INDOOR AIR MONITORING PLAN
BUILDING B-2
STRATFORD ARMY ENGINE PLANT

Prepared For:

TACOM - SAEP
USACE NEW ENGLAND DISTRICT

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1.0 INTRODUCTION

This monitoring plan has been prepared to outline the requirements and methods to be used to monitor indoor air quality in Building B-2 of the former Stratford Army Engine Plant. The purpose of the indoor air monitoring program is to document whether indoor air quality complies with the limits established under the Connecticut Department of Environmental Protection (CTDEP) Remediation Standard Regulations (RSRs), prior to sale or lease of Building B-2.

In August 1999, a soil vapor survey with on-site analysis was conducted beneath the majority of buildings at SAEP. Exceedances of CTDEP RSRs for soil vapor have been observed beneath the central portion of Building B-2. The soil vapor survey data is preliminary, but off-site confirmatory analytical results indicate concentrations of trichloroethylene (TCE) in soil vapor up to one order of magnitude higher than the CTDEP RSR of 16 ppmv.

The air quality objectives of this monitoring plan are outlined below:

1. Document indoor air quality concentrations of target contaminants of concern for averaging periods that correspond to the CTDEP "Industrial/Commercial Target Indoor Air Concentration" standards.
2. Document whether the source of contaminants of concern (COCs) found in the indoor air quality is from subsurface contaminants or contaminants found in the background ambient air.
3. Document the variability of indoor air quality concentrations over time.
4. Document the average and maximum air quality concentrations in the central portion of Building B-2. The average concentrations will be used to document potential worker exposure levels and the maximum concentrations will be used to document hotspot areas within the building to evaluate potential mitigative measures, if necessary to reduce indoor COC concentrations.

2.0 MONITORING LOCATIONS AND SCHEDULE

Indoor air monitoring will be conducted at five locations within the interior of the warehouse. Each monitoring location will be placed according to the following criteria:

- Minimum of 35 feet from any wall or other obstruction to airflow; or,
- Minimum unrestricted airflow of at least 270 degrees around the sample inlet; and
- Sample inlet height of 5 feet above grade. This will be achieved either through placement of the monitoring canister on a platform, or extending the inlet from the monitoring canister to 5 feet through use of ¼" teflon tubing.

One of the indoor monitoring locations will be located in the vicinity of the subsurface hotspot associated with soil vapor sample SG-99-04 (se Figure 1). The remaining four monitoring locations will be distributed within an approximate radius of 200 feet from the identified hotspot (see Figure 1). Hotspot locations are areas of elevated soil gas concentrations detected during a soil gas survey conducted within various areas beneath the floor of Building B-2.

In order to identify the source of any COCs detected during the monitoring program, two outdoor monitoring locations will be selected along the perimeter of the site in an upwind location based on the prevailing local wind direction observed during the monitoring period. The proposed monitoring locations are between Buildings B-2 and B-13, and in the West Parking Lot (see Figure 1). These monitoring locations will be used to determine background COC concentrations in the ambient air.

3.0 MONITORING AND ANALYTICAL METHODS

All air samples will be collected and analyzed in accordance with a modified EPA TO-14 method. The TO-14 method uses gas chromatography/mass spectrometry (GC/MS) to analyze for a select series of volatile organic compounds. The monitoring and analysis procedures will follow the EPA TO-14 method, with the exception that the samples will be analyzed for the COCs, not the full TO-14 analyte list. The level of detection of the analytical method will be approximately 0.1 to 10 parts per billion (ppb) for most compounds analyzed. The target list of COCs, based on the preliminary data from the soil gas sampling program, is listed below:

Contaminants of Concern (COCs)
1,1,1-Trichloroethane
1,1-Dichloroethene
Perchloroethylene
Trichloroethylene
Vinyl Chloride

Monitoring will be conducted over an 8-hour period between 7 am and 3 pm. This period corresponds to the Industrial/Commercial Target Indoor Air Concentrations under the CTDEP regulations. The EPA TO-14 method uses an evacuated SUMMA©canister to draw an air sample for subsequent analysis. The use of a SUMMA© canister eliminates the need for pumps and sampling media and associated equipment calibration activities. A 15 liter SUMMA© canister will be used to ensure sufficient sample volume over the 8-hour monitoring period. Standard operating procedures for collecting canister samples are outlined in Appendix A.

Two sampling events will be conducted: one at a time of high atmospheric pressure, and the other at a time of low atmospheric pressure.

At the conclusion of the monitoring event, the SUMMA© canisters will be removed from the monitoring location, canister pressure checked and recorded, flow controller removed and valve closed and covered to prevent contamination during shipping. The canisters will then be labeled with the monitoring location ID number, date and total monitoring time, and placed into a shipping container. Chain-of-custody forms will also be filled out and placed with the samples for shipment to the analytical laboratory. When filling out the chain-of-custody forms, the sampling technician will identify the analytes to be analyzed using the EPA TO-14 method.

Weather observations will be recorded at the start and finish of the monitoring program. These data will be used to interpret the monitoring data, as necessary. Local wind directions will be recorded based on visual observations, since winds are strongly influenced by site specific conditions. All other meteorological data will be obtained from the closest National Weather Service (NWS) Station or from a local weather report. Meteorological data to be recorded will include: wind speed, wind direction, temperature, relative humidity, and atmospheric pressure.

3.0 MONITORING AND ANALYTICAL METHODS

Air Toxics Limited (ATL) in Folsom, California or an equivalent laboratory will be used for all sample analysis. ATL is a laboratory specializing in the analysis of toxic air samples, and is certified through various State environmental laboratory approval programs. ATL also participates in the USEPA's Superfund Special Analytical Services (SAS) National Standards Institute (NSI) audit canister program.

Indoor air quality concentrations will vary during changes in weather patterns due to atmospheric pressure changes, and to a lesser extent, temperature changes. Therefore, air monitoring will be conducted during two separate monitoring events. This will provide information on the variability of COC concentrations during varying weather conditions.

Field Monitoring Data Logs will be used to record all data on sampling times and canister readings. A map will be marked up to identify the actual monitoring locations selected in the field. Distances from property boundaries, walls, beams, etc. will be recorded in order to verify locations in the future, if necessary.

4.0 QUALITY ASSURANCE/QUALITY CONTROL MEASURES

Quality assurance (QA) and quality control (QC) checks will be performed to evaluate the accuracy and precision of both the monitoring and analytical methods. The QA/QC checks will include the following standard procedures:

- 10 percent method blanks and spikes;
- 10 percent field blanks; and
- daily duplicate field samples.

In order to provide a quality assurance check on the sample analysis procedures, 10 percent method blanks and spikes will be analyzed by the laboratory for each monitoring event. The method blank is performed by analyzing ultrapure air evacuated into the canister. The method blank is used to identify the background concentration of contaminants that may be present in the SUMMA canisters. The method spike is performed by analyzing a known concentration of each COC, which is injected into a clean canister, then extracted for subsequent analysis. The method spike measures the efficiency of recovery of the analyte during the TO-14 SUMMA© canister extraction procedure.

A field blank will be analyzed for the sample canisters to identify potential contamination during shipping and/or handling of the samples. The field blank will be obtained by simulating monitoring through testing the canister pressure, installing and removing the flow controller, capping and sealing the canister, then packing the canister for shipment with the actual field samples. The field blank includes all sample handling activities with the exception that air is not drawn into the canister. One field blank will be obtained for every 10 samples collected.

To test the precision of the monitoring and analytical methods, a duplicate co-located sample will be obtained at one monitoring location from either the indoor or outdoor air samples. The results of the primary and secondary (duplicate) samples will be compared to determine the variation in the COC concentrations measured. A duplicate sample will be obtained during each monitoring event.

5.0 DATA REPORT FORMAT

All data results will be tabulated for each monitoring location. If the COCs are detected in the outdoor ambient air samples, these concentrations will not be subtracted from the indoor air results. However, if significant concentrations are found in the ambient air that cause an exceedance of the CTDEP Industrial/Commercial Target Indoor Air Concentrations, then external air emission sources will need to be investigated. The CTDEP standards are outlined below for each of the COCs:

Chemical of Concern	Industrial/Commercial Target Indoor Air Conc. ($\mu g/m^3$)
1,1,1-Trichloroethane	1,460
1,1-Dichloroethene	0.0818
Perchloroethylene	11
Trichloroethylene	5
Vinyl Chloride	0.0487

EPA Method TO-14 provides a measurement of the COC concentrations in ppmv. Because the analytical instrumentation is calibrated at standard temperature and pressure, the laboratory results do not require any temperature and pressure correction for comparison to the CTDEP Industrial/Commercial Target Indoor Air Concentrations. However, to adjust the concentrations to obtain common units as the standards, the following equation must be used:

$$\text{Conc } (\mu g/m^3) = \text{Conc (ppmv)} \times \text{Molecular Weight} / 0.02404$$

Average and maximum concentrations will be tabulated for each COC at each monitoring location. The average indoor concentrations will be computed for comparison to the CTDEP Industrial/Commercial Target Indoor Air Concentrations. Monitoring methods will be summarized in the report and any specific conditions encountered during the monitoring event will be documented in the report to assist in evaluating the final data results. All QA/QC results will be summarized in the report with discussions on the data validity based on the QA/QC results. All field monitoring logs, chain-of-custody logs, and analytical laboratory reports will be included in an appendix to the final data report. The final laboratory report will provide all backup equipment calibration data and gas chromatographs along with the results of the QA/QC checks.

APPENDIX A

Standard Operating Procedures for Monitoring with EPA Method TO-14

1.0 APPLICABILITY

This document describes the procedures to be used for the routine operation of SUMMA© passivated canisters. The canisters are used to sample ambient air for the determination of volatile organic compounds (VOCs) by EPA Method TO-14.

2.0 DOCUMENTATION REQUIRED

The following documentation should be completed by the field personnel:

AQ Form 1: Canister Sampling Data Sheet

AQ Form 2: Chain of Custody Form

3.0 EQUIPMENT REQUIRED

6 or 15L SUMMA© passivated canisters
30 PSIG Vacuum gauge
9/16" wrench or adjustable wrench
Flow controller
Flow meter (rotometer or digital flow meter) and connecting plumbing (only required if adjusting flowrate in the field)
Tripod
1/4" OD Teflon (3-5 ft)
1/4" Swagelock nuts
Packing tape

Note: for 24 hour samples, a 15 L canister may be preferred. The larger canister volume allows the use of a higher flow rate, which will maintain a more stable flow. A critical flow orifice is also recommended for 24 hour sampling, to avoid unstable flows.

4.0 SAMPLING METHOD

Method TO-14 is based on the collection of whole air samples in SUMMA© passivated stainless steel canisters. A 6 Litre (L) or 15 L canister is used that has been certified cleaned and evacuated to a pressure of -30 pounds per square inch gauge (psig) prior to sampling. During sampling, the canister collects a sample by regulating the flow rate into the canister through a stainless steel precleaned flow controller. The canister vacuum is checked periodically during sampling to maintain a flow rate that will result in a final vacuum pressure between -5 and -15 psig. The canister should never be evacuated to atmospheric pressure. Figure 1 is a diagram of a typical canister based sampling system.

4.1 Equipment Setup

The following steps should be followed when setting up the canister for sampling:

Step 1: Check the initial vacuum of the labeled canister by removing the brass cap from the canister and connecting the vacuum gauge to the canister, then opening the valve. The pressure should read -30 psi, ± 2 psi. Record the canister starting pressure in AQ Form 1. *Make sure the pressure gauge is capped off on the outlet or the canister will evacuate immediately and cannot be used.*

Step 2: Record the vacuum on the canister label and the canister sampling data sheet, AQ Form 1.

Step 3: Close the canister valve (hand tight) and remove the vacuum gauge. Do not overtighten the valve, but ensure the valve is closed. *Make sure the valve is closed before removing the gauge or the canister will evacuate immediately and cannot be used.*

Step 4: Remove the brass cap and plastic plug from the flow controller. If the flow controller has not been preset in the laboratory, it will need to be adjusted to the proper flowrate setting. The flowrate setting should be established by dividing 75% of the canister volume (maximum fill level) by the total sampling time (ltr/min).

Step 5: Connect the flow controller outlet, "LP" to the canister. Using the 9/16" wrench tighten the nut (on the flow controller) 1/4 turn beyond finger tight. Verify the tightness of the connection by attempting to rotate the flow controller. It should <u>not</u> be possible to rotate the controller.

Step 6: Connect the filter to the flow controller inlet ("HP"). Tighten the filter to the flow controller using the 9/16" wrench. The filter prevents dust or particulates from entering the flow controller.

Step 7: Connect the inlet of the filter to a length of teflon tubing using a 1/4" swagelock nut fitting. Fasten the tubing to a tripod or other device to ensure the inlet is located at the appropriate sampling height. For outdoor sampling, the teflon tubing should be angled downward to avoid precipitation from entering the sampling line.

Step 8: Once the sampling system is placed at the sampling location, open the canister valve to initiate sampling. Record the sample start time on AQ Form 1. If a critical flow orifice is used to control the sampling flowrate, the canister pressure does not need to be tested during the sampling period.

4.2 Equipment Teardown

After sampling is complete, perform the following procedures:

Step 1: Close the valve on the canister, remove the tripod, and remove the canister from the sample location.

Step 2: Check the final pressure of the labeled canister by removing the flow controller and filter, connecting the vacuum gauge to the canister, and opening the valve. The pressure should be between -5 and -15 psig (optimal pressure is -10 psig). Record the final vacuum on the canister label and in AQ Form 1. *Make sure the pressure gauge is capped off on the outlet or the canister will evacuate immediately and cannot be used.*

Step 3: Close the canister valve and then remove the vacuum gauge. Make sure the valve is closed or the sample will be lost. Do not overtighten the valve.

Step 4: Send the labeled canister accompanied with a chain-of-custody form (AQ Form 2) to the laboratory for analysis. Indicate on the chain-of-custody form the sample ID number, the date and time of sampling, the sampling location, the analytical method to be used, and the compounds to be analyzed for. Sign the form in the first "reliquished by" signature box.

AQ FORM 1
CANISTER SAMPLING DATA SHEET

Network:

Sampled By:

Site Location:

Sampling Date:

Sample ID No.	Sampling Location	Start Time	End Time	Total Sample Time	Canister Start Pressure (psig)	Canister End Pressure (psig)

Comments:

AQ FORM 2
CHAIN OF CUSTODY FORM

Network

Site Location

Sampled By:

ANALYSES (List analytical method and compounds to be analyzed)

Sample No./ Identification	Date	Time	Sampling Location	Lab Sample Number							

Relinquished by: (*Signature*)	Date	Time	Received by: (*Signature*)	Date	Time
Relinquished by: (*Signature*)	Date	Time	Received for Laboratory: (*Signature*)	Date	Time
Sample Disposal Method:			Disposed of by: (*Signature*)	Date	Time
SAMPLE COLLECTOR		ANALYTICAL LABORATORY			