



SUNOCO PIPELINE LP

VAPOR INTRUSION PROGRESS REPORT

Upper Makefield Response
Washington Crossing, Pennsylvania
PROJ-051861

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1.0 INTRODUCTION

This Vapor Intrusion Progress Report (Report) was prepared by CTEH, LLC (CTEH) on behalf of Sunoco Pipeline LP (Sunoco Pipeline) in relation to the Upper Makefield Response in Washington Crossing, Pennsylvania. This Report has been prepared to address item 1-i (page 9) of the Administrative Order issued to Sunoco Pipeline by the Commonwealth of Pennsylvania Department of Environmental Protection (PA DEP) on March 6, 2025. This revised version (dated June 13, 2025) supersedes the original Report submitted on April 2, 2025 and addresses the comments provided by PA DEP on April 30, 2025.

A release from a pipeline that transports refined petroleum products, including jet fuel, was identified in January 2025. The GPS coordinates for the approximate location of the release site (Site) are: 40.271184, -74.875953. A map of the incident location is provided in Attachment A. Environmental consultants, including personnel from CTEH and Groundwater & Environmental Services, Inc. (GES), on behalf of Sunoco Pipeline, have conducted several activities to investigate the nature and extent of potential impacts to residences near the incident location, including impacts to potable well water supplies and impacts to residences via vapor intrusion.

This Report summarizes the investigation activities conducted to date, the preliminary (i.e., unvalidated) results of those investigation activities, plans for further investigation and evaluation, and the projected schedule for future planned investigation and evaluation activities.

2.0 SUMMARY OF INVESTIGATION ACTIVITIES

Vapor intrusion investigation activities (including those conducted to date and those currently underway and/or planned) have been designed and conducted based on technical guidance for assessing vapor intrusion published by the PA DEP¹.

As of the date of this Report, an investigation into the potential for vapor intrusion related to the incident has been conducted and/or is underway. To date, these investigation activities have included:

1. Indoor air sampling at six (6) residences on Glenwood Drive, Walker Road, and Spencer Road (initial sampling events on February 25 to 26, 2025 and March 15 to 16, 2025; second sampling events on April 8 to 9, 2025 and April 21 to 22, 2025);
2. Passive soil gas sampling at 22 properties on Glenwood Drive, Walker Road, and Spencer Road (February 25 to March 14, 2025);
3. Water sampling from external wells at three (3) properties in the Mt. Eyre Manor neighborhood (March 24, 27, and 28, 2025); and

¹ PA DEP. Land Recycling Program Technical Guidance Manual (TGM) Section IV: Vapor Intrusion into Buildings from Groundwater and Soil. 261-0300-101. March 2021.

4. Sub-slab soil gas sampling at six (6) residences on Glenwood Drive, Walker Road, and Spencer Road (initial sampling event on June 12, 2025).

Additional investigation activities are underway and/or planned. These activities include a second sub-slab soil gas sampling event at six (6) residences on Glenwood Drive, Walker Road, and Spencer Road.

3.0 INDOOR AIR SAMPLING

3.1 Progress to Date

As of the date of this Report, indoor air sampling has been conducted at six residences on Glenwood Drive, Walker Road, and Spencer Road, in accordance with the Indoor Air Sampling and Analysis Plan (SAP) prepared by CTEH personnel, dated February 21, 2025. The initial indoor air sampling events were conducted by CTEH personnel from February 25 to 26, 2025 and March 15 to 16, 2025. Preliminary results from five initial indoor air sampling events conducted from February 25 to 26, 2025 were provided to each property owner on March 15, 2025 and shared with the PA DEP on March 17, 2025.

Follow-up indoor air sampling events at each residence were conducted by CTEH personnel from April 8 to 9, 2025 and April 21 to 22, 2025. Preliminary results from the second indoor air sampling events conducted from April 8 to 9, 2025 and April 21 to 22, 2025 were provided to each property owner on May 5, 2025.

The preliminary air sampling results from both the first and second rounds of indoor air sampling were shared with the PA DEP via ShareFile on May 5, 2025.

3.2 Strategy

Residences eligible for the first phase of indoor air sampling were selected based on the results of potable well water sampling conducted at the residence by GES personnel. Specifically, residences were eligible for indoor air sampling if water sampling results at the residence indicated detections of one or more volatile target analytes at a concentration above the Residential groundwater Statewide health standard vapor intrusion screening values (Residential SV_{GW}) established by the PA DEP, or if light non-aqueous phase liquid (LNAPL) was present in the potable water well at the residence. A total of six residences were selected for the first phase of indoor air sampling.

The objectives of the indoor air sampling program are to:

1. Collect indoor air samples from discrete locations inside residences to evaluate potential impacts to indoor air related to the volatile constituents of refined petroleum products, including jet fuel; and

2. Collect outdoor air samples from discrete locations outside residences to evaluate the presence of these constituents in the ambient environment and the potential influence of these constituents on indoor air.

3.3 Methods

Prior to the air sampling event, it was requested that residents remove potential sources of volatile organic compounds (VOCs) (e.g., fuel containers, paints, cleaning products, personal care products, candles) from the air sampling locations at least 24 hours prior to deployment of the air sample. On the day of air sample deployment, a pre-sampling survey was conducted with one resident from each residence, which included a questionnaire for the resident about building-specific factors that could potentially influence the concentration of VOCs in indoor air. During the pre-sampling survey, a visual and air monitoring assessment of accessible portions of the lowest level and first floor of the residence were also conducted to identify any items within the residence that could be potential sources of VOCs.

Air samples were then deployed at three locations: 1) on the lowest level of the residence (e.g., basement); 2) on the first floor of the residence; and 3) outside (and near) the residence. The air sample collected on the lowest level was generally located in an area where vapors may be expected to enter or in an area with the greatest potential for vapor intrusion impact (often near the installed Point-of-Entry Treatment [POET] system). The air sample collected on the first floor was generally centrally located in an area of typical occupancy and/or high activity (e.g., living and/or family room). The air sample collected outside the residence was located in an area that is representative of ambient conditions outside the residence (e.g., backyard).

Each air sample consisted of a 1.4-liter evacuated canister with a 24-hour regulator. Air samples were collected for a duration of approximately 24 hours at a height representative of the breathing zone (i.e., the canister inlet was located four to six feet above the ground). After the air sampling period, air samples were sent under chain-of-custody to Pace Analytical National Center for Testing & Innovation (Pace Analytical) in Mt. Juliet, Tennessee, a National Environmental Laboratory Accreditation Program (NELAP)-accredited laboratory, for analysis of target analytes via United States Environmental Protection Agency (US EPA) Method TO-15².

Target analytes were selected based on analytical requirements for soil and/or water testing related to refined petroleum products, including jet fuel, as outlined in the Short List of Petroleum Products in the Land Recycling Program Technical Guidance Manual established by the PA DEP. Specifically, all volatile parameters related to refined petroleum products, including jet fuel, were selected as target analytes for air sampling. Hexane and cyclohexane were additionally selected based on their listing on the safety data

² Benzene, naphthalene, 1,2-dichloroethane, and 1,2-dibromoethane were analyzed using US EPA Method TO-15 in Selective Ion Monitoring (SIM) mode to achieve lower detection limits.

sheet (SDS) for one of the products (unleaded gasoline) that traveled through the impacted pipeline. Target analytes were the following VOCs: benzene, toluene, ethylbenzene, total xylenes (calculated by adding the concentrations of m&p-xylene and o-xylene), isopropylbenzene, methyl tert-butyl ether (MTBE; also known as methyl tertiary butyl ether), naphthalene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, 1,2-dichloroethane (EDC), 1,2-dibromoethane (EDB; also known as ethylene dibromide), hexane, and cyclohexane.

A post-sampling survey and a visual and air monitoring assessment of accessible portions of the lowest level and first floor of the residence were also conducted at the end of the air sampling period.

The PA DEP Land Recycling Program Technical Guidance Manual outlines that, for vapor intrusion assessment, a minimum of two air sampling events should occur at least 45 days apart. In addition, both air sampling events should occur when the daily average outdoor temperature is at least 15 degrees Fahrenheit below the minimum indoor temperature in the occupied space. In accordance with this guidance, a follow-up air sampling event occurred at the six residences on April 8 to 9, 2025 and April 21 to 22, 2025. The second air sampling event was conducted in the same manner as the first air sampling event.

3.4 Results

Indoor air sampling results were compared to one-tenth (1/10) of the Residential indoor air Statewide health standard vapor intrusion screening values (Residential SV_{IA}) established by the PA DEP.

A summary of the preliminary air sampling results collected during the first indoor air sampling event is provided in **Table 1**. Analytes detected in at least one indoor air sample at a concentration above one-tenth of the Residential SV_{IA} were benzene (12 of 12 samples), ethylbenzene (5 of 12 samples), xylenes (1 of 12 samples), naphthalene (9 of 12 samples)³, and 1,2-dichloroethane (9 of 12 samples). Several analytes were also detected in at least one outdoor air sample. Preliminary results for the five indoor air sampling events conducted from February 25 to 26, 2025 were provided to each respective property owner on March 15, 2025. These preliminary result packages included a Summary of Air Sampling Results letter and the preliminary laboratory report issued by Pace Analytical. These preliminary result packages were subsequently shared with the PA DEP on March 17, 2025.

A summary of the preliminary air sampling results collected during the second indoor air sampling event is provided in **Table 2**. Analytes detected in at least one indoor air sample at a concentration above one-tenth of the Residential SV_{IA} were benzene (12 of 12 samples), ethylbenzene (2 of 12 samples), xylenes

³ The laboratory method detection limit (MDL) for naphthalene is higher than one-tenth of the Residential SV_{IA} for naphthalene. Therefore, any detection of naphthalene is above one-tenth of the Residential SV_{IA} for naphthalene.

(1 of 12 samples), naphthalene (10 of 12 samples)⁴, 1,2,4-trimethylbenzene (1 of 12 samples), and 1,2-dichloroethane (11 of 12 samples). Several analytes were also detected in at least one outdoor air sample. Preliminary results for the follow-up indoor air sampling events conducted from April 8 to 9, 2025 and April 21 to 22, 2025 were provided to each respective property owner on May 5, 2025. These preliminary result packages included a Summary of Air Sampling Results letter and the preliminary laboratory report issued by Pace Analytical. These preliminary result packages were subsequently shared with the PA DEP via ShareFile on May 5, 2025.

During the second indoor air sampling event, two additional outdoor air samples were collected at the request of the PA DEP to further characterize ambient conditions. The two additional outdoor air samples were collected on Upper Makefield Township property, located west of Glenwood Drive. A summary of the preliminary air sampling results for the two additional outdoor air samples is provided in **Table 3**.

⁴ The laboratory method detection limit (MDL) for naphthalene is higher than one-tenth of the Residential SV_{IA} for naphthalene. Therefore, any detection of naphthalene is above one-tenth of the Residential SV_{IA} for naphthalene.

Table 1. Summary of Preliminary Air Sampling Results | First Sampling Event

Analyte	1/10 PA DEP Residential SV _{IA} (µg/m ³)	Number of Indoor Samples	Number of Indoor Detections	Range of Indoor Detections (µg/m ³)	Number Detected Above 1/10 Residential SV _{IA}	Number of Outdoor Samples	Number of Outdoor Detections	Range of Outdoor Detections (µg/m ³)
Benzene	0.31	12	12	0.604 – 3.55	12	6	6	0.562 – 1.53
Toluene	520	12	12	2.66 – 19.6	0	6	6	0.987 (J) – 26.7
Ethylbenzene	0.97	12	11	0.38 (J) – 4.11	5	6	1	1.74
m&p-Xylene	10*	12	10	1.14 (J) – 9.19	1	6	2	0.941 (J) – 4.08
o-Xylene		12	10	0.46 (J) – 3.82		6	2	0.46 (J) – 2.01
Isopropylbenzene	42	12	5	0.404 (J) – 1.68	0	6	1	0.424 (J)
Methyl tert-butyl ether	9.4	12	0	< 0.293	0	6	0	< 0.293
Naphthalene	0.072	12	9	0.134 (J) – 0.357	9	6	0	< 0.13
1,2,4-Trimethylbenzene	6.3	12	10	0.643 (J) – 5.25	0	6	1	0.736 (J)
1,3,5-Trimethylbenzene	6.3	12	6	0.496 (J) – 2.66	0	6	0	< 0.419
1,2-Dichloroethane	0.094	12	12	0.0705 (J) – 1.13	9	6	6	0.0595 (J) – 0.115
1,2-Dibromoethane	0.0041	12	0	< 0.0961	0	6	0	< 0.0961
Hexane	73	12	11	1.33 (J) – 10.7	0	6	3	0.582 (J) – 1.7
Cyclohexane	630	12	5	0.802 – 11.5	0	6	1	2.74

µg/m³ = micrograms per cubic meter. Laboratory non-detections are reported as less than (<) the laboratory Method Detection Limit (MDL). Laboratory result qualifiers are reported to the right of corresponding detections (in parentheses). Definitions of reported qualifiers are as follows. J: Result is estimated between the laboratory method detection limit and reporting limit.

* The PA DEP Residential SV_{IA} is established for total xylenes. The concentration of total xylenes is calculated by adding the concentrations of m&p-xylene and o-xylene.

Table 2. Summary of Preliminary Air Sampling Results | Second Sampling Event

Analyte	1/10 PA DEP Residential SV _{IA} (µg/m ³)	Number of Indoor Samples	Number of Indoor Detections	Range of Indoor Detections (µg/m ³)	Number Detected Above 1/10 Residential SV _{IA}	Number of Outdoor Samples	Number of Outdoor Detections	Range of Outdoor Detections (µg/m ³)
Benzene	0.31	12	12	0.348 – 9.20	12	6	6	0.399 – 1.30
Toluene	520	12	12	1.11 (J) – 31.9	0	6	6	0.689 (J) – 8.10
Ethylbenzene	0.97	12	8	0.394 (J) – 11.2	2	6	0	< 0.337
m&p-Xylene	10*	12	8	1.33 (J) – 25.4	1	6	0	< 0.754
o-Xylene		12	8	0.564 (J) – 10.7		6	0	< 0.385
Isopropylbenzene	42	12	3	0.418 (J) – 2.07	0	6	0	< 0.355
Methyl tert-butyl ether	9.4	12	0	< 1.10 ⁺	0	6	0	< 0.293
Naphthalene	0.072	12	10	0.133 (J) – 0.486	10	6	1	0.181
1,2,4-Trimethylbenzene	6.3	12	9	0.506 (J) – 8.00	1	6	0	< 0.455
1,3,5-Trimethylbenzene	6.3	12	3	0.496 (J) – 2.65	0	6	0	< 0.419
1,2-Dichloroethane	0.094	12	11	0.132 – 0.700	11	6	6	0.0919 – 0.138
1,2-Dibromoethane	0.0041	12	0	< 0.360 [^]	0	6	0	< 0.0961
Hexane	73	12	8	0.620 (J) – 26.5	0	6	1	0.814 (J)
Cyclohexane	630	12	2	3.48 – 29.6	0	6	0	< 0.585

µg/m³ = micrograms per cubic meter. Laboratory non-detections are reported as less than (<) the laboratory Method Detection Limit (MDL). Laboratory result qualifiers are reported to the right of corresponding detections (in parentheses). Definitions of reported qualifiers are as follows. J: Result is estimated between the laboratory method detection limit and reporting limit.

* The PA DEP Residential SV_{IA} is established for total xylenes. The concentration of total xylenes is calculated by adding the concentrations of m&p-xylene and o-xylene.

+ One of the twelve samples was diluted by the laboratory due to sample volume, yielding an MDL of 1.10 µg/m³. The MDL for the remaining eleven samples was 0.293 µg/m³.

[^] One of the twelve samples was diluted by the laboratory due to sample volume, yielding an MDL of 0.360 µg/m³. The MDL for the remaining eleven samples was 0.0961 µg/m³.

Table 3. Summary of Preliminary Air Sampling Results | Two Additional Outdoor Air Samples

Analyte	Number of Outdoor Samples	Number of Outdoor Detections	Range of Outdoor Detections ($\mu\text{g}/\text{m}^3$)
Benzene	2	2	0.479 – 5.17
Toluene	2	2	1.37 (J) – 6.86
Ethylbenzene	2	0	< 0.337
m&p-Xylene	2	0	< 0.754
o-Xylene	2	0	< 0.385
Isopropylbenzene	2	1	1.96
Methyl tert-butyl ether	2	0	< 0.293
Naphthalene	2	0	< 0.13
1,2,4-Trimethylbenzene	2	0	< 0.455
1,3,5-Trimethylbenzene	2	0	< 0.419
1,2-Dichloroethane	2	2	0.0988 – 0.136
1,2-Dibromoethane	2	0	< 0.0961
Hexane	2	1	0.955 (J)
Cyclohexane	2	0	< 0.585

$\mu\text{g}/\text{m}^3$ = micrograms per cubic meter. Laboratory non-detections are reported as less than (<) the laboratory Method Detection Limit (MDL). Laboratory result qualifiers are reported to the right of corresponding detections (in parentheses). Definitions of reported qualifiers are as follows. J: Result is estimated between the laboratory method detection limit and reporting limit.

3.5 Additional Planned Activities

The preliminary air sampling results collected during both the first and second indoor air sampling events are undergoing Stage IV data validation by Environmental Standards, Inc. (Environmental Standards). If any issues with data quality are identified during data validation, Sunoco Pipeline personnel will notify the respective property owner and the PA DEP.

After the results of both the first and second indoor air sampling events have undergone Stage IV data validation, the indoor air sampling results will be used to calculate estimates of lifetime cancer risk and noncancer hazard quotient for the inhalation exposure pathway. Preliminary estimates based on the preliminary results of the first and second indoor air sampling events were provided to the PA DEP on March 24, 2025 (first sampling event) and May 6, 2025 (second sampling event).

As of the date of this Report, no additional properties are scheduled for indoor air sampling. However, any residences that previously did not meet the eligibility criteria for the first phase of indoor air sampling but have now met the criteria (i.e., since selection for the first phase of indoor air sampling, LNAPL has been found in the potable water well at the residence or water sampling results collected at the residence have indicated detections of one or more volatile target analytes at a concentration above the Residential SV_{GW} established by the PA DEP) continue to be eligible for indoor air sampling.

In addition to the first phase of indoor air sampling, which included six residences selected as outlined in Section 3.2, a second phase of indoor air sampling for additional selected residences in the Mt. Eyre Manor neighborhood may also occur, as determined by the results of sub-slab soil gas sampling conducted at the six residences. If conducted, residences included in the second phase of indoor air sampling will be selected based on inferred fracture trace from electrical resistivity imaging and will include additional residences on Glenwood Drive, Walker Road, and Spencer Road. If conducted, the second phase of indoor air sampling will occur in the same manner as outlined in Section 3.3, including a follow-up sampling event at least 45 days after the first air sampling event.

4.0 PASSIVE SOIL GAS SAMPLING

4.1 Progress to Date

As of the date of this Report, passive soil gas sampling has been conducted at 22 properties on Glenwood Drive, Walker Road, and Spencer Road. The passive soil gas sampling events were conducted by GES personnel from February 25 to March 14, 2025. Preliminary results packages were prepared and provided to each property owner on April 1, 2025. The preliminary results were also shared with the PA DEP on April 1, 2025.

4.2 Strategy

Properties eligible for passive soil gas sampling were selected based on electrical resistivity imaging, and the locations of sampling were influenced by property access limitations. A total of 22 properties were selected for passive soil gas sampling.

The objective of the passive soil gas sampling program is to collect passive soil gas samples from discrete locations on residential properties to evaluate the potential plume footprint along electrical resistivity transects and identify areas where constituents of refined petroleum products, including jet fuel, may exist in the subsurface.

4.3 Methods

Passive soil gas samples were collected at one to nine discrete locations on each property, depending on electrical resistivity transects and property size. Each soil gas sample consisted of a Beacon Passive Sampler installed at a depth of approximately 30 inches below the soil surface using a hand tool. Soil gas samples were collected for a duration of approximately one week. After the soil gas sampling period, the passive soil gas samples were sent under chain-of-custody to Beacon Environmental Services, Inc. (Beacon Environmental) in Bel Air, Maryland, a United States Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP)-accredited laboratory, for analysis of target analytes via US EPA Method TO-17.

Target analytes were selected based on analytical requirements for soil and/or water testing related to refined petroleum products, including jet fuel, as outlined in the Short List of Petroleum Products in the Land Recycling Program Technical Guidance Manual established by the PA DEP. Specifically, all volatile parameters related to refined petroleum products, including jet fuel, were selected as target analytes for passive soil gas sampling. Target analytes were the following VOCs: benzene, toluene, ethylbenzene, total xylenes (calculated by adding the concentrations of m&p-xylene and o-xylene), isopropylbenzene, methyl tert-butyl ether (MTBE; also known as methyl tertiary butyl ether), naphthalene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, 1,2-dichloroethane (EDC), and 1,2-dibromoethane (EDB; also known as ethylene dibromide). Passive soil gas sampling did not include hexane or cyclohexane, as these compounds are not included on the Short List of Petroleum Products for soil testing related to refined petroleum products; however, these compounds were included in the indoor air sampling program due to their listing on the SDS for one of the products (unleaded gasoline) that traveled through the impacted pipeline.

4.4 Results

Passive soil gas sampling results were compared to the Residential sub-slab soil gas Statewide health standard vapor intrusion screening values (Residential SV_{SS}) established by the PA DEP. However, it is

important to note that the soil gas samples were not collected underneath the slabs of residences; rather, they were collected at other permeable locations on the properties (e.g., in grassy areas).

A summary of the preliminary passive soil gas sampling results is provided in **Table 4**. No analytes were detected in any sample at a concentration above the Residential SV_{SS}.

Preliminary results, including a Passive Soil Gas Survey Results letter and the preliminary laboratory report issued by Beacon Environmental, were provided to each respective property owner on April 1, 2025. The preliminary results were also shared with the PA DEP on April 1, 2025.

Table 4. Summary of Preliminary Passive Soil Gas Sampling Results

Analyte	PA DEP Residential SV _{SS} (µg/m ³)	Number of Samples	Number of Detections	Range of Detections (µg/m ³)	Number Detected Above Residential SV _{SS}
Benzene	120	47	1	3.63	0
Toluene	200,000	47	17	5.20 – 28.5	0
Ethylbenzene	370	47	0	< 3.00	0
m&p-Xylene	4,000*	47	0	< 2.90	0
o-Xylene		47	0	< 2.90	
Isopropylbenzene	16,000	47	0	< 3.07	0
Methyl tert-butyl ether	3,600	47	0	< 5.10	0
Naphthalene	28	47	0	< 1.28	0
1,2,4-Trimethylbenzene	2,400	47	0	< 3.07	0
1,3,5-Trimethylbenzene	2,400	47	0	< 3.07	0
1,2-Dichloroethane	36	47	0	< 1.82	0
1,2-Dibromoethane	1.6	47	0	< 2.62	0

µg/m³ = micrograms per cubic meter. Laboratory non-detections are reported as less than (<) the laboratory Limit of Quantification (LOQ). The LOQ varies depending on sampling duration. Analytes with no detections are reported as < the highest LOQ among the samples.

* The PA DEP Residential SV_{SS} is established for total xylenes. The concentration of total xylenes is calculated by adding the concentrations of m&p-xylene and o-xylene.

4.5 Additional Planned Activities

As of the date of this Report, no additional properties are scheduled for passive soil gas sampling. However, additional passive soil gas samples may be collected at additional residences in the Mt. Eyre Manor neighborhood based on inferred fracture trace from electrical resistivity imaging.

5.0 WELL WATER SAMPLING

5.1 Progress to Date

As of the date of this Report, water sampling directly from the well column has been conducted at three properties in the Mt. Eyre Manor neighborhood, in accordance with the Well Water Sampling and Analysis Plan (SAP) prepared by CTEH personnel, originally dated March 20, 2025 and revised April 10, 2025. The well water sampling events were conducted by GES personnel on March 24, 27, and 28, 2025. Preliminary results were provided to each property owner between March 27 and April 2, 2025 and shared with the PA DEP on April 1, 2025.

5.2 Strategy

Water samples were collected directly from the well column at selected domestic wells in the Mt. Eyre Manor neighborhood. As of the date of this Report, a total of three properties have been sampled. Water sampling from additional selected wells in the Mt. Eyre Manor neighborhood may be conducted.

The objectives of the well water sampling program are to:

1. Conduct air monitoring of well headspace as screening for VOCs;
2. Collect water samples directly from the well column at select residences to evaluate potential impacts to domestic wells, including the potential for vapor intrusion impacts to residences, related to refined petroleum products, including jet fuel; and
3. Generate data from select domestic wells in the Mt. Eyre Manor neighborhood that can be used to guide or support future characterization and/or remediation activities.

5.3 Methods

Prior to the water sampling event, air monitoring of the well headspace using a photoionization detector (PID) is used as a field screening tool. The well headspace is screened by slowly lifting the well cover and placing the inlet of the PID into the well headspace. The peak reading for VOCs is recorded. Headspace air monitoring is conducted using a properly calibrated PID with a 10.6 electron volt (eV) lamp (e.g., RAE Systems by Honeywell MultiRAE or MiniRAE 3000+, ION Science Tiger XT; detection limit = 0.1 parts per million [ppm]). Regardless of whether VOCs are detected in the well headspace, an aliquot of water is then drawn from the well for observation (as accessible) using approved materials (i.e., single-use bailer). Observations of product and/or odor, or lack thereof, are made (e.g., visual observation of separate phase liquids, color, and clarity; character and strength of odor).

A single-use bailer is then used to draw water directly from the well column⁵. After retrieval to the surface, the drawn well water is transferred to laboratory-provided sample containers. The retrieval of the bailer to the surface and filling of sample containers with drawn well water is conducted in a manner that minimizes potential volatilization of VOCs from the water sample (e.g., each sample container will be properly filled with water and immediately sealed; a sample container will not be half-filled and left open while additional water is drawn from the well).

Samples are then sent to Pace Analytical in Westborough, Massachusetts for analysis of target analytes via US EPA Method 524.2 (for select VOCs), US EPA Method 504.1 (for 1,2-dibromoethane), and US EPA Method 200.8 (for lead)⁶. Pace Analytical in Westborough, Massachusetts is accredited for analysis of the target VOCs in drinking water via US EPA Method 524.2 and is accredited for analysis of EDB in drinking water via US EPA Method 504.1. The Westborough laboratory is not accredited for analysis of lead in drinking water; therefore, the Westborough laboratory sends the water sample collected for lead analysis to Pace Analytical in Mansfield, Massachusetts, and the sample is analyzed for lead by the Mansfield laboratory, which is accredited for analysis of lead in drinking water via US EPA Method 200.8.

Target analytes were selected based on analytical requirements for water testing related to refined petroleum products, including jet fuel, as outlined in the Short List of Petroleum Products in the Land Recycling Program Technical Guidance Manual established by the PA DEP. Target analytes are the following VOCs: benzene, toluene, ethylbenzene, total xylenes (calculated by adding the concentrations of m&p-xylene and o-xylene), isopropylbenzene, methyl tert-butyl ether (also known as methyl tertiary butyl ether or MTBE), naphthalene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and 1,2-dichloroethane (also known as ethylene dichloride or EDC); 1,2-dibromoethane (also known as ethylene dibromide or EDB); and lead (dissolved). Well water sampling did not include hexane or cyclohexane, as these compounds are not included on the Short List of Petroleum Products for water testing related to refined petroleum products; however, these compounds were included in the indoor air sampling program due to their listing on the SDS for one of the products (unleaded gasoline) that traveled through the impacted pipeline.

⁵ The three well water sampling events conducted to date have been performed using varied methodologies. Version 1.0 of the SAP outlined collection of well water using a HydraSleeve or equivalent no-purge groundwater sampling device. Due to technical limitations and the existence of alternative methodologies, the SAP was updated (Version 1.1) to outline collection of well water using a single-use bailer.

⁶ The well water sample at one of the three properties sampled to date was analyzed only for VOCs via US EPA Method 524.2. Analysis of 1,2-dibromoethane and lead via US EPA Methods 504.1 and 200.8, respectively, was not conducted.

5.4 Results

To evaluate potential vapor intrusion impacts to residences, well water sampling results were compared to the Residential groundwater Statewide health standard vapor intrusion screening values (Residential SV_{GW}) established by the PA DEP.

A summary of the preliminary well water sampling results is provided in **Table 5**. Aside from one detection of lead, no analytes were detected in any sample.

Preliminary results, including a cover letter and the preliminary laboratory report issued by Pace Analytical, were provided to each respective property owner between March 27 and April 2, 2025. The preliminary results were also shared with the PA DEP on April 1, 2025.

Table 5. Summary of Preliminary Well Water Sampling Results

Analyte	PA DEP Residential SV _{GW} (µg/L)	Number of Samples	Number of Detections	Range of Detections (µg/L)	Number Detected Above Residential SV _{GW}
Benzene	23	3	0	< 0.19	0
Toluene	34,000	3	0	< 0.19	0
Ethylbenzene	700	3	0	< 0.13	0
m&p-Xylene	10,000*	3	0	< 0.3	0
o-Xylene		3	0	< 0.19	
Isopropylbenzene	1,900	3	0	< 0.13	0
Methyl tert-butyl ether	6,300	3	0	< 0.13	0
Naphthalene	100	3	0	< 0.14	0
1,2,4-Trimethylbenzene	510	3	0	< 0.13	0
1,3,5-Trimethylbenzene	360	3	0	< 0.15	0
1,2-Dichloroethane	34	3	0	< 0.15	0
1,2-Dibromoethane	2.9	2	0	< 0.005	0
Lead	N/A	2	1	0.0007 (J) mg/L	N/A

µg/L = micrograms per liter. mg/L = milligrams per liter. N/A = No Residential SV_{GW} has been established for the analyte. Laboratory non-detections are reported as less than (<) the laboratory Method Detection Limit (MDL). Laboratory result qualifiers are reported to the right of corresponding detections (in parentheses). Definitions of reported qualifiers are as follows. J: Result is estimated between the laboratory method detection limit and reporting limit.

* The PA DEP Residential SV_{GW} is established for total xylenes. The concentration of total xylenes is calculated by adding the concentrations of m&p-xylene and o-xylene.

5.5 Additional Planned Activities

The preliminary well water sampling results are undergoing data validation by Environmental Standards. All sampling results are undergoing Stage II data validation, and 10% of the sampling results are

undergoing Stage IV data validation. If any issues with data quality are identified during data validation, Sunoco Pipeline personnel will notify the respective property owner and the PA DEP.

As of the date of this Report, no additional properties are scheduled for well water sampling. However, water sampling from additional selected wells in the Mt. Eyre Manor neighborhood may be conducted.

6.0 SUB-SLAB SOIL GAS SAMPLING

6.1 Progress to Date

As of the date of this Report, sub-slab soil gas sampling has been conducted at six residences on Glenwood Drive, Walker Road, and Spencer Road, in accordance with the Sub-Slab Soil Gas Sampling and Analysis Plan prepared by Verdantas personnel, dated June 2, 2025. The initial sub-slab soil gas sampling event was conducted by GES personnel on June 12, 2025. The preliminary results of the initial sub-slab soil gas sampling event have not yet been received.

6.2 Strategy

Residences selected for sub-slab soil gas sampling included the six residences previously selected for indoor air sampling. These residences were previously selected based on the results of potable well water sampling conducted at the residence by GES personnel. Specifically, residences were selected if water sampling results at the residence indicated detections of one or more volatile target analytes at a concentration above the Residential SV_{GW} established by the PA DEP, or if LNAPL was present in the potable water well at the residence. A total of six residences were selected for sub-slab soil gas sampling.

The objective of the sub-slab soil gas sampling program is to collect soil gas samples from beneath the slab (basement or slab-on-grade) of selected residences to use:

1. As an additional line of evidence for the evaluation of sampling results from indoor air samples collected in accordance with the Indoor Air Sampling and Analysis Plan; and
2. To evaluate potential vapor intrusion into inhabited buildings from soil and/or groundwater contamination associated with the pipeline release, including associated LNAPL.

6.3 Methods

Approximately 24 hours prior to the sub-slab soil gas sampling event, stainless steel Vapor Pin sampling devices were installed at two locations in the lowest level of each residence. Sampling locations were determined based on the specific characteristics of the building and were at least five feet from perimeter foundation walls and away from footers, large floor cracks, and slab penetrations (e.g., sumps, floor drains).

The Vapor Pin sampling device was installed by using a rotary hammer drill to drill a hole of 5/8-inch diameter through the slab. A wet/dry vacuum was used to remove cuttings from the hole, and the Vapor Pin sampling device was assembled and placed into the hole with the conical end down. The installation/extraction tool was then used to tap the Vapor Pin sampling device into place using a dead blow hammer while protecting the barb fitting of the Vapor Pin sampling device from damage. The Vapor Pin cap was placed on the Vapor Pin sampling device, and the sub-slab soil gas conditions were allowed to equilibrate for approximately 24 hours prior to the sub-slab soil gas sampling event.

Prior to the sub-slab soil gas sampling event, it was requested that residents remove potential sources of VOCs (e.g., fuel containers, paints, cleaning products, personal care products, candles) from the sampling location (lowest occupied level of the structure) at least 24 hours prior to sampling. On the day of sample collection, a pre-sampling survey was conducted with one resident from each residence, which included a questionnaire for the resident about building-specific factors that could potentially influence the concentration of VOCs in indoor air and sub-slab soil gas. During the pre-sampling survey, a visual and air monitoring assessment of accessible portions of the lowest level of the residence were also conducted to identify any items within the residence that could be potential sources of VOCs.

Sub-slab soil gas samples were then collected by attaching a 2.7-liter passivated stainless steel canister with a 30-minute regulator to the Vapor Pin sampling device using polytetrafluoroethylene (PTFE) tubing. Prior to initiating the sampling, the sampling train was purged of at least one sampling train volume using a graduated syringe connected to the sampling train. A hydrostatic test was performed during the sampling event to test the seal between the concrete slab and the Vapor Pin sampling device for leaks. Sub-slab soil gas samples were collected for a duration of approximately 15-30 minutes. After the sampling period, sub-slab soil gas samples were sent under chain-of-custody to Pace Analytical in Mansfield, Massachusetts, a National Environmental Laboratory Accreditation Program (NELAP)-accredited laboratory, for analysis of target analytes via US EPA Method TO-15⁷.

Target analytes were selected based on analytical requirements for soil and/or water testing related to refined petroleum products, including jet fuel, as outlined in the Short List of Petroleum Products in the Land Recycling Program Technical Guidance Manual established by the PA DEP. Specifically, all volatile parameters related to refined petroleum products, including jet fuel, were selected as target analytes for air sampling. Hexane and cyclohexane were additionally selected, as they were previously selected for indoor air sampling based on their listing on the SDS for one of the products (unleaded gasoline) that traveled through the impacted pipeline. Target analytes were the following VOCs: benzene, toluene, ethylbenzene, total xylenes (calculated by adding the concentrations of m&p-xylene and o-xylene), isopropylbenzene, methyl tert-butyl ether (MTBE; also known as methyl tertiary butyl ether),

⁷ Benzene, naphthalene, 1,2-dichloroethane, and 1,2-dibromoethane were analyzed using US EPA Method TO-15 in Selective Ion Monitoring (SIM) mode to achieve lower detection limits, consistent with the indoor air sampling program.

naphthalene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, 1,2-dichloroethane (EDC), 1,2-dibromoethane (EDB; also known as ethylene dibromide), hexane, and cyclohexane.

6.4 Results

The preliminary results of the initial sub-slab soil gas sampling event have not yet been received.

6.5 Additional Planned Activities

The preliminary sub-slab soil gas sampling results will undergo Stage IV data validation by Environmental Standards. If any issues with data quality are identified during data validation, Sunoco Pipeline personnel will notify the respective property owner and the PA DEP.

The PA DEP Land Recycling Program Technical Guidance Manual outlines that, for vapor intrusion assessment, a minimum of two sampling events should occur at least 45 days apart. In accordance with this guidance, a follow-up sub-slab soil gas sampling event is planned at the six residences sampled during the initial sub-slab soil gas sampling event. The second sampling event will be conducted in the same manner as the first sampling event and using the Vapor Pin sampling devices that were installed prior to the first sampling event. The second sub-slab soil gas sampling event is estimated to occur on or after July 27, 2025 (i.e., 45 days after the first sub-slab soil gas sampling event that occurred on June 12, 2025). The preliminary sub-slab soil gas sampling results collected during the second sampling event will also undergo Stage IV data validation by Environmental Standards.

In addition to the first phase of sub-slab soil gas sampling, which included six residences selected as outlined in Section 6.2, sub-slab soil gas sampling at additional selected residences in the Mt. Eyre Manor neighborhood may be conducted. If conducted, residences will be selected based on horizontal and vertical proximity distances of soil or groundwater with concentrations above the applicable Statewide health standard (SHS) screening values or identified LNAPL.

7.0 MITIGATION MEASURES

Vapor intrusion mitigation measures may be implemented and may include (but are not limited to) the inspection of pre-existing radon mitigation systems and the installation of sub-slab depressurization systems at select residences. If implemented, the installation of new vapor intrusion mitigation measures will be employed after adequate data is collected and validated to support decision making (e.g., after both the first and second indoor air sampling and sub-slab soil gas sampling events have been conducted and the data validated).

In the meantime, product recovery from groundwater is ongoing via recovery wells that were installed near the Site.

Attachment A

Site Location Map

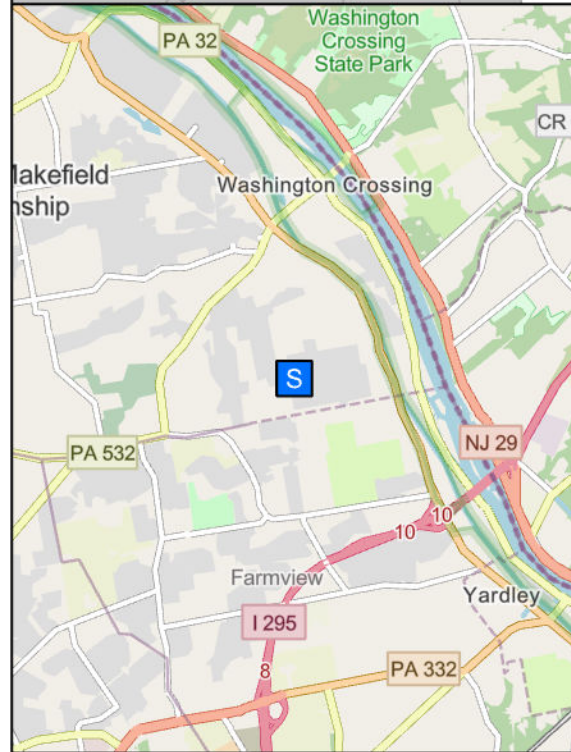
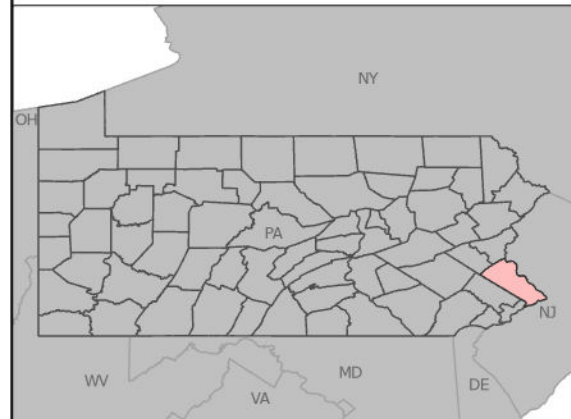


Upper Makefield Response

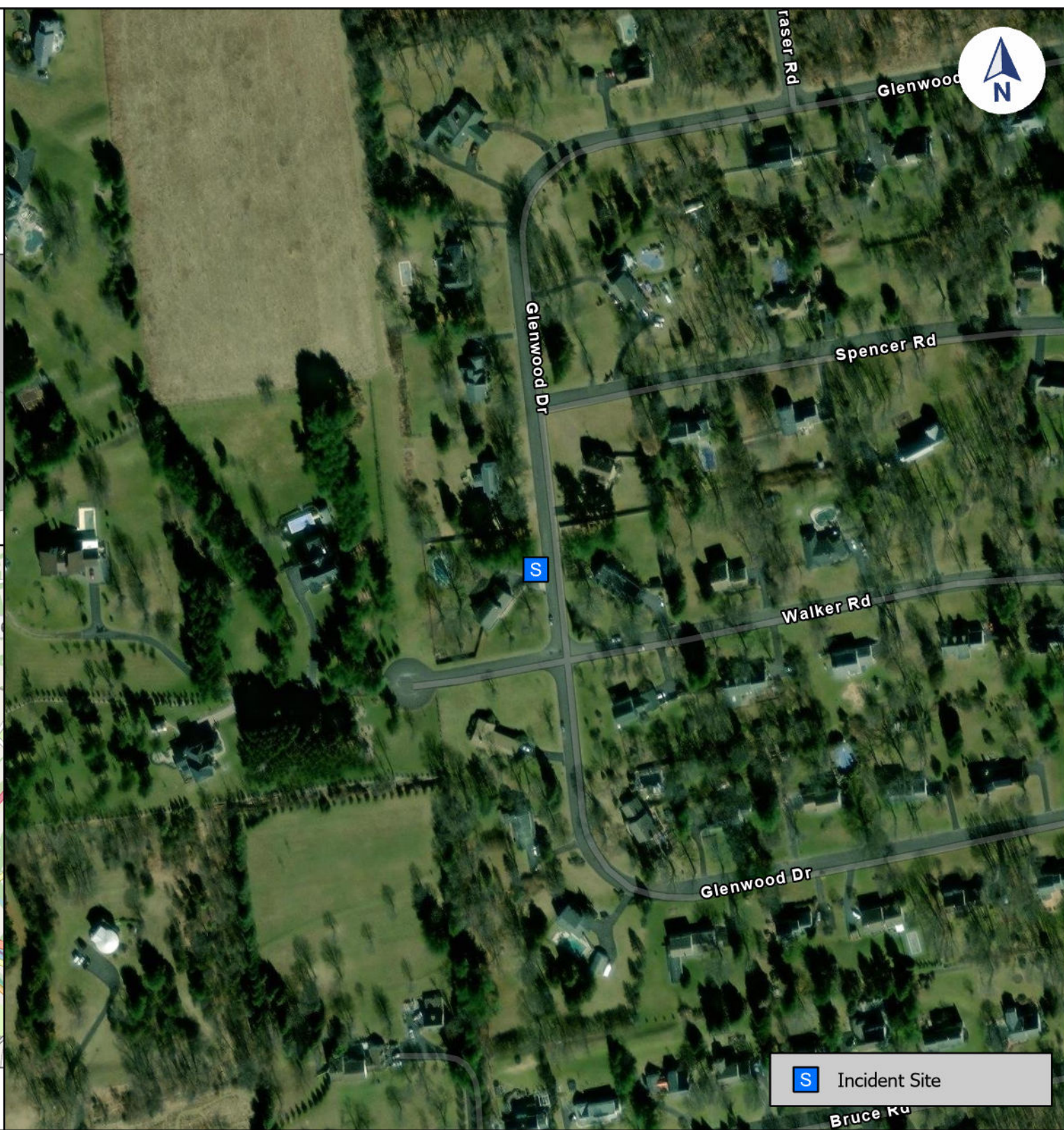
Incident Location

Washington Crossing, PA | Bucks County

PROJ-051861



Updated At: 2/15/2025 4:18 PM
Projection: NAD 1983 2011 StatePlane Pennsylvania South
FIPS 3702 Ft US



Incident Site