 feet below ground surface (ft. bgs). (Ref. 37, p. 3). The maximum concentration of TCE detected in soil gas at the Site was 3,310,000 micrograms per cubic meter ($\mu g/m^3$) at soil gas sampling location SG-1 (Ref 37, p. 2) (See Figure 13.) The maximum TCE concentration detected in groundwater at the Site (2,700 ug/l) occurred at MW-2L, located within the source zone, and shown on Figure 9 (Ref. 27, p. 4).

The Agency for Toxic Substances and Disease Registry (ATSDR) reports that TCE may evaporate from contaminated soil and groundwater and migrate into air spaces beneath buildings to enter the indoor air, a process termed vapor intrusion (Ref. 30, pp. 2, 3, and 9).

Establishment of Background Levels

To establish that one or more observed exposures has occurred at the Site, indoor air concentrations of TCE must be equal to or greater than the quantitation limit when TCE is not detected in background samples (Ref. 1, Table 2-3). Indoor air samples collected at structures, which are more distant from the area of sub surface soil gas contamination shown on Figure 13 are considered representative of background conditions. In addition to samples collected during the first two indoor air sampling events, follow up background samples were collected in February 2018 at 77 Brennan Road and 338 Park Drive West. Locations of these background indoor air samples with respect to observed exposure samples are shown on Figure 15. Table 5-13 summarizes the results of indoor air samples collected from these background locations.

Table 5-13
Nockamixon TCE HSCA Site
Summary of Background Indoor Air Samples

Sample Location	Sample Start Date/Time	Sample Collection Date/Time	TCE (ug/m^3)	MDL (ug/m^3)	Ref.
77 Brennan Road (Basement)	4/5/2016 @ 10:15	4/6/2016 @ 09:57	1.1 U	1.1	38, p. 10
77 Brennan Road (Basement 1)	Not Indicated	2/28/2018 @ 10:00	0.546 U	0.546	40, p. 11
77 Brennan Road (Basement 2)	Not Indicated	2/28/2018 @09:55	0.546 U	0.546	40, p. 14
30 Brennan Road Air	2/24/2016 @ 09:15	2/25/2016 @ 09:15	1.1 U	1.1	38, p. 4
324 Park Drive West (Basement)	2/24/2016 @ 11:50	2/25/2016 @ 11:35	1.1 U	1.1	38, p. 10
338 Park Drive West Air	2/24/2016 @ 11:20	2/25/2016 @ 11:20	1.1 U	1.1	38, p. 8
338 Park Drive West Dup Air	2/24/2016 @ 11:20	2/25/2016 @ 11:20	1.1 U	1.1	38, p. 9
338 Park Drive West Basement 1	Not Indicated	2/28/2018 @ 10:45	0.546 U	0.546	40, p 2
338 Park Drive West Basement 2	Not Indicated	2/28/2018 @ 10:42	0.546 U	0.546	40, p. 5

Notes:
U – Not Detected
$\mu g/m^3$ – micrograms per cubic meter
MDL – method detection limit

Since TCE was not detected in the background samples, samples with TCE concentrations exceeding the quantitation limit meet the criteria for an observed release and because a quantitation limit is not defined in the associated laboratory reports, and these samples were not analyzed under the EPA Contract Laboratory Procedure (CLP), the detection limit is used in place of the quantitation limit (Ref. 1, Table 2-3).

Consideration of Indoor Anthropogenic Origins

Prior to indoor air sampling conducted by DEP a pre-sampling survey form was sent owners/occupants of targeted residential sampling locations to gain access and acquire information related to building ventilation, personal habits, hobbies, and chemical usage/storage. Additionally, at the time of SUMMA canister deployment, a visual inspection of the sampling area was performed along with screening with a photo ionization detector (PID) (Ref. 41, pp. 2, 3, and Attachment 1). Based on these survey responses and pre-sampling inspections and the presence of TCE in the subsurface, DEP believes the concentrations of TCE shown on Table 5-12 result from vapor intrusion.

Consideration of Outdoor Air Concentrations

Outdoor or ambient air samples were collected at selected locations during each indoor air sampling event. Outdoor air samples were collected during the same period as indoor air samples to ensure that detections of TCE in indoor air had not influenced by outdoor concentrations of TCE. Outdoor air samples were collected in a similar fashion to indoor air samples using laboratory provided SUMMA canisters and 12-hour regulators. The outdoor air samples were analyzed by the same laboratories as indoor samples collected at the same time by EPA Method TO-15.

Table 5-14
Nockamixon TCE HSCA Site
Summary of Ambient/Outdoor Air Samples

Sample Location	Sample Start Date/Time	Sample Collection Date/Time	TCE (ug/m^3)	MDL (ug/m^3)	Ref.
30 Brennan Road Ambient Air	2/24/2016 @ 09:20	2/25/2016 @ 09:10	N.D.	1.1	38, p. 3
338 Park Drive West Ambient Air	2/24/2016 @ 11:10	2/25/2016 @ 11:13	1.1 U	1.1	38, p. 7
65 Brennan Road Ambient Air	3/31/2016 @ 10:53	4/1/2016 @ 10:40	1.1 U	1.1	39, p. 5
77 Brennan Outdoor/Ambient Air	Not Indicated	2/28/2018 @ 09:47	0.546 U	0.546	40, p. 17
338 Park Drive West Ambient Air	Not Indicated	2/28/2018 @ 10:53	0.546 U	0.546	40, p. 8

Notes:
U – Not Detected
$\mu g/m^3$ – micrograms per cubic meter
MDL – method detection limit

Since TCE was not detected in any ambient/outdoor air sample, outdoor air contamination did not likely influence the results of samples, which confirmed exposures at 65 and 84 Brennan Road.

Structure Containment

As presented above, the two regularly occupied structures have observed exposure documented through chemical analysis. Therefore, s structure attainment value of 10 has been assigned (Ref. 1, Table 5-12).

AOE Hazardous Waste Quantity

Hazardous waste quantity was derived using Tier C procedures to calculate the volume of occupied structures within the AOE. Based upon county property records, the living areas at 65 and 84 Brennan Road are estimated to be 2548 square feet (ft^2) (Ref. 42, p.1) and 2933 ft^2 (Ref. 43, p.1), respectively. A default ceiling height of 8 ft. was used, resulting in a volume of 1624.0 cubic yards (yd^3) and hazardous waste quantity value of 649.6 (Ref. 1, Table 5-19). This value results in a hazardous waste quantity factor value of 100.0 (Ref. 1, Table 2-6).

5.2.1 SUBSURFACE INTRUSION COMPONENT

5.2.1.1 LIKELIHOOD OF EXPOSURE

5.2.1.1.1 Observed Exposure

The documentation and analytical results presented and referenced above in Section 5.2.0 demonstrates that TCE, a hazardous substance, has been released into 2 regularly occupied residential structures via subsurface intrusion, thereby establishing observed exposure for the Site. Therefore, an observed exposure factor value of 550 is assigned (Ref. 1, Section 5.1.1.1).

SsI Component Observed Exposure Factor Value: 550

5.2.1.1.3 Calculation of Likelihood of Exposure Factor Category Value

A likelihood of exposure factor category value is assigned because observed exposure is established for the site (Ref. 1, Section 5.2.1.1.3).

Likelihood of Exposure Factor Category Value: 550

5.2.1.2 WASTE CHARACTERISTICS

5.2.1.2.1 Toxicity/Degradation

The hazardous substance associated with the Site used in the subsurface intrusion evaluation is TCE, because it is associated with the source and found in samples meeting observed exposure criteria.

Toxicity Factor Value

The toxicity and degradation factor value for TCE is 1,000 (Ref. 2, p. 36).

Degradation Factor Value

Because TCE meets the criteria for observed exposure a degradation factor value of 1 is assigned (Ref. 1, Section 5.2.1.2.1.2).

Toxicity/Degradation Factor Value

The toxicity/degradation factor value is calculated by multiplying the toxicity and degradation factor values (Ref. 1, Section 5.2.2.2.1.3).

Toxicity/Degradation Factor Value: 1,000

5.2.1.2.2 Hazardous Waste Quantity for Subsurface Intrusion Component

As described above in Section 5.2.0, the volumes of the two residences with observed exposures results in a hazardous waste quantity value of 649.6 and a hazardous waste quantity factor value of 100.

Hazardous Waste Quantity Factor Value: 100

5.2.1.2.3 Calculation of Waste Characteristics Factor Category Value

The waste characteristics factor category value is determined by multiplying the toxicity/degradation and hazardous waste quantity factor values, subject to a maximum product of 1×10^8, and assigning a value from HRS Table 2-7 based on the product (Ref. 1, Section 5.2.1.2.3).

Toxicity/Degradation Factor Value: 1,000
Hazardous Waste Quantity Factor Value: 100
Toxicity Factor Value X Hazardous Waste Quantity Factor Value: 10,000

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

5.2.1.3 TARGETS

There are 2 regularly occupied residential structures within the AOE, which constitute the Site (see Figure 15 and Section 5.2.0 of this HRS documentation record). At 65 Brennan Road, TCE was detected at concentrations of 27 $\mu g/m^3$ and 31 $\mu g/m^3$ in February and April 2016, respectively (Ref. 38 p. 6 & Ref. 39, p. 3). At 84 Brennan Road, TCE was detected at concentrations of 4.0 $\mu g/m^3$ and 2.6 $\mu g/m^3$ in February and April 2016, respectively (Ref. 38 p. 5 & Ref. 39 p. 8). These concentrations exceed the benchmarks for cancer risk (0.478 $\mu g/m^3$) and non-cancer risk (2.09 $\mu g/m^3$) (Ref 2, p. 37).

5.2.1.3.1 Exposed Individual

There are exposed individuals in 2 regularly occupied structures subject to Level I concentrations (i.e., concentrations above health-based benchmarks), as discussed above in Section 5.2.1.3 and as displayed in Figure 15 of this HRS documentation record. The maximum concentration of TCE detected within 84 Brennan Road qualifies as Level I Contamination (Ref. 1, Section 2.5).

This data demonstrates that there is at least one exposed individual in one or more regularly occupied structures subject to Level I concentrations; therefore, a value of 50 is assigned as the exposed individual factor value (Ref. 1, Section 5.2.1.3.1).

Exposed Individual Factor Value: 50

5.2.1.3.2 Population

Population is evaluated based on Level I concentrations. Population with Level II concentrations and within an area of subsurface contamination are not considered for this scoring evaluation. For the structures that were documented in AOE 1 through chemical analysis, the Nockamixon Township average of 2.94 persons per household is used (Ref. 32, p. 1).

5.2.1.3.2.1 Level I Concentrations

Level I concentrations are media-specific concentrations for the target that meet the criteria for observed exposure for the pathway and are at or above SsI component-specific benchmark values, as discussed above in Section 5.2.1.3 (Refs. 1, Section 2.5; 2, p. 37). Information for AOE 1 can be found in **Section 5.2.0**. The regularly occupied structures that meet observed exposure criteria and exhibit Level I concentrations are located at 65 and 84 Brennan Road (Ref. 39. pp. 3 & 8).

Sum of regularly occupied structures' total population values subject to Level I concentrations: 5.88

Sum of regularly occupied structures' total population values subject to Level I concentrations x 10: 58.8

Level I Concentrations Factor Value: 58.8

5.2.1.3.2.2 Level II Concentrations

Level II concentrations is not evaluated for this site.

Level II Concentrations Factor Value: Not Scored

5.2.1.3.2.3 Population within Area(s) of Subsurface Contamination

Population within an area of subsurface contamination (ASC) is not evaluated for this site.

Population within an Area of Subsurface Contamination Factor Value: Not Scored

5.2.1.3.2.4 Calculation of Population Factor Value

The population factor value is the sum of the factor values for Level I concentrations, Level II concentrations, and population within the ASCs (Ref. 1, Section 5.2.1.3.2.4).

Level I Concentrations Factor Value: 58.8

Level II Concentrations Factor Value: Not Scored

Population within an Area of Subsurface Contamination Factor Value: Not Scored

Level I Concentrations + Level II Concentrations + Population within an ASC: 58.8

Population Factor Value: 58.8

5.2.1.3.3 Resources

No resources as defined in the HRS Rule are present within the AOE (Ref. 1, Section 5.2.1.3.3).

Resources Factor Value: 0

5.2.1.3.4 Calculation of Targets Factor Category Value

The sum of the values for the exposed individual, population, and resources factors is assigned as the targets factor category value for the subsurface intrusion component (Ref. 1, Section 5.2.1.3.4).

Exposed Individual Factor Value: 50

Population Factor Value: 58.8

Resources Factor Value: 0

Exposed Individual + Population + Resources: 101.8

Targets Factor Category Value: 101.8