

## Appendix H.5

Potable Water Sampling and Analysis Plan

Version 1.4

July 24, 2025

*Note: Attachments not included*



UPPER MAKEFIELD RESPONSE  
WASHINGTON CROSSING, PENNSYLVANIA

**POTABLE WATER SAMPLING AND ANALYSIS  
PLAN (SAP)**


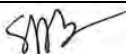
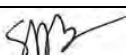
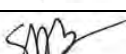

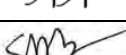

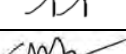
Version 1.4

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July 24, 2025

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## 1.0 Introduction and Purpose

This Potable Water Sampling and Analysis Plan (SAP) was prepared by CTEH, LLC (CTEH) on behalf of Sunoco Pipeline LP (Sunoco Pipeline) for potable well water monitoring and sampling performed by Groundwater & Environmental Services, Inc. (GES) personnel in relation to the Upper Makefield Response in Washington Crossing, Pennsylvania. 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 (hereinafter referred to as Site) are: 40.271184, -74.875953. A map of the incident location is provided in **Attachment A**.

The objectives of the potable well water monitoring and sampling are to:

1. Conduct air monitoring of influent, midfluent, and effluent water (as applicable) headspace and well water headspace, as accessible, as screening for volatile organic compounds (VOCs); and
2. Collect water samples from influent, midfluent, and effluent water sources (as applicable) fed by domestic potable wells to evaluate potential impacts to potable water related to refined petroleum products, including jet fuel, and their potential constituents.

## 2.0 Health and Safety

Field personnel will review and adhere to the site-specific Health and Safety Plan (HASP). Monitoring, sampling, and documentation activities will only be conducted under weather and other environmental conditions that do not create an unsafe working environment.

## 3.0 Data Quality Objectives

The data collected during field activities will be used to assess potential impacts to potable water related to refined petroleum products, including jet fuel, and their potential constituents and to evaluate the potential impacts to human health related to these constituents.

A strategic planning approach based on the scientific method will be employed for data collection activities, providing a systematic procedure to ensure that the type, quantity, and quality of data used in decision-making are appropriate for the intended application. All water samples will be submitted to the analytical laboratory for a Level II data quality package. Additionally, 10% of samples will be submitted to the analytical laboratory for a Level IV data quality package.

## **4.0 Potable Water Monitoring and Sampling Methods**

### **4.1 Location and Frequency**

Water samples will be collected from influent, midfluent, and effluent (as applicable) water sources fed by domestic potable wells within the Mt. Eyre Manor neighborhood topographic watershed plus a 500-foot buffer. A map of the geographical area within which domestic potable wells are eligible for sampling is provided in **Attachment B**.

One water monitoring/sampling event will initially be conducted per eligible residence. Subsequent monitoring/sampling events will be conducted in accordance with the frequency structure outlined in Section 9.0 and as requested by the property owner and/or Sunoco Pipeline personnel.

### **4.2 Headspace Air Monitoring**

Headspace air monitoring for total VOCs will be used as a field screening tool to provide an indicator of potential product presence. Water from each water sampling location (including influent, midfluent, and effluent sources, as applicable; see Section 4.3) and well column (as accessible) will be screened by conducting air monitoring for VOCs in the headspace. Headspace air monitoring will be conducted using a properly calibrated photoionization detector (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]).

#### **4.2.1 Influent, Midfluent, and Effluent Sources**

Prior to water collection, field personnel will flush the system for a minimum of five minutes with a fully opened faucet or valve to prompt the water lines to flush and the system water pump to engage. This flushing is intended to supplement the flushing of water that occurs through normal resident use.

Water from each water sampling location (including influent, midfluent, and effluent sources, as applicable; see Section 4.3) will then be collected, immediately placed into a clean 100-mL glass vial, and sealed with approximately 50% headspace remaining in the vial. After fifteen minutes, the vial will be slowly opened (minimizing the release of headspace volume), the inlet of the PID will be placed into the headspace of the vial, and the peak air monitoring reading for VOCs will be recorded.

#### **4.2.2 Well Column**

If accessible, the headspace of the well column will also be screened by removing the well cover, placing the inlet of the PID into the well headspace, and recording the peak air monitoring reading for VOCs. If VOCs are detected in the well headspace at a concentration greater than 1.0 ppm, an aliquot of water will be 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, will be made (e.g., visual observation of separate phase liquids, color, and clarity; character and strength of odor).

If observations of product and/or odor indicate the presence of product in a well, an oil-water interface probe will be used to measure the thickness of light non-aqueous phase liquid (LNAPL) in the well (e.g., Solinst Model 122 Interface Meter). Additional site investigation(s), including but not limited to additional sampling and/or manual removal of product, may be performed.

The aliquot of drawn well water will be disposed of in accordance with the Waste Management Plan. If a wellhead is inaccessible or the well column is blocked, field personnel will document the reason and report the finding to the project lead for potential follow up.

### **4.3 Potable Water Sampling**

As noted in Section 4.2.1, prior to sample collection, field personnel will flush the system for a minimum of five minutes with a fully opened faucet or valve to prompt the water lines to flush and the system water pump to engage.

Field personnel will determine the presence/absence of a water filtration system through property owner questionnaire and/or visual inspection. If a home has a filtration component installed (e.g., carbon filter, Point-of-Entry Treatment [POET] system), the field personnel will collect a pre-treatment water sample at the influent source (e.g., bladder tank or pre-treatment sampling port) and a post-treatment water sample at the effluent source (e.g., kitchen faucet or post-treatment sampling port). For POET systems that contain a midport valve, field personnel will also collect a mid-treatment (midfluent) water sample from the midport valve. If a pre-treatment water sample at the influent bladder tank cannot be collected due to accessibility issues, field personnel will document the reason and will collect a post-treatment water sample at the nearest accessible location (e.g., closest to the pre-treatment water source). If the home does not have a filtration component installed, field personnel will collect a single sample at the kitchen faucet.

If a sample is collected from a faucet, field personnel will remove the faucet aerator (as applicable based on faucet design and as permitted by the property owner) prior to sample collection. During sample collection, water flow from the faucet will be as slow as possible without dripping.

Observations of product and/or odor (or lack thereof) will be made during each water sampling event (e.g., visual observation of separate phase liquids, color, and clarity; character and strength of odor). Observations will be recorded in the field form, along with other details about the residence and sampling event (**Attachment C**).

### 4.3.1 Sampling Methodology and Analysis

Target analytes were 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 Pennsylvania Department of Environmental Protection (PA DEP). Target analytes are the following VOCs: benzene, toluene, ethylbenzene, total xylenes, 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).

Water samples will be collected in laboratory-supplied sample containers and submitted to Pace Analytical in Westborough, Massachusetts for analysis of target analytes, as outlined in **Table 1**.

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 will send the water sample collected for lead analysis to Pace Analytical in Mansfield, Massachusetts, and the sample will be analyzed for lead by the Mansfield laboratory, which is accredited for analysis of lead in drinking water via US EPA Method 200.8.

**Table 1. Summary of Analytical Methods**

Analysis	Method	Sample Container	Preservative	Hold Time
Volatile Organic Compounds <sup>1</sup>	US EPA Method 524.2	3 x 40-mL VOAs, preservative: hydrochloric acid (HCl) <sup>2</sup>	HCl to pH < 2; Ice, maintained at 0-6°C	14 days
1,2-Dibromoethane (EDB)	US EPA Method 504.1	2 x 40-mL VOAs, preservative: sodium thiosulfate (Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> )	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> to pH < 2; Ice, maintained at 0-6°C	14 days
Lead <sup>3</sup>	US EPA Method 200.8	1 x 250-mL poly, preservative: nitric acid (HNO <sub>3</sub> )	HNO <sub>3</sub> to pH < 2; Ice, maintained at 0-6°C	180 days

<sup>1</sup> Benzene, toluene, ethylbenzene, total xylenes, isopropylbenzene, methyl tert-butyl ether (MTBE), naphthalene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and 1,2-dichloroethane (EDC)

<sup>2</sup> If the water source has recently been chlorinated, the water sample collected for VOCs analysis will be collected using 2 x 40-mL VOAs, preservative: ascorbic acid (C<sub>6</sub>H<sub>8</sub>O<sub>6</sub>) with HCl added to the water sample in the field to pH < 2, per guidance provided by Pace Analytical.

<sup>3</sup> The water sample collected for lead analysis is sent from Pace Analytical in Westborough, Massachusetts to Pace Analytical in Mansfield, Massachusetts, and is analyzed for lead by the Mansfield laboratory, which is accredited for lead analysis in drinking water via US EPA Method 200.8.

## 5.0 Sample Handling and Documentation

### 5.1 Sampling Handling

Water samples will be collected in laboratory-supplied sample containers appropriate for the intended analysis, packaged, labeled, and immediately placed in a cooler and retained on ice pending laboratory analysis. Custody seals will be placed on each sample-containing cooler, and chain-of-custody procedures

will be maintained from the time of sample collection until arrival at the laboratory to protect sample integrity. Samples will be shipped or otherwise transported to the laboratory within a timeframe that meets recommended holding times.

## 5.2 Sample Labeling

Sample containers will be clearly labeled with the following information:

- Unique sample identification;
- Sample matrix;
- Sampler name or initials;
- Date and time of sample collection;
- Analysis to be performed; and
- Bottle and preservative type.

Labeling may include quality assurance (QA) sample designations (e.g., for matrix spike/matrix spike duplicate [MS/MSD] samples or field duplicate samples).

## 6.0 Quality Assurance

Field activities, including water sampling, will be carried out in conjunction with a well-defined field quality assurance (QA) program and in accordance with the Quality Assurance Project Plan (QAPP) that accompanies this SAP. The field QA program refers to the sampling, analysis, and data validation procedures that will be performed for generating valid and defensible data, including to document that samples are collected without accidental cross- or systematic contamination. The types of quality control (QC) samples that will be collected are outlined in **Table 2**.



**Table 2. Summary of Quality Control Samples**

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria*
Trip Blank (TB), matrix matched <sup>1</sup>	VOCs	One per cooler	Accuracy / Bias / Contamination	Target analyte(s) detected in the associated field samples must have concentrations < 1/2 the LOQ
Field Duplicate	All	One per 10 field samples per matrix	Precision / Representativeness	If both the original and duplicate results are $\geq 5 \times$ LOQ, the RPD is recommended to be $\leq 30\%$ for aqueous samples. If either the original or duplicate results are < $5 \times$ LOQ, the difference should be $\leq$ the LOQ for aqueous samples.
Matrix Spike/ Matrix Spike Duplicate (MS/MSD) <sup>2</sup>	All, excluding pH	One per 20 field samples per matrix	Accuracy / Bias / Contamination / Representativeness	Accuracy and precision criteria as documented by the laboratory
Cooler Temperature Blank <sup>3</sup>	Temperature only	One per cooler	Representativeness	Upon arrival at the laboratory, samples may not exceed 6°C, and aqueous samples may not be frozen. For samples received the same day of collection, evidence of cooling must be present. During laboratory storage, samples must be maintained at a temperature between 0°C and 6°C. Samples must not be frozen, with the exception of water-preserved VOC samples, which must be frozen within 48 hours of collection.

\* LOQ = Limit of Quantitation, RPD = relative percent difference

<sup>1</sup> TBs will be included in bottle shipments from the laboratory. Aqueous TBs will be prepared using VOC-free water in a 40-mL preserved VOA with no headspace. At the sampling site, a TB will be packed in each cooler containing VOC samples and shipped to the laboratory with the site samples and required documentation (i.e., chain-of-custody form).

<sup>2</sup> Known quantities of the method analytes are added to this preserved field sample in the laboratory. The MS is processed and analyzed exactly like a sample to determine whether the sample matrix contributes bias to the analytical results. The background concentrations of the analytes in the sample matrix must be determined in a separate sample extraction, and the measured values in the MS must be corrected for background concentrations.

<sup>3</sup> Samples requiring thermal preservation must be placed on ice upon collection. If no temperature blank is provided, a representative sample container from each cooler will be used to measure the temperature (with an infrared thermometer).

## **6.1 Field Calibration**

Instruments used in the field as part of this sampling program will consist of PIDs and handheld data collection devices such as tablets/smartphones. PID instruments will be maintained and calibrated daily in accordance with manufacturer recommendations and instructions (e.g., using 100 ppm isobutylene calibration gas). Operators of each instrument are responsible for maintaining (including proper battery charge) and operating the equipment such that it conforms to manufacturer specifications.

## **6.2 Trip Blanks**

Trip blanks identify contamination in on-site sample handling and transportation. They are prepared by the laboratory and travel with samples to and from the laboratory to ensure that any detections of target analytes in investigative samples are not a result of contamination during the handling or sampling process prior to analysis. One trip blank will be placed in each sample-containing cooler prior to transport to the laboratory for analysis of VOCs.

## **6.3 Field Duplicate Samples**

For approximately every ten samples collected in the field, one field duplicate sample will be collected and submitted for laboratory analysis to verify the reproducibility of the sampling methods. Field duplicate samples will be collected at the same time and location as the parent sample and will be submitted as a separate sample to the laboratory for analysis consistent with the proscribed analyses.

## **6.4 Field Split Samples**

Split sampling is a technique in which multiple samples are collected from the same location at the same time and sent to separate laboratories for analysis. Split sampling may facilitate sampling across multiple parties (e.g., stakeholders, regulatory agencies) and/or may be collected to verify the accuracy of the data being reported. Field split samples may be collected as requested by Sunoco Pipeline personnel.

## **6.5 Matrix Spike/Matrix Spike Duplicate Samples**

Matrix spike/matrix spike duplicate (MS/MSD) samples refer to field samples spiked at the laboratory with the target analytes prior to analysis to assess method performance and any effects of matrix interference. Approximately one in twenty samples will be analyzed as MS/MSD samples.

## **6.6 Laboratory Quality Assurance**

Laboratory QC procedures will be conducted in accordance with the laboratory Standard Operating Procedures (SOP), which are referenced in the QAPP that accompanies this SAP. Deliverables will contain the supporting documentation necessary for data validation. Internal laboratory QC checks will include

method blanks, matrix spike/matrix spike duplicate samples, surrogate samples, calibration standards, and laboratory control standards (LCS).

## 6.7 Data Verification/Validation

Third-party data verification/validation will be performed by Environmental Standards, Inc. Data verification/validation will include, at a minimum, sample holding times, accuracy, precision, contamination of field-generated or laboratory method blanks, and surrogate compound recovery. Accuracy will be determined by evaluating LCS and MS recovery. Precision will be determined by evaluating laboratory and field duplicate samples.

Level II data verification will be performed on 100% of the samples. Additionally, Level IV data validation will be performed on approximately 10% of the samples. The components of data verification/validation are summarized in **Table 3**.

**Table 3. Summary of Data Verification/Validation Levels**

Data Verification/ Validation Level	Definition
Level I	Sample data reporting only
Level II	Complete QC, including data blanks, spikes, duplicates (including matrix spike duplicates), laboratory control samples, relative percent difference (RPD), and percent recovery
Level III	Items listed in Level II plus QC limits and QA batch cross-reference table
Level IV	Items listed in Levels II and III, including sample raw data and chromatograms

## 7.0 Decontamination and Waste Disposal

### 7.1 Decontamination

Decontamination procedures refer to the steps taken to minimize the potential for off-site contamination and cross-contamination between individual sampling locations. Prior to collecting a sample, any non-disposable sampling equipment which come into contact with sampling media will be decontaminated using a bristled brush and a solution comprised of a laboratory-grade, non-phosphate detergent (e.g., Liquinox) and distilled water. Depending on ancillary activities being conducted, the decontamination of sampling equipment may be conducted over poly sheeting at the sample location or in a nearby designated area. The sampling equipment to be decontaminated will first be placed in a container with detergent solution and thoroughly washed using a bristled brush. The items will then be transferred to a second container with distilled water for rinsing. Following the initial rinsing, the item will be held over a third container while distilled water is carefully decanted over each item. Decontaminated items will be wrapped in clean aluminum foil for transit to the next sampling location.

Nitrile gloves will be worn by sampling personnel and changed between activities at each discrete sample collection location. Previously worn nitrile gloves will be discarded in appropriate waste receptacles for personal protective equipment (PPE).

## **7.2 Waste Disposal**

Decontamination fluids, used PPE, and drawn well water will be containerized and collected at the designated on-site waste staging area. All waste produced on-site will be managed and disposed of in accordance with the Waste Management Plan.

## **8.0 Data Analysis**

Validated water sampling results will be used to evaluate the potential impacts to potable water related to jet fuel and its potential constituents. Water sampling results will be reviewed for the presence/absence of target analytes and, if a target analyte is detected, the concentration of that analyte will be compared to relevant screening levels. Background concentrations of target analytes may be determined by evaluating the results of water samples collected from influent, midfluent, and effluent water sources (as applicable) fed by domestic potable wells located upgradient or cross-gradient of the Site, or by obtaining publicly available data to determine historic background concentrations.

Prior to data validation, preliminary water sampling results issued by the laboratory will be provided to Sunoco Pipeline personnel, who will share the results with individual property owners. Sharing preliminary sampling results will enable property owners to receive their water sampling results in a timelier manner, rather than waiting for data validation to be completed before sharing water sampling results. If any issues with data quality are identified during data validation, Sunoco Pipeline personnel will notify the individual property owner.

### **8.1 Screening Levels**

Sampling results will be compared to the Statewide health standard Medium-Specific Concentrations (MSCs) for Organic and Inorganic Regulated Substances in Groundwater, as established by the State of Pennsylvania in Title 25 of the Pennsylvania Code, Chapter 250: Administration of Land Recycling Program (25 Pa. Code § 250.2).

If water sampling results indicate that concentrations of target analytes are below their respective MSCs, no further action will be required, and subsequent monitoring/sampling events will be conducted in accordance with the frequency structure outlined in Section 9.0. If water sampling results indicate that concentrations of target analytes are above their respective MSCs, subsequent monitoring/sampling events will be conducted in accordance with the frequency structure outlined in Section 9.0, and additional site investigation(s), including but not limited to additional sampling, may be performed.

## 9.0 Frequency of Re-Sampling Events

Subsequent monitoring/sampling events will be conducted in accordance with the frequency structure outlined in **Tables 4** and **5** and as requested by the property owner and/or Sunoco Pipeline personnel. The frequency of subsequent monitoring/sampling events for residences that had POET systems installed related to this incident is outlined in **Table 4**.

**Table 4. Summary of Re-Sampling Frequency for Residences with POET Systems\***

Description	Frequency
Residences on Glenwood Drive, Walker Road, Spencer Road, or Crestwood Road that had POET systems installed and where LNAPL has been observed in the potable water well	Monthly
Residences on Glenwood Drive, Walker Road, Spencer Road, or Crestwood Road that had POET systems installed but where LNAPL has not been observed in the potable water well	Bimonthly
Residences that had POET systems installed and where previous sampling event(s) indicated detections of VOC(s) above the MSC(s)	Bimonthly
Residences that had POET systems installed and where previous sampling event(s) indicated detections of VOC(s) below the MSC(s), including J-flagged detections	Quarterly
Residences within the Mt. Eyre Manor neighborhood topographic watershed plus a 500-foot buffer that do not fit the descriptions above but had POET systems installed	Quarterly

\* POET = Point-of-Entry Treatment; LNAPL = light non-aqueous phase liquid; VOC = volatile organic compound; MSC = Medium-Specific Concentration; bimonthly = every other month

The frequency of subsequent monitoring/sampling events for residences that have potable water wells but did not have POET systems installed related to this incident is outlined in **Table 5**.

**Table 5. Summary of Re-Sampling Frequency for Other Residences\***

Description	Frequency
Residences that have potable water wells and where previous sampling event(s) indicated detections of VOC(s) above the MSC(s) <sup>1</sup>	Monthly
Residences on Glenwood Drive, Walker Road, Spencer Road, or Crestwood Road that have potable water wells	Bimonthly
Residences that have potable water wells and where previous sampling event(s) indicated detections of VOC(s) below the MSC(s), including J-flagged detections	Quarterly
Residences within the Mt. Eyre Manor neighborhood topographic watershed plus a 500-foot buffer that do not fit the descriptions above but have potable water wells	Quarterly

\* VOC = volatile organic compound; MSC = Medium-Specific Concentration; bimonthly = every other month

<sup>1</sup> Residences that fit this description will be offered a POET system, after which the re-sampling frequency will follow that outlined in Table 4 for residences with POET systems.

## 10.0 Records Management

Records management refers to the procedures for generating, controlling, and archiving project-specific records and records of field activities. Project records, particularly those that are anticipated to be used as evidentiary data, directly support current or ongoing technical studies and activities, and provide historical evidence needed for later reviews and analyses, will be legible, identifiable, retrievable, and protected against damage, deterioration, and loss on a centralized electronic database. Handwritten records will be written in indelible ink. Records may include, but are not limited to, the following: bound field notebooks on pre-numbered pages, sample collection forms, personnel qualification and training forms, sample location maps, equipment maintenance and calibration forms, chain-of-custody forms, maps and drawings, transportation and disposal documents, reports issued as a result of the work, procedures used, correspondences, and any deviations from the procedural records. Documentation errors will be corrected by drawing a single line through the error so that it remains legible and writing the correction adjacent to the error; the change will be initialed by the responsible individual, along with the date of change.