05-0146
SDMS 268561

Weston Solutions, Inc.
10 Lyman Street, Suite 2
Pittsfield, Massachusetts 01201
413-442-4224 • Fax 413-442-4447

Restoring Resource Efficiency

October 11, 2005

Dean Tagliaferro
USEPA
10 Lyman Street
Suite 2
Pittsfield, MA 01201

RE: Air Monitoring Plan
GE Oversight – Newell Street Area II RAA
Site Specific Environmental Restoration Contract (SSERC)
GE/Housatonic River Site Pittsfield, Massachusetts
DCN #: GE-101105 ACXM

Dear Dean,

Enclosed please find the completed Air Monitoring Plan for GE Oversight – Newell Street Area II RAA Site Specific Environmental Restoration Contract (SSERC).

If you have any questions, please feel free to contact me.

Very truly yours,

Thomas R. Czelusniak
Office Manager

Cc: Bill Lovely, USEPA
Mike Argue, Weston Solutions
Joe Schmidl, Weston Solutions
Linda Palmieri, Weston Solutions
Tony Riccio, Weston Solutions (via e-mail)
Joe Mastone, Weston Solutions (via e-mail)
Chris Moran, Weston Solutions (via e-mail)

AIR MONITORING PLAN
GE OVERSIGHT –
NEWELL STREET AREA II RAA

SITE-SPECIFIC ENVIRONMENTAL RESTORATION CONTRACT (SSERC)
GE/HOUSATONIC RIVER SITE
PITTSFIELD, MASSACHUSETTS

Contract No. DACW33-00-D-0006
DCN: GE-101105 ACXM

Prepared for:

U.S. DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT, CORPS OF ENGINEERS
696 Virginia Road
Concord, MA 01742-2751

Prepared by:

WESTON SOLUTIONS, INC.
One Wall Street
Manchester, NH 03101-1501

October 2005

W.O. Number 20124.001.098

1. PERIMETER AIR MONITORING PLAN

1.1 OVERVIEW

This Perimeter Air Monitoring Plan (PAMP) describes the design, installation, and operation of the ambient air quality monitoring system on and along the boundary of the Newell II Remedial Action Area (RAA). This PAMP complements daily particulate monitoring and weekly PCB ambient air monitoring being performed by the General Electric Company as part of its air monitoring program for the Newell Street RAA.

The PAMP will consist of daily monitoring and weekly sampling during remedial activities at select stations on and around the site perimeter. Daily monitoring will be conducted for volatile organic compounds (VOCs) using a handheld photoionization detector. The weekly sampling will use equipment to collect time-weighted air samples that will provide concurrent data for specific VOC compounds.

1.2 AMBIENT AIR SAMPLING AND MONITORING

1.2.1 Perimeter Monitoring

1.2.1.1 Hand Held Organic Vapor Monitor

The equipment to be used for daily monitoring of ambient air concentrations of organic vapors will be a Thermo Environmental Instruments, Inc. Model 580B Organic Vapor Meter (OVM) or equivalent. The OVM 580B Photoionization Detector (PID) will be equipped with an 11.7 ev lamp calibrated to an isobutylene standard. As shown on Attachment A, the ionization potential for each of the contaminants of concern (COCs) identified at the site is less than 11.7 ev. Therefore, the range of operation of the PID is appropriate for detecting on-site COCs that may volatilize into the ambient air from the work zone.

During the course of construction, PID readings will be recorded hourly within the active work area and at a minimum of 3 times per day from the 10 perimeter monitoring locations depicted on Figure 1. Perimeter PID monitoring frequency may be increased as discussed in Section 1.4.

1.2.1.2 Perimeter Monitoring Station Selection

A total of 10 monitoring stations will be located around the perimeter of the site as depicted in Figure 1. Each station will have a unique identifier that will be used in all data recording. The stations have been positioned so as to provide coverage of the entire perimeter, as well as to provide data representative of potential off-site migration of pollutants in the directions of nearby sensitive receptors.

These general locations are designed to primarily provide coverage of all sides of the site perimeter. The perimeter monitoring stations will be adjusted, if needed, to adapt to changes in the locations of remediation activities or meteorological conditions. The stations may also be moved short distances to facilitate construction access.

1.2.2 Weekly Air Sampling

1.2.2.1 Sample Collection and Analysis

Six time-weighted samples (5 discrete samples plus one duplicate) will be collected weekly for an 8-hour period from 5 locations during remedial activities. The samples will be collected using stainless steel canisters in accordance with Standard Operating Procedure for Sampling Volatile Organic Compounds Using SUMMA® Polished Stainless Steel Canisters (EPA-REG1-ESD/CAN-SAM-SOP) which is included as Attachment C. Samples collected will be analyzed for a standard list of specific target VOC compounds using U.S. EPA Method TO-15 ("Determination of Volatile Organic Compounds (VOCs) In Ambient Air Using Specially Prepared Canisters with Subsequent Analysis by Gas Chromatography", January, 1999).

1.2.2.2 Air Sampling Station Selection

A total of five sampling stations are included as part of the weekly air sampling program. One station will be on the downwind side of the active work area while the remaining four stations will be placed on the perimeter of the site in order to capture both upwind and downwind locations. The sampling stations are shown on Figure 1 and may change based upon the daily wind forecast and on-site observations as discussed in Section 1.3. Consideration will also be given to adjacent residences, terrain, and construction activities.

1.2.3 Sample Information Management

Each weekly air sample will receive a unique identification number (ID) that is based on the unique combination of site location, media type, sample location, quality control type, and date as outlined in the project Quality Assurance Project Plan (QAPP) and Field Sampling Plan (FSP). Sample Attribute Forms and Chain of Custodies will also be completed as outlined in the QAPP and FSP.

The sample ID will be structured as follows:

N2-AR000001-0-5S23, where

N2	= Newell Street Area II
AR	= Air Sample
000001	= Sample location 1
0	= QC code for a normal sample

5	= 2005
S	= September
23	= Date

1.2.3.1 Field Data

Daily source area PID monitoring results will be recorded in a logbook while each perimeter PID monitoring round will be documented on the field form included in Attachment B. Weekly air sampling field data, such as initial canister vacuum, mid-sample vacuum readings, final canister vacuum, and elapsed time readings will be manually recorded in a logbook and sample forms. A single logbook will be used to document all sampling during the study, and entries will be made by the field technician(s) at the time of sampling.

1.2.3.2 Laboratory Data

Data will be received from the laboratories as hard copy reports and electronic data deliverables (EDDs). The EDDs are provided to allow efficient electronic uploading of the analytical results to the project databases and eliminate data entry errors.

1.2.4 Quality Assurance/Quality Control

Quality Assurance (QA) includes the planned and systematic actions necessary to provide adequate confidence that a measurement of a process will satisfy a given requirement for accuracy. Quality Control (QC) are the operational techniques and activities that are used to fulfill requirements for quality. The QA/QC procedures for the ambient air monitoring will be conducted in accordance with the project QAPP. The following subsections briefly describe the QA/QC procedures that will be followed.

1.2.4.1 Hand-held Organic Vapor Monitors

The 580B OVM will arrive on-site from Weston's Central Equipment Stores fully calibrated. Daily span gas checks with isobutylene will be conducted at the start of each day to check calibration. If the daily span gas check reading shows a greater than 10% variance from the known span gas concentration, the unit will be re-calibrated at the site and in accordance with the manufacturer's instructions.

1.2.4.2 Field QA/QC

Summa canisters will arrive to the site certified pre-cleaned and leak-free, evacuated, and ready for sampling. As a result, there is no need for calibration, decontamination, or the collection field blanks. Post-sampling vacuum reading is documented in the field and verified upon receipt of the samples at the lab, trip blanks will not be required. A field duplicate will be collected during each sampling event over the course of the monitoring program and submitted for analysis.

1.2.4.3 Laboratory QA/QC

Laboratory QA/QC procedures such as surrogates, spikes, and blanks will be conducted in accordance with EPA's TO-15 Method and the QAPP.

1.2.4.4 Data Validation

As outlined in the Project QAPP, upon receipt of the data package from the lab, data verification, data evaluation, and Tier II data validation will be conducted to finalize the data deliverable.

1.3 METEOROLOGICAL MONITORING

At the start of each work day Weston will obtain the daily wind forecast for the Pittsfield Municipal Airport site from the National Weather Service. The daily wind forecast, along with on-site observations, will be utilized to select air sampling locations. On-site observations of the wind direction will be recorded throughout the day. At the completion of each work day, Weston will download the wind rose from the Pittsfield Municipal Airport site as well as obtain data collected from an on-site meteorological monitoring station maintained by GE's Contractor as further documentation of wind direction and intensity.

1.4 ACTION LEVELS

Attachment A includes a list of compounds that have the greatest potential to volatilize into the ambient air based on site conditions. GE and their contractors will utilize administrative and engineering controls in order to control fugitive emissions during construction activities. However, it is still possible that remediation activities could generate nuisance levels of VOCs migrating off-site.

EPA, with the concurrence of the Agency for Toxic Substances and Disease Registry (ATSDR), has developed action levels for both the PID screening and weekly air sampling activities described in Sections 1.2.1 and 1.2.2. Should either of the two monitoring activities show an exceedence of these action levels, then EPA will promptly discuss with GE the need to implement additional engineering controls including, but not limited to, vapor reducing foams and placement of additional clean fill in open excavation areas.

1.4.1 Ambient Concentrations

Action levels for organic vapors will be used as indicators of off-site emissions. The following subsections describe the ambient concentration action levels to be used initially during remedial activities. These action levels are subject to change based on actual conditions encountered during site activities.

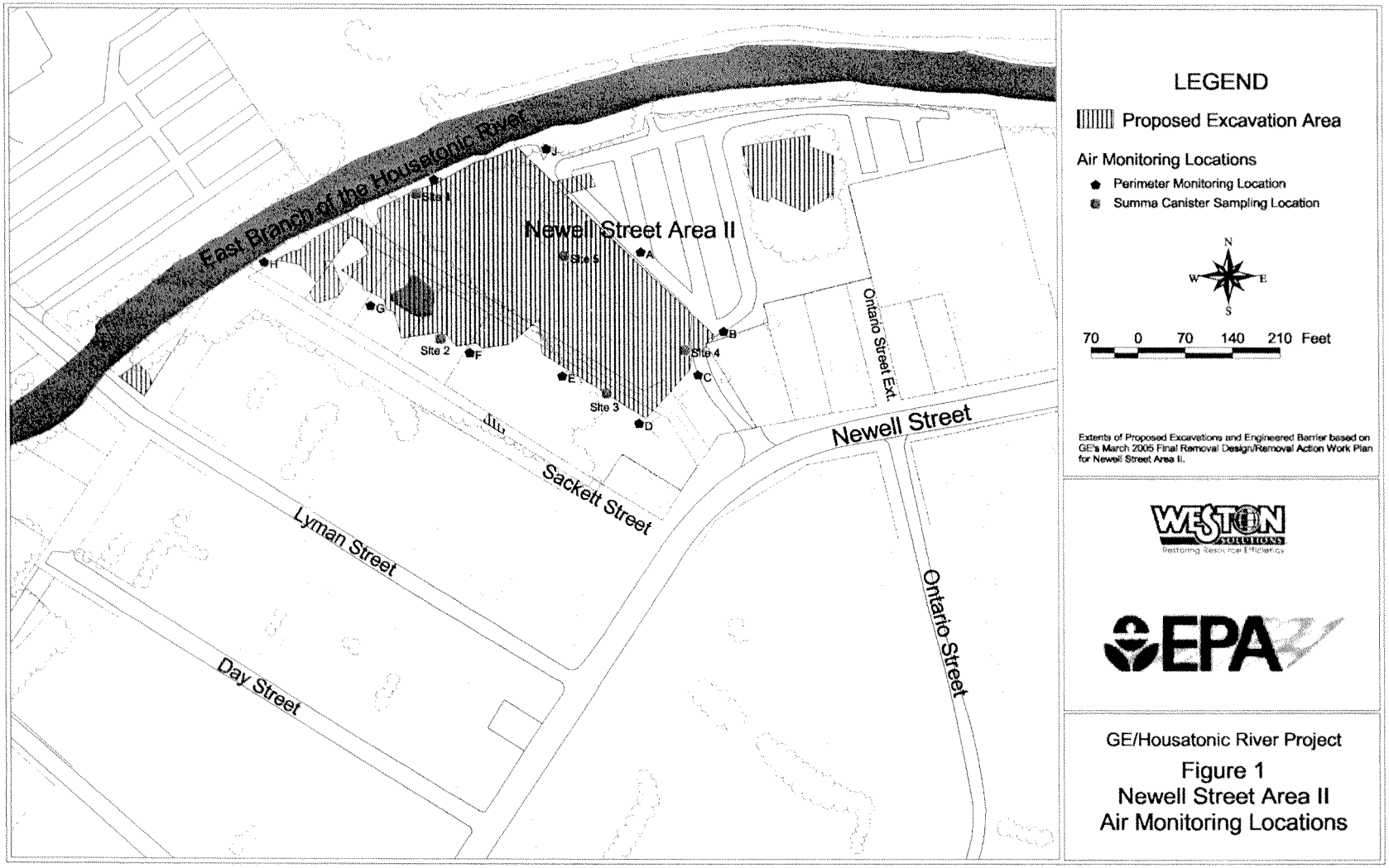
1.4.1.1 PID Screening

EPA has established two action levels for the PID screening: 2.5 units (ppm) average per 8 hour day, and 15 units (ppm) maximum per individual screening event. If during daily PID air monitoring, a reading at or above 2.5 ppm is recorded and sustained for a period of 15 minutes within the active work area, Weston will increase the perimeter PID monitoring frequency to hourly. If during perimeter monitoring a reading at or above 15 ppm is recorded and sustained for a period of 15 minutes, Weston will contact the EPA official or his/her designee immediately. The EPA official or his/her designee will then immediately contact GE to discuss administrative and engineering controls that should be implemented to better control the emissions.

At the end of the construction day, the average PID reading at each perimeter station will be calculated using the discreet readings collected throughout the day. If the average daily PID reading for an individual station exceeds 2.5 ppm (or during the same day it becomes evident that the daily average will exceed 2.5 ppm), Weston will contact the EPA official or his/her designee immediately in order to contact GE to discuss administrative and engineering controls that should be implemented to better control the emissions the following work day.

1.4.1.2 Weekly Air Sampling

Weekly air samples will be analyzed on a priority turnaround time of 48 hours. If the analytical results indicate contaminant concentrations above the contaminant-specific action levels summarized on the table in Attachment A, Weston will immediately contact the EPA official or his/her designee. The EPA official or his/her designee will immediately contact GE to discuss what additional administrative and engineering controls should be implemented to reduce the emissions to acceptable levels.


East Branch of the Housatonic River
Newell Street Area II
Site 1
Site 2
Site 3
Site 4
Site 5
A
B
C
D
E
F
G
H
J
L
Ontario Street Ext.
Newell Street
Sackett Street
Lyman Street
Day Street
Ontario Street
LEGEND
Proposed Excavation Area
Air Monitoring Locations
Perimeter Monitoring Location
Summa Canister Sampling Location
N
W
E
S
70 0 70 140 210 Feet
Extents of Proposed Excavations and Engineered Barrier based on GE's March 2005 Final Removal Design/Removal Action Work Plan for Newell Street Area II.
WESTON SOLUTIONS
Restoring Resource Efficiency
EPA
GE/Housatonic River Project
Figure 1
Newell Street Area II
Air Monitoring Locations

ATTACHMENT A

CONTAMINANTS OF CONCERN (COCS) AND ACTION LEVELS

GE/Housatonic River Project – Newell Street Area II

Contaminants of Concern

Compound	Ionization Potential (eV)	OSHA Permissible Exposure Limit (ppm)	NIOSH Recommended Exposure Limit (ppm)	ACGIH Threshold Limit Values (ppm)	Odor Threshold (ppm)	Perimeter Action Level (ppm)
cis-1,2-Dichloroethene	9.65	200	200	200	17	20
1,2,4-Trichlorobenzene	unknown		5	STEL C 5	3.0	0.5
1,1,2-Trichloroethane	11.0	10	Ca (IDLH 100)	10	135	1
Trichloroethene	9.45	100 (C 200)	Ca (IDLH 1,000)	50	28	5
m-Xylene	8.56	100	100	100	0.05 – 4.0	10
p-Xylene	8.44	100	100	100	0.05 – 4.0	10
o-Xylene	8.56	100	100	100	0.05 – 4.0	10

eV - Electron volts

ppm - Parts per million

OSHA - Occupational Safety and Health Administration

IDLH - Immediate danger to life and health

NIOSH – National Institute of Occupational Safety and Health

STEL - Short-term exposure limit

C - Ceiling

Ca - Carcinogen

ACGIH – American Conference of Governmental Industrial Hygenists

ATTACHMENT B

FIELD LOG

GE/Housatonic River Project – Newell Street Area II Perimeter Air Monitoring Log Sheet

Name: _____ Date: _____

Station ID	Time	PID Reading	Wind Direction	Comments	Station ID	Time	PID Reading	Wind Direction	Comments
Station A					Station F				
Station B					Station G				
Station C					Station H				
Station D					Station I				
Station E					Station J				

ATTACHMENT C

AIR SAMPLE COLLECTION SOP

EPA-REG1-ESD/CAN-SAM-SOP
MARCH 2001
REVISION 2

STANDARD OPERATING PROCEDURE

SAMPLING VOLATILE ORGANIC COMPOUNDS USING

SUMMA® POLISHED STAINLESS STEEL CANISTERS

U.S. ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND REGIONAL LABORATORY
OFFICE OF ENVIRONMENTAL MEASUREMENT & EVALUATION
11 TECHNOLOGY DRIVE
NORTH CHELMSFORD, MASSACHUSETTS 01863

CONTENTS

CONTENTS

APPENDIX

SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to describe the procedures utilized by EPA Region I ESD for sampling of volatile organic compounds (VOCs) in ambient or indoor air environments. The samples are collected as whole air samples in passivated SUMMA_ or Silco lined stainless steel canisters. The VOCs are subsequently separated by gas chromatography (GC) and measured by an ion trap mass spectrometer (MS) at the EPA Region I ESD Laboratory. The ESD Laboratory analytical operating procedures for the GC/MS are described under separate cover in SOP document, AIRCAN6.SOP.

This canister sampling SOP describes procedures for sampling with canisters at final pressures above atmospheric pressure (referred to as pressurized sampling), below atmospheric pressure (referred to as subatmospheric sampling), and at atmospheric pressure (referred to as grab sampling). This method is applicable to specific VOCs that have been tested and determined to be stable when stored in pressurized and subatmospheric pressure canisters. The organic compounds that have been successfully collected in canisters by this method are listed on table 1. These compounds have been measured at the parts per billion by volume (ppbv) level.

The canister sampler configuration and procedure, the number of samples to be collected, where they are collected, and the duration of the sampling event, are dependent upon the project objectives. Therefore, prior to field sampling activities, a detailed sampling work plan is prepared for each project. The sampling work plan will incorporate the procedures specified in the following SOP document.

This document is divided into four parts. Part 1 describes the grab sampler configuration and sampling procedures, Part 2 the subatmospheric time-integrated sampler configuration and sampling procedures, Part 3 the pressurized time-integrated sampler configuration and sampling procedures, and Part 4 describes the quality assurance/quality control procedures and performance criteria.

TABLE 1 - EPA METHOD TO15 TARGET VOC LIST

Propylene
Dichlorodifluoromethane (F12)
Chloromethane (Methyl Chloride)
1,2-Dichloro-1,1,2,2-Tetrafluoroethane (F114)
Vinyl Chloride
1,3-Butadiene
Methyl Bromide (Bromomethane)
Chloroethane
Acetone
Trichlorofluoromethane
Isopropyl Alcohol
1,1-Dichloroethylene
Methylene Chloride
Carbon Disulfide
1,1,2-Trichloro-1,2,2-Trifluoroethane (F113)
trans-1,2-Dichloroethene
1,1-Dichloroethane
Methyl-t-butyl ether
Methyl Ethyl Ketone
cis-1,2-Dichloroethene
Hexane
Chloroform
Ethyl Acetate
Tetrahydrofuran
1,2-Dichloroethane
1,1,1-Trichloroethane
Benzene
Carbon Tetrachloride
Cyclohexane
1,2-Dichloropropane
Bromodichloromethane
Trichloroethene
Heptane
cis-1,3-Dichloropropene
Methyl Isobutyl Ketone
trans-1,3-Dichloropropene
1,1,2-Trichloroethane
Toluene
2-Hexanone
Dibromochloromethane
1,2-Dibromoethane
Tetrachloroethene
Chlorobenzene
Ethyl Benzene
m,p-Xylene
Styrene
1,1,2,2-Tetrachloroethane
o-Xylene
4-Ethyl Toluene
1,3,5-Trimethylbenzene
1,2,4-Trimethylbenzene
1,3-Dichlorobenzene
Chloromethylbenzene
1,4-Dichlorobenzene
1,2-Dichlorobenzene
1,2,4-Trichlorobenzene
Hexachlorobutadiene

PART 1

CANISTER GRAB SAMPLING PROCEDURES

1.1 CANISTER GRAB SAMPLING EQUIPMENT

See Figure 1 for a diagram of the grab sampling system.

- Sampling Inlet Line - chromatographic-grade stainless steel tubing to connect canister to sample inlet.

- Sample Canister - certified clean and leak free stainless steel pressure vessels of desired volume with valve and SUMMA_ passivated or Silco lined interior surfaces (Scientific Instrumentation Specialists (SIS), Andersen Instruments Inc., RESTEK, or equivalent). A vacuum/pressure gauge (0-30 in Hg and 0-30 psig) can be attached to canister as an option.

- Vacuum/Pressure Gauge - if a vacuum/pressure gauge is not attached to canister, a separate gauge is connected to check vacuum/pressure readings before and after sampling event.

- Particulate Matter Filter - 2 micrometer stainless steel in-line filter (Nupro Co., Model SS4F-2, or equivalent) is attached to sample inlet line.

- Chromatographic-grade Stainless Steel Tubing and Fittings for Interconnections - all material in contact with sample, analyte, and support gases should be chromatographic-grade stainless steel.

- Canister Shipping Containers - Sheet metal container holds two 15 liter canisters to protect canisters and valves from becoming damaged during shipment.

1.2 CANISTER GRAB SAMPLING PROCEDURES

1. Configure the sampler as shown in Figure 1 using the components described in Section 1.1.

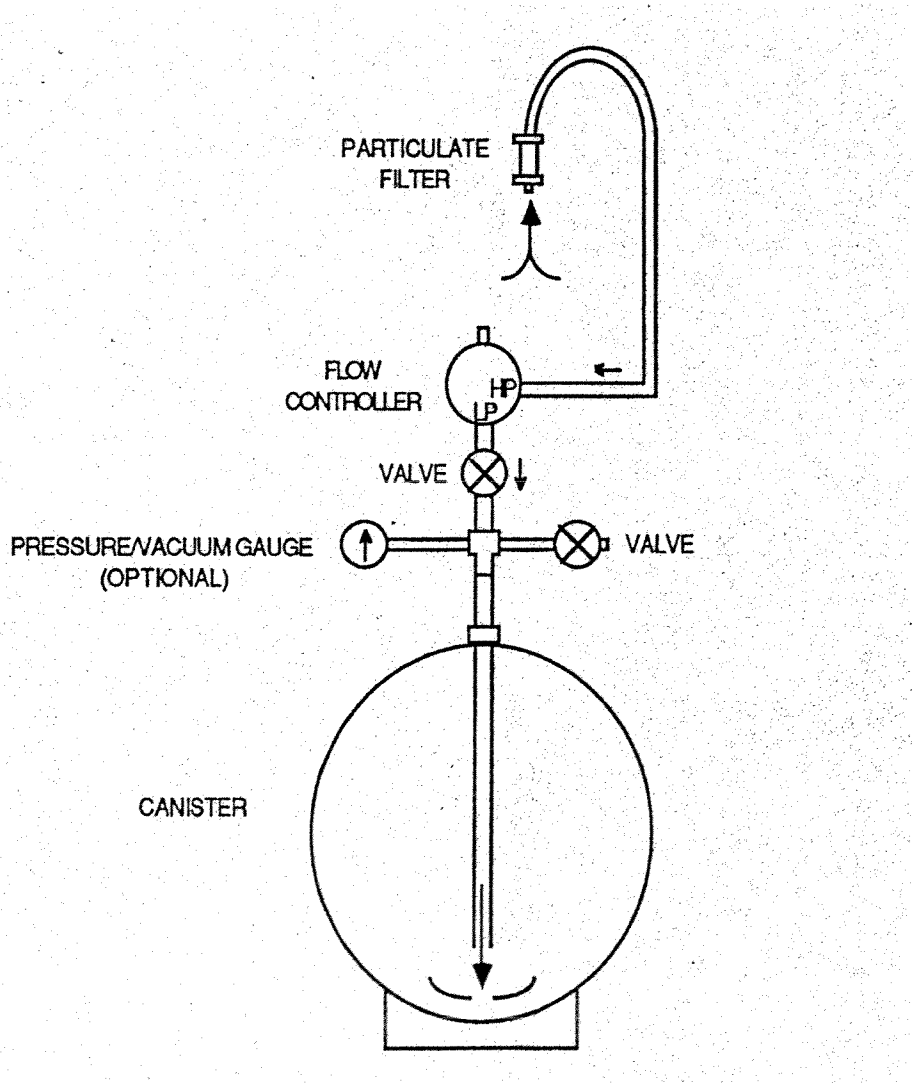
2. If the canister does not have a vacuum/pressure gauge attached, connect a gauge to the canister inlet, open the valve, read the gauge, close the valve, and remove the gauge.

3. If a vacuum/pressure gauge is attached, open valve, read the gauge, and then close the valve.

4. Connect the 2 micrometer particulate matter filter and sampling line to the canister inlet as shown in Figure 1.

FIGURE 1

GRAB AIR SAMPLER CONFIGURATION



5. Open the canister valve slightly, just enough to slowly allow a sample to be drawn into the canister. The canister pressure differential causes the sample to flow into the canister. It will take approximately 30 seconds for the canister pressure to go from 30 psig vacuum to atmospheric pressure or 0 gauge.

6. In a field log book record the project name, sampling event date, sampling location, canister number, initial canister pressure gauge reading, and the sampling start time.

7. Close the canister valve. **DO NOT OVER-TIGHTEN THE VALVE.**

8. Disconnect the 2 micrometer particulate matter filter from the canister inlet.

9. If the canister does not have a vacuum/pressure gauge attached, connect a gauge to the canister inlet, open the valve, read the gauge, close the valve, and then disconnect the gauge from the canister.

10. If a vacuum/pressure gauge is attached, open valve, read the gauge, and then close the valve.

11. In a field log book record the final canister pressure gauge reading and the meteorological conditions during the sampling event.

13. Place canister into shipping container.

14. Complete chain-of-custody record form. See Part 4.

PART 2

CANISTER SUBATMOSPHERIC TIME-INTEGRATED SAMPLING PROCEDURES

2.1 CANISTER SUBATMOSPHERIC TIME-INTEGRATED SAMPLING EQUIPMENT

See Figure 2 for a diagram of the subatmospheric time-integrated sampling system.

- Sampling Inlet Line - chromatographic-grade stainless steel tubing to connect canister to sample inlet.

- Sample Canister - certified clean and leak free stainless steel pressure vessels of desired volume with valve and SUMMA_ passivated or Silco Lined interior surfaces (Scientific Instrumentation Specialists (SIS), Andersen Instruments Inc.,RESTEK, or equivalent). A vacuum/pressure gauge (0-30 in Hg and 0-30 psig) can be attached to canister as an option.

- Vacuum/Pressure Gauge - if a vacuum/pressure gauge is not attached to canister, a separate gauge is connected to check vacuum/pressure readings before and after sampling event.

- Particulate Matter Filter - 2 micrometer stainless steel in-line filter (Nupro Co., Model SS4F-2, or equivalent) is attached to sample inlet line.

- Chromatographic-grade Stainless Steel Tubing and Fittings for Interconnections - all material in contact with sample, analyte, and support gases should be chromatographic-grade stainless steel.

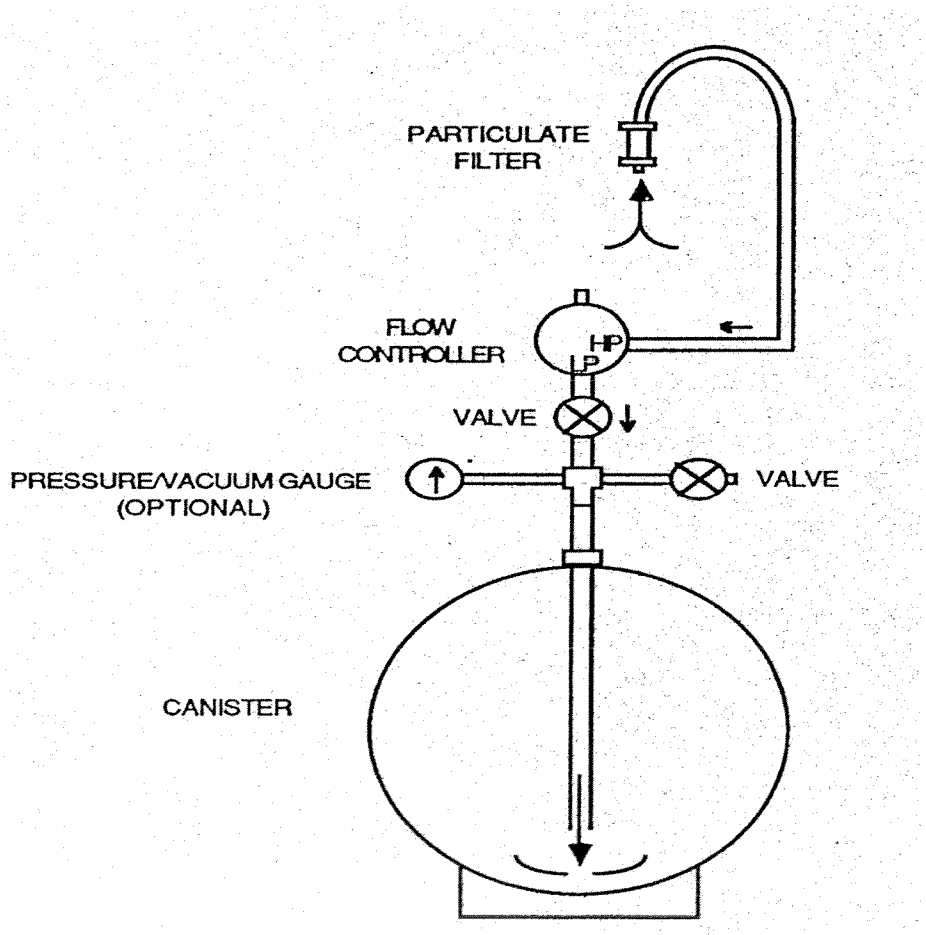
- Flow Controller - Millaflow Controller, model SC423SXFT/B or equivalent, a mechanical flow controller made of stainless steel, having a flow range of 5 - 500 ml/min.

- Mass Flowmeter - An Aalborg Electronic Mass Flowmeter (Model GFM-1700) is used to calibrate the flow controller. The mass flowmeter measures flow rates between 0 - 500 ml/min. within $\pm$1.5% full scale.

- Canister Shipping Containers - Sheet metal container holds two 15 liter canisters to protect canisters and valves from becoming damaged during shipment.

FIGURE 2

SUBATMOSPHERIC TIME-INTERGRATED AIR SAMPLER CONFIGURATION



2.2 CANISTER SUBATMOSPHERIC TIME-INTEGRATED SAMPLING PROCEDURES

1. In the laboratory, prior to the sampling event, calibrate the flow controller using the procedure outlined in Section 4.1.2. **Note: For this procedure use an evacuated dummy canister.**

2. In the field, before placing the sampler at the desired sampling location, check the calibration of the flow controller using the procedure outlined in Section 4.1.2. **Note: For this procedure use an evacuated dummy canister.**

3. Select the canister and flow controller to be used for the sampling event and bring it to the desired sampling location. If the canister does not have a vacuum/ pressure gauge attached, connect a gauge to the canister inlet, open the valve, read the gauge, close the valve, and then disconnect the gauge from the canister. If the canister to be used for the sampling event does have a vacuum/pressure gauge attached, read the gauge and record value and canister number in field log book.

4. Connect the sample inlet line with particulate matter filter to the flow controller's high pressure inlet port (HP) and the low pressure outlet port (LP) to the canister inlet port as shown in Figure 2 using the components described in Section 2.1.

5. In a field log book record the project name, sampling event date, sampling location, canister number, flow controller number, and the initial canister pressure gauge reading.

6. After all of the samplers have been set-up at their desired sampling locations, go back to each location and open the canister valve to allow a sample to be drawn through the flow meter and into the canister. The canister pressure differential causes the sample to flow into the canister. In the field log book record the sampling event start time for each sampling location.

7. During the course of the sampling event, periodically check each sampling location to see if the sampler had been tampered with. In addition, if the canister has a vacuum/pressure gauge attached, observe and record the gauge reading to determine if the canister is being filled at a constant rate. If the no vacuum/pressure gauge is being used, connect the Aalborg Electronic Mass Flowmeter and check the flow rate, adjust if necessary.

8. 45 to 30 minutes before the end of the sampling period, visit each sampling location and obtain a flow rate reading using the procedure outlined in Section 4.1.3.

9. At the conclusion of the predetermined sampling period, return to each sampling location and close the canister valve. **DO NOT OVER-TIGHTEN THE VALVE.** Disconnect the sample inlet line with particulate matter filter from the flow controller and the flow controller from the canister. If the canister does not have a vacuum/ pressure gauge attached, connect a gauge to the canister inlet, open the valve, read the gauge, close the valve, and then disconnect the gauge from the canister. If the canister does have a vacuum/pressure gauge attached, read the gauge, and record the value in the field log book. **Note: The gauge reading obtained in this step and in step 3 should agree with the predetermined final canister pressure used in the calculations described in Section 4.1.1. This step will help determine if the sample had been collected at a constant rate over the sampling period.**

10. Place canister into shipping container.

11. In a field log book record for each sampling location, the sampling event end time, final canister pressure, and meteorological conditions during the sampling event.

12. Complete chain-of-custody record form. See Part 4.

PART 3

CANISTER PRESSURIZED TIME-INTEGRATED SAMPLING PROCEDURES

3.1 CANISTER PRESSURIZED TIME-INTEGRATED SAMPLING EQUIPMENT

See Figure 3 for a diagram of the pressurized time-integrated sampling system.

- Sampling Inlet Line - chromatographic-grade stainless steel tubing to connect canister to sample inlet.

- Sample Canister - certified clean and leak free stainless steel pressure vessels of desired volume with valve and SUMMA_ passivated or Silco lined interior surfaces (Scientific Instrumentation Specialists (SIS), Andersen Instruments Inc., RESTEK, or equivalent). A vacuum/pressure gauge (0-30 in Hg and 0-30 psig) can be attached to canister as an option.

- Vacuum/Pressure Gauge - if a vacuum/pressure gauge is not attached to canister, a separate gauge is connected to check vacuum/pressure readings before and after sampling event.

- Particulate Matter Filter - 2 micrometer stainless steel in-line filter (Nupro Co., Model SS4F-2, or equivalent) is attached to sample inlet line.

- Chromatographic-grade Stainless Steel Tubing and Fittings for Interconnections - all material in contact with sample, analyte, and support gases should be chromatographic-grade stainless steel.

- Flow Controller - Millaflow Controller, model SC423SXFT/B, a mechanical flow controller made of stainless steel, having a flow range of 5 - 500 ml/min.

- Mass Flowmeter - An Aalborg Electronic Mass Flowmeter (Model GFM-1700) is used to calibrate the flow controller. The mass flowmeter can measure flow rates between 0 - 500 ml/min. within $\pm$1.5% full scale.

- Sample Pump - SIS stainless steel/viton diaphragm vacuum pump/compressor, model NO5SV, with a current draw at max load of 1.1 amps.

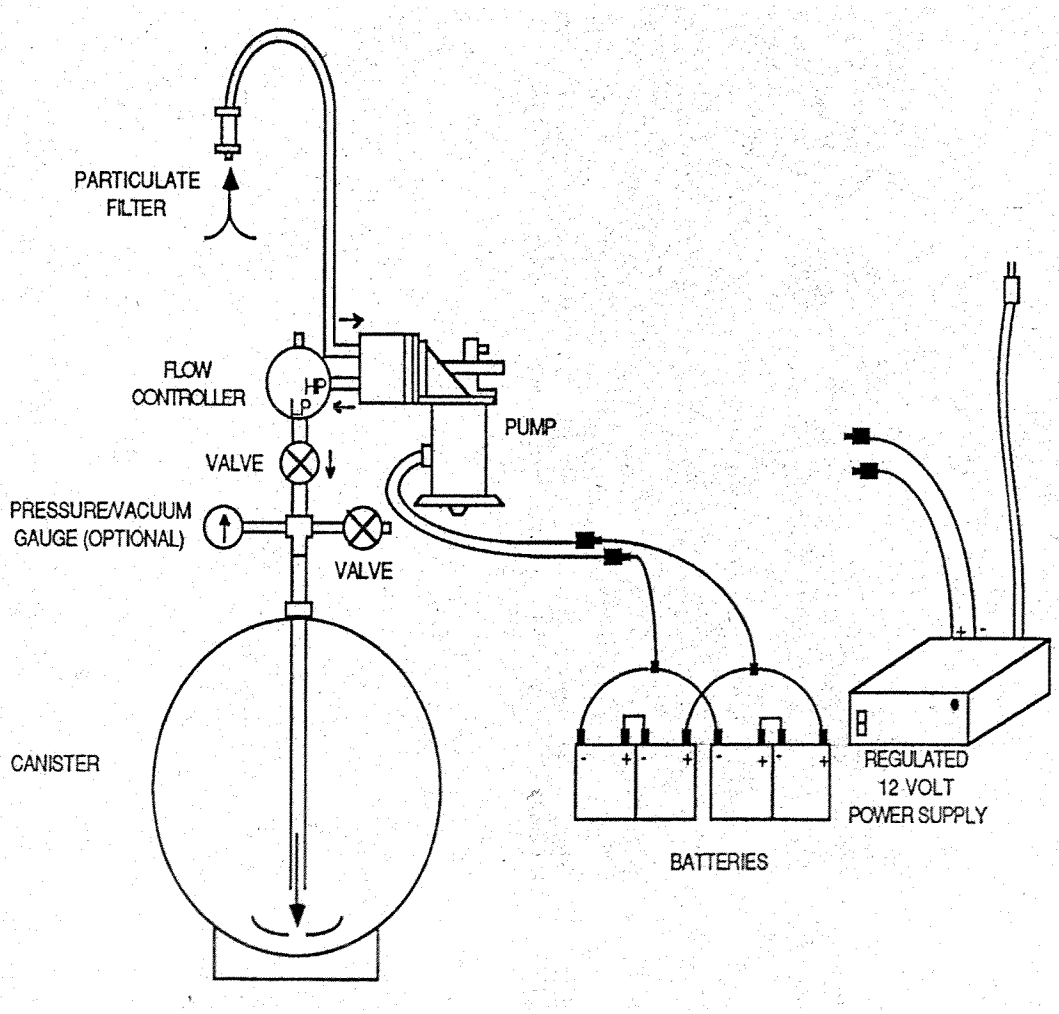
- Batteries - 2 Technacell rechargeable solid-gel cell 6 volt, 12 ampere hour batteries connected in series to produce 12 volts.

- Power Supply - Micronta regulated 12 volt power supply, converts 120VAC to 12VDC

- Sampler Carrying Case - Pelican Products, Inc. Pro Case houses and protects the sampling pump, batteries, and power supply.

- Canister Shipping Containers - Sheet metal container holds two 15 liter canisters to protect canisters and valves from becoming damaged during shipment.

FIGURE 3



PRESSURIZED TIME-INTERGRATED AIR SAMPLER CONFIGURATION

3.2 CANISTER PRESSURIZED TIME-INTEGRATED SAMPLING PROCEDURES

1. In the laboratory, prior to the sampling event, calibrate the flow controller using the procedure outlined in Section 4.1.4. **Note: For this procedure use an evacuated dummy canister.**

2. In the field, before placing the sampler at the desired sampling location, check the calibration of the flow controller using the procedure outlined in Section 4.1.4. **Note: For this procedure use an evacuated dummy canister.**

3. Select the canister and sampler to be used for the sampling event and bring it to the desired sampling location. If the canister does not have a vacuum/ pressure gauge attached, connect a gauge to the canister inlet, open the valve, read the gauge, close the valve, and then disconnect the gauge from the canister. If the canister to be used for the sampling event does have a vacuum/pressure gauge attached, read the gauge and record the value and canister number in a field log book.

4. Connect the sample inlet line with particulate matter filter to the inlet/vacuum side of the pump. Connect the outlet/pressure side of the pump to the high pressure inlet port (HP) of the flow controller. Connect the low pressure outlet port (LP) side of the flow controller to the canister inlet port. Refer to Figure 3 for a diagram of the sampler.

5. In a field log book record the project name, sampling event date, sampling location, canister number, sampler number, and the initial canister pressure gauge reading.

6. After all of the samplers have been set-up at their desired sampling locations, go back to each location and first turn on the sampling pump then open the canister valve. In the field log book record the sampling event start time for each sampling location.

7. During the course of the sampling event, periodically check each sampling location to see if the sampler had been tampered with or that the pump is running. In addition, if the canister has a vacuum/pressure gauge attached, observe and record the gauge reading to determine if the canister is being filled at a constant rate. If the no vacuum/pressure gauge is being used, connect the Aalborg Electronic Mass Flowmeter and check the flow rate, adjust if necessary.

8. 45 to 30 minutes before the end of the sampling period, visit each sampling location and obtain a flow rate reading using the procedure outlined in Section 4.1.5.

9. At the conclusion of the predetermined sampling period, return to each sampling location and first close the canister valve then turn off the sampling pump. **DO NOT**

OVER-TIGHTEN THE VALVE. Disconnect the sampler from the canister. If the canister does not have a vacuum/ pressure gauge attached, connect a gauge to the canister inlet, open the valve, read the gauge, close the valve, and then disconnect the gauge from the canister. If the canister does have a vacuum/pressure gauge attached, read the gauge and record the value and in the field log book. **Note: The gauge reading obtained in this step and in step 3 should agree with the predetermined final canister pressure used in the calculations described in Section 4.1.1. This step will help determine if the sample had been collected at a constant rate over the sampling period.**

10. Place canister into shipping container.

11. In a field log book record for each sampling location, the sampling event end time, final canister pressure, and meteorological conditions during the sampling event.

12. Complete chain-of-custody record form. See Part 4.

PART 4

QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES AND PERFORMANCE CRITERIA

4.1 FLOW CONTROLLER CALIBRATION

The canister sampling system uses a Millaflow flow controller, model SC423SXFT/B or equivalent to regulate the flow of sample entering the canister over the desired sample period. The flow controller is calibrated using an Aalborg Electronic Mass Flowmeter (Model GFM-1700) capable of measuring flow rates between 0 - 500 ml/min. within $\pm$1.5% full scale. Laboratory and field pre-sampling event calibration procedures for subatmospheric and pressurized canister samples are described in Sections 4.1.2 and 4.1.4, respectively. The post sampling event flow rate check procedures for subatmospheric and pressurized canister samples are described in Sections 4.1.3 and 4.1.5, respectively.

4.1.1 FLOW RATE DETERMINATION

Flow rates are determined based on the duration of the sampling event and whether subatmospheric or pressurized samples will be collected. Flow rates can be calculated using the following formula:

$$F = \frac{P \times V}{T \times 60}$$

F = flow rate (ml/min)
P = final canister pressure, atmospheres absolute
= $\frac{\text{gauge pressure (psig) + 14.7 psi}}{\text{14.7 psi}}$
V = volume of canister (ml)
T = sampling period (hours)

For example, if a 15 liter canister is to be pressurized to 26 psig in 8 hours, the flow rate should be calculated as follows:

$$\text{Flow Rate (ml/min)} = \frac{(26 \text{ psig} + 14.7 \text{ psi})}{14.7} \times \frac{15{,}000 \text{ ml}}{8 \text{ hours} \times 60 \text{ min}}$$

$$= \frac{2.8 \text{ atmospheres absolute} \times 15{,}000 \text{ ml}}{480 \text{ min}}$$

= 88 ml/min

If a subatmospheric sample is be collected in a 15 liter canister over an 8 hour period the flow rate should be calculated as follows to achieve a final canister gauge pressure reading of 8 in. Hg vacuum:

$$\text{Flow Rate (ml/min)} = \frac{(-8 \text{ in. Hg} + 29.92 \text{ in. Hg})}{29.92 \text{ in. Hg}} \times 15{,}000 \text{ ml}$$

$$\frac{}{8 \text{ hours} \times 60 \text{ min}}$$

$$= \frac{0.73 \text{ atmospheres absolute} \times 15{,}000 \text{ ml}}{480 \text{ min}}$$

= 23 ml/min

4.1.2 Subatmospheric Canister Laboratory and Field Flow Controller Calibration Procedures

1. On the inlet side of the Aalborg Electronic Mass Flowmeter (Model GFM-1700) connect the 7 micrometer stainless steel Nupro Co. particulate filter supplied with the flowmeter.

2. Power up the Aalborg Electronic Mass Flowmeter (Model GFM-1700) by connecting it to the power supply. **Note: The meter must be warmed up for a minimum of 15 minutes prior to taking readings.**

3. Using an insulated screwdriver through the ZERO (lower) access window adjust the trim potentiometer until the display reads zero.

4. Configure the sampler as shown in Figure 2 using the components described in Section 2.1. Connect the sample inlet line with particulate matter filter to the flow controller's high pressure inlet port (HP) and the low pressure outlet port (LP) to an evacuated canister. **Note: This canister will serve as a dummy canister for calibrating all the flow controllers to be used during the sampling event.**

5. Connect the flowmeter to the sample inlet making sure the "FLOW ARROW" marked on the flowmeter is pointing in the right direction.

6. In a field log book record the project name, calibration date, and flow controller number.

7. Open the canister valve to allow a sample of room air or clean/background ambient air to be drawn through the flowmeter and into the canister. The canister pressure differential causes the sample to flow into the canister.

8. Observe the mass flowmeter reading and adjust the micrometering valve on the flow controller until the predetermined flow rate registers on the meter. In the field log book record the flow rate reading. Refer to Section 4.1.1 for the procedure to calculate flow rates. **Note: With the mechanical flow controller, the difference between the inlet and outlet pressure must be 10 psi to maintain a constant flow rate. As the internal canister pressure approaches atmospheric pressure, there will be a decrease in the flow rate. Therefore, a 6 liter canister will only be able to collect a 2 - 3 liter sample.**

9. Close the canister valve. **DO NOT OVER-TIGHTEN THE VALVE.**

10. Turn off (unless it will be used for further calibrations) and disconnect the Aalborg Electronic Mass Flowmeter from the sample inlet.

11. Disconnect the sample inlet line with particulate matter filter from the flow controller and the flow controller from the canister.

12. Place flow controller in appropriate carrying case.

4.1.3 Subatmospheric Canister Field Flow Controller Post and During Sampling Flow Check Procedures

1. On the inlet side of the Aalborg Electronic Mass Flowmeter (Model GFM-1700) connect the 7 micrometer stainless steel Nupro Co. particulate filter supplied with the flowmeter.

2. Power up the Aalborg Electronic Mass Flowmeter by connecting it to the power supply. **Note: The meter must be warmed up for a minimum of 15 minutes prior to taking readings.**

3. Using an insulated screwdriver through the ZERO (lower) access window adjust the trim potentiometer until the

display reads zero.

4. Connect the flowmeter to the sample inlet making sure the "FLOW ARROW" marked on the flowmeter is pointing in the right direction.

5. Observe the mass flowmeter reading. In a field log book record the date, sampling location, flow controller number, and flow rate reading.

6. Turn off (unless it will be used at another sampling location) and disconnect the Aalborg Electronic Mass Flowmeter from the sample inlet.

7. Place flow controller in appropriate carrying case.

4.1.4 Pressurized Canister Laboratory and Field Flow Controller Calibration Procedures

1. On the inlet side of the Aalborg Electronic Mass Flowmeter (Model GFM-1700) connect the 7 micrometer stainless steel Nupro Co. particulate filter supplied with the flowmeter.

2. Power up the Aalborg Electronic Mass Flowmeter (Model GFM-1700) by connecting it to the power supply. **Note: The meter must be warmed up for a minimum of 15 minutes prior to taking readings.**

3. Using an insulated screwdriver through the ZERO (lower) access window adjust the trim potentiometer until the display reads zero.

4. Configure the sampler as shown in Figure 3 using the components described in Section 3.1. Connect the sample inlet line with particulate matter filter to the inlet/vacuum side of the pump. Connect the outlet/ pressure side of the pump to the high pressure inlet port (HP) of the flow controller. Connect the low pressure outlet port (LP) side of the flow controller to the canister inlet port. **Note: This canister will serve as a dummy canister for calibrating all the flow controllers to be used during the sampling event.**

5. Connect the Aalborg Electronic Mass Flowmeter (Model GFM-1700) to the sampler inlet making sure the "FLOW ARROW" marked on the flowmeter is pointing in the right direction.

6. Power up the pump, open the canister valve to allow a

sample of room air or clean/background ambient air to be drawn into the canister.

7. Observe the mass flowmeter reading and adjust the micrometering valve on the flow controller until the predetermined flow rate registers on the meter. In the field log book record the date, pump number, sampler number, and flow rate reading.

8. Close the canister valve. **DO NOT OVER-TIGHTEN THE VALVE.**

10. Turn off the pump and flowmeter (unless it will be used for further calibrations).

11. Disconnect the Aalborg Electronic Mass Flowmeter from the sample inlet.

12. Disconnect the sampler from the canister.

13. Place flow controller and sampler in their appropriate carrying case.

4.1.5 Pressurized Canister Field Flow Controller Post and During Sampling Flow Check Procedures

1. On the inlet side of the Aalborg Electronic Mass Flowmeter (Model GFM-1700) connect the 7 micrometer stainless steel Nupro Co. particulate filter supplied with the flowmeter.

2. Power up the Aalborg Electronic Mass Flowmeter (Model GFM-1700) by connecting it to the power supply. **Note: The meter must be warmed up for a minimum of 15 minutes prior to taking readings.**

3. Using an insulated screwdriver through the ZERO (lower) access window adjust the trim potentiometer until the display reads zero.

4. Connect the Aalborg Electronic Mass Flowmeter (Model GFM-1700) to the sampler inlet making sure the "FLOW ARROW" marked on the flowmeter is pointing in the right direction.

5. Observe the mass flowmeter reading. In a field log book record the date, sampling location, sampler number (includes flow controller and pump number), and flow rate reading.

6. Turn off (unless it will be used at another sampling location) and disconnect the Aalborg Electronic Mass Flowmeter from the sample inlet.

7. Place flow controller in appropriate carrying case.

4.2 FIELD/TRIP BLANK

There will be no canister field/trip blanks brought back to the laboratory for analyses. All the canisters and samplers designated for a specific project are certified clean and leak free by the ESD Laboratory prior to sample collection. The cleaning and leak certification procedures are described under separate cover in SOP document, EPA-REG1-OEME/CANISTER-CLEANING-SOP, Revision 2. This process eliminates the need to have field/trip blanks analyzed with canister samples.

4.3 CANISTER STORAGE

Canisters that have been certified clean and leak free by the ESD Laboratory are stored in a locked cabinet under pressure. Several days prior to the sampling event canisters are evacuated to their final canister pressure (10^{-3} TORR). After the sampling event and after being logged into the laboratory, the canister samples are stored in a locked cabinet. Two engineers from the Ambient Air and Emissions Monitoring Section responsible for collecting canister samples and a chemist from the Chemistry Section performing canister analyses have keys to the cabinet.

4.4 CANISTER TRANSPORT

Canisters are transported to the field and back to the laboratory in a SIS metal carrying case designed to carry two 15 liter canisters. The carrying case helps eliminate valves on the canisters from being inadvertently opened and/or damaged.

4.5 CHAIN-OF-CUSTODY

4.5.1 CHAIN-OF-CUSTODY RECORD FORM

A chain-of-custody record form accompanies the samples from the point of sample collection to the point of analyses. The field engineer enters the following information on the chain-of-custody record form (copy provided in Appendix A) at the completion of the sampling event:

Project/Site Name
Samplers Signature
Station Numbers
Date

Station Location Description
Remarks: canister type (i.e. SIS, Andersen), canister size (i.e. 15, 6 liter), canister number, final canister gauge pressure reading, and any other pertinent information

The field engineer returns to the laboratory, stores the samples in the locked cabinet or on shelf in the hall outside the Air Calibration Room, and contacts a representative of the Chemistry Section to transfer sample custody. At that time, the engineer signs and enters the date/time on the chain-of-custody record form, relinquishing the samples to the Chemistry representative, who also signs and enters the date/time on to the form.

4.6 DATA REPORTING

The field engineer prepares a final report after the laboratory has submitted its analytical report. The final report describes in detail the project's objective/purpose, the sampling and analytical procedures utilized, the quality/useability of the data generated, an interpretation of the results from an air quality impact perspective, and presents the air sampling data using a spread sheet.

APPENDIX A

CHAIN-OF-CUSTODY FORMS