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INDOOR AIR MONITORING PLAN
STRATFORD ARMY ENGINE PLANT
Stratford, Connecticut

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Prepared for

TACOM-SAEP
U.S. Army Corps of Engineers
New England District
Concord, Massachusetts

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STRATFORD, CONNECTICUT

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1.0 INTRODUCTION

This monitoring plan has been prepared to outline the requirements and methods of continued monitoring of indoor air quality in Buildings B-1, B-2, B-3, B-6, B-10, B-12, and B-65 of the former Stratford Army Engine Plant (SAEP). The purpose of the indoor air monitoring program is to document indoor air quality in selected currently occupied and unoccupied areas of the facility, and evaluate the air quality for continued and future occupancy. The program will consist of both monthly 8-hour and quarterly 7-day sampling rounds over a period of one year. Air quality will be compared to the limits established under the Connecticut Department of Environmental Protection (CTDEP) Remediation Standard Regulations (RSRs) and previous sample results. Monthly monitoring data will be summarized, and the indoor air risk screening previously prepared by Harding ESE (Indoor Air Rounds 1-10 Technical Memorandum, September 28, 2000) shall be updated twice during the proposed 12-month monitoring period.

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 were observed at the facility for select volatile organic compounds (VOCs). In September 1999 two rounds (rounds 1 and 2) of indoor air monitoring were performed in Building B-2 (HLA/FWENC, 1999). Results indicated some exceedances of CTDEP RSRs for indoor air and two additional rounds (rounds 3 and 4) of indoor air samples were collected in occupied portions of the facility. Rounds 3 and 4 indicated indoor air quality in some of the occupied areas exceeds the CTDEP RSRs for indoor air. A screening level human health risk assessment was completed for these results which indicated that for a five-year exposure period, excess cancer risks did not exceed $1x10^{-5}$ for Rounds 1, 2 and 3.

The air monitoring described in this workplan is a continuation of the air monitoring conducted during Rounds 1 through 20 for selected buildings at the facility.

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

1. Document indoor air quality concentrations, in occupied areas of the facility, of target contaminants of concern (COCs) for averaging periods that correspond to the CTDEP "Industrial/Commercial Target Indoor Air Concentration" standards.
2. Collect samples from outside of facility buildings to evaluate background air quality.
3. Document the variability of indoor air quality concentrations from differing weather conditions and seasons, and estimate average concentrations over the 12-month period. The program consists of both 8-hour monitoring and one year of quarterly 7-day monitoring.

2.0 MONITORING LOCATIONS AND SCHEDULE

Indoor air monitoring samples will be collected from select facility buildings. In addition, one background sample will be collected for each 8-hour and 7-day sampling event. Each monitoring location will be placed, where possible, 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 through use of ¼" teflon tubing.

Proposed locations for 8-hour indoor air sampling are as follows (see Figure 1):

Designation	Building	Location Description
IA-B1-01	B-2	Main Entrance/Guard Area
IA-B1-02	B-1	Second Floor
IA-B1-03	B-1	Third Floor
IA-B2-01	B-2	Boiler Room
IA-B3-03	B-3	Center of building
IA-B6-01	B-6	East corner of building
IA-B12-01	B-12	Maintenance Area
IA-B12-02	B-12	Office Area
IA-B65-01	B-65	Index Lease Area
IA-ML-02	B-2	Meyer's Lease, storage area
IA-BKGD-07	Background	50' North of B-12

Locations are subject to change per NAE/TACOM direction. 8-hour monthly monitoring will begin during the first week of August 2001, and will continue for approximately 12 months. The last monthly samples will be collected in July 2002.

Proposed locations for 7-day indoor air sampling are as follows (see Figure 1):

Designation	Building	Location Description
IA-B1-01	B-2	Main Entrance/Guard Area
IA-B2-02	B-2	North end of building
IA-B2-03	B-2	South end of building
IA-B3-03	B-3	Center of building
IA-B6-02	B-6	Center of building
IA-B10-01	B-10	Center of building
IA-B12-01	B-12	Maintenance Area
IA-B12-02	B-12	Office Area
IA-B65-01	B-65	Index Lease Area
IA-ML-02	B-2	Meyer's Lease, storage area
IA-BKGD-07	Background	50' North of B-12

Locations are subject to change per NAE/TACOM direction. 7-day quarterly monitoring will begin in September 2001 and will be completed in June 2002.

3.0 MONITORING AND ANALYTICAL METHODS

The monthly sampling events will be conducted over an 8-hour period, from approximately 7 am to 5 pm. This period corresponds to the Industrial/Commercial Target Indoor Air Concentrations under the CTDEP regulations, and corresponds to the expected work schedule of workers that are likely to use the building space. Each quarterly round of monitoring will be conducted over a 7-day period, to provide a time-weighted average of VOC concentrations, that are likely to vary due to fluctuating meteorological parameters over the 7-day period.

All air samples will be collected and analyzed in accordance with a modified EPA Method TO-14/15, using gas chromatography/mass spectrometry (GC/MS) in the single ion monitoring (SIM) acquisition mode to obtain the desired detection limits. The TO-14/15 method uses GC/MS to analyze for a select series of VOCs. Laboratory analysis will be conducted for the COCs only, not the full EPA TO-14/15 analyte list. The level of detection of the analytical method will be approximately 0.1 to 10 parts per billion by volume (ppbv) for most compounds analyzed. The target list of COCs, based on the data from the soil gas sampling program, is listed below:

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

The EPA TO-14/15 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 the associated equipment calibration activities. The 6-liter SUMMA® canisters will be used for both the 8-hour and 7-day monitoring programs. The 6-liter volume has proven to be adequate during previous indoor air monitoring rounds. Standard operating procedures for collecting canister samples are outlined in Appendix A.

At the conclusion of each sampling event, the SUMMA® canisters will be removed from their monitoring location, the canister pressure checked and recorded, the flow controller removed, and the 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 completed and shipped with the samples to the analytical laboratory. When completing the chain-of-custody forms, the sampling technician will identify the specific analytes to be analyzed using the EPA TO-14 method (i.e., the COCs).

Reporting of sampling events will include presentation of meteorological data from hourly weather observations taken at Bridgeport-Sikorsky Memorial Airfield, located across Main Street from the facility. Observations collected at the airfield include wind speed and direction, temperature, relative humidity, and atmospheric pressure. Analysis of the effects of these meteorological conditions on the sampling results will be included, as applicable.

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.

AQ Form 1 – Canister Sampling Data Sheet (see Appendix A) will be used to record all data on sampling times and canister readings. A map will be marked to identify 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.

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 for both 8-hour and 7-day monitoring events will include the following standard procedures:

- batch certification of Summa canisters;
- trip blank (one per sampling event);
- duplicate field sample (one per sampling event);
- laboratory method spike (one per sampling event); and
- laboratory duplicate sample (one per sampling event).

In order to provide a quality assurance check on the canister cleaning procedures, a batch blank is performed on the canisters prior to shipment. The batch certification of canisters is performed by analyzing ultrapure air evacuated into the canisters. A method spike will be analyzed by the laboratory for each monitoring event. The method spike is performed by analyzing a known concentration of each COC, which is injected into a clean canister, and then later extracted for subsequent analysis. The method spike measures the efficiency of recovery of the analyte during the TO-14/15 SUMMA® canister extraction procedure. Canister blanks, method spikes, and laboratory duplicate samples will be generated and conducted by the laboratory; they do not require additional sample collection.

A trip blank will be analyzed each sampling round to identify potential contamination during shipping and/or handling of the samples. The trip 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 trip blank includes all sample-handling activities with the exception that air is not drawn into the canister.

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 background 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.

Analytical data will be validated using USEPA Region I, EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses (12/96 Draft). In addition to the validation of the samples presented in this Work Plan, the indoor air analytical data collected from August 2000 (Round 11) through May 2001 (Round 20) will also be validated.

5.0 DATA REPORTING

5.1 Reporting Schedule

A brief letter report will be completed for each 8-hour and 7-day monitoring event, and will summarize all data collected, report on trends in the data, and make recommendations for future actions.

The indoor air risk screening previously prepared by Harding ESE (Indoor Air Rounds 1-10 Technical Memorandum, September 28, 2000) shall be updated twice during the period, once in 2001 and once in 2002. Data to be incorporated into the Year 2001 Revised Risk Screening Memorandum will include validated sampling results for 8-hour sampling rounds August 2000 (Round 11) through May 2001 (Round 20).

5.2 Reporting Format

All data results will be tabulated for each monitoring location. Data will be compared to CTDEP I/C IATC, presented below for each of the COCs:

Chemical of Concern	Industrial/Commercial Target Indoor Air Conc. (ppbv)
1,1,1-Trichloroethane	266
1,1-Dichloroethene	0.02
Tetrachloroethylene	1.61
Trichloroethylene	0.92
Vinyl Chloride	0.36

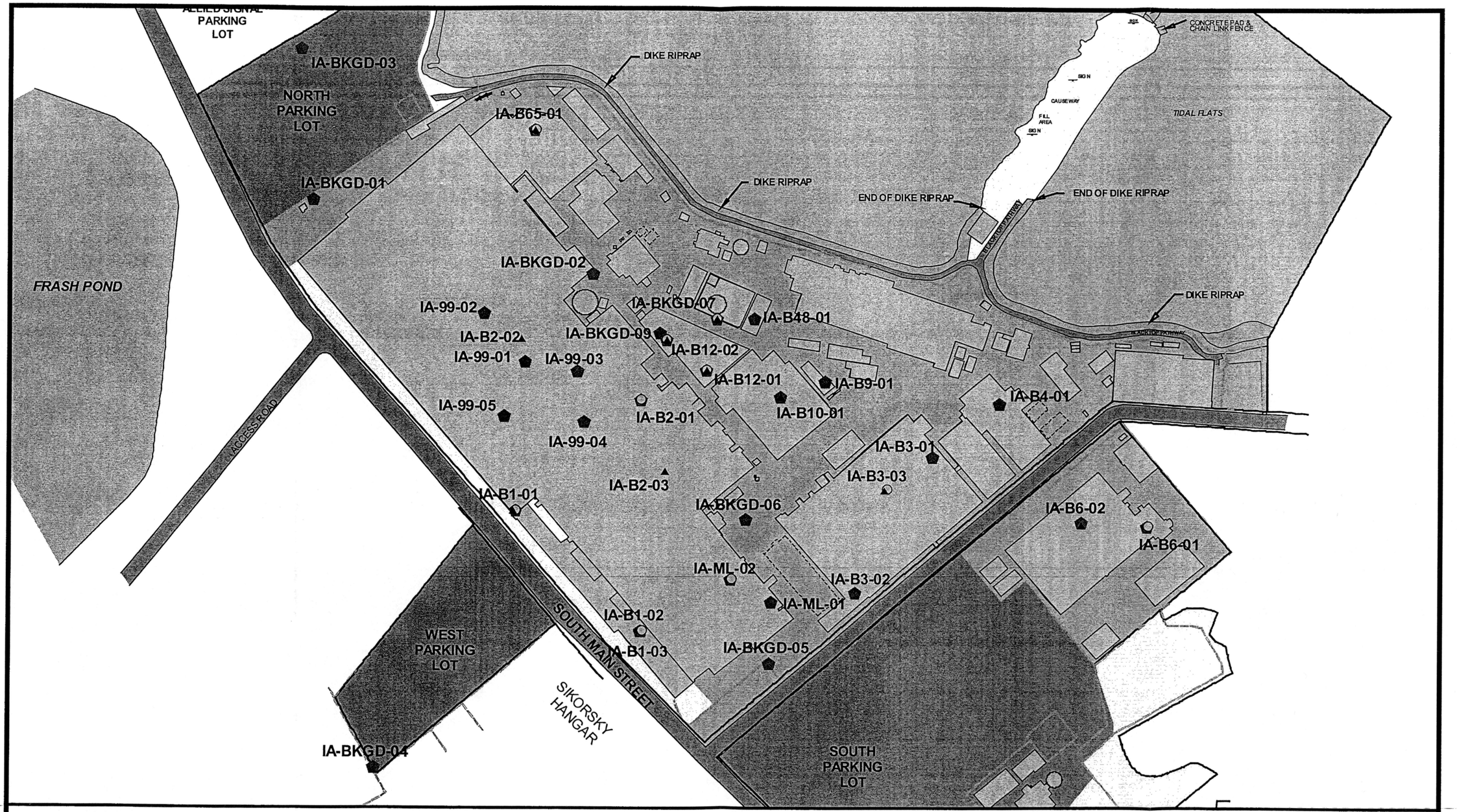
Monitoring methods will be summarized in the report, and any specific conditions encountered during the monitoring event will be documented in the report to assist in evaluating the analytical results. All QA/QC results, based on data validation procedures, will be summarized in the report.

For monthly 8-hour sampling events, technical memoranda shall be prepared following each round (12 rounds total) of sampling and analysis. Monthly technical memoranda will present a summary of the sampling event, meteorological conditions during the sampling event, validated sample results, and a summary of the data comparison to CTDEP I/C IATCs. Each memorandum will be issued as a Draft for concurrent Army and regulatory agency review, and as a Final for incorporation of comments.

The indoor air risk screening previously prepared by Harding ESE (Indoor Air Rounds 1-10 Technical Memorandum, September 28, 2000) shall be updated twice during the period, once in 2001 and once in 2002. Data to be incorporated into the Year 2001 Revised Risk Screening Memorandum will include the August 2000 (Round 11) through May 2001 (Round 20) sampling

results. The risk screening update reports will also contain a compilation of all the 8-hour indoor air monitoring data collected to date. Each risk screening update memorandum will be issued as a Draft for concurrent Army and regulatory agency review, and as a Final for incorporation of comments.

For quarterly 7-day sampling events, a technical memorandum shall be prepared following each round (4 rounds total) of sampling and analysis. Each technical memoranda will present a summary of the sampling event, meteorological conditions during the sampling event, validated sample results, and a summary of the data comparison to CTDEP I/C IATCs. Each memorandum will be issued as a Draft for concurrent Army and regulatory agency review, and as a Final for incorporation of comments.



Site Map

50 0 50 100 150 200 Feet

Legend

- ▲ Proposed 7-day Sampling Locations
- ◉ Proposed 8-hour Sampling Locations
- ⬟ September 1999 through July 2001 8-hour Sampling Locations

FIGURE 1
PROPOSED INDOOR AIR SAMPLING LOCATIONS

Stratford Army Engine Plant
Stratford, Connecticut
Harding ESE

STANDARD OPERATING PROCEDURES FOR MONITORING WITH EPA METHOD TO-14/15

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-14/15.

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 (or equivalent 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" 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-14/15 is based on the collection of whole air samples in SUMMA® passivated stainless steel canisters. A 6-Liter (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 pre-cleaned 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:

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 psig, ± 2 psig. 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.

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

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.

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 (L/min).

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 not be possible to rotate the controller.

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.

7. 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 Breakdown

After sampling is complete, perform the following procedures:

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

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.*

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.

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 "relinquished 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					ANALYSES (List analytical method and compounds to be analyzed)						
Site Location											
Sampled By:											
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	