

**Verification Study for Air Dispersion Modeling at
Fenceline**

Draft Plan

October 2003

Table of Contents

I. OVERVIEW

II. MONITORING PLAN

1. Objectives
2. Site Description
3. Target Compound
4. Sampling Strategy
5. Sampling Equipment
6. Analytical Methods
7. Meteorological Monitoring
8. Quality Assurance and Quality Control

III. MODELING PLAN

1. Objectives
2. Emission Inventory
 - 2.1. Source Characterization
 - 2.2. Methods for Estimating Emissions
3. Meteorological Data
4. Model Selection and Methodology
5. Receptor Selection

IV. COMPARISON OF RESULTS

V. PROJECT TIMING

REFERENCES

APPENDIXES

- A. OSHA Versatile Sampling Tube Information
- B. Sample Field Log
- C. Sample Shipment Protocol
- D. Equipment Calibration Procedures

I. OVERVIEW

This study is intended to compare results from air dispersion modeling and ambient air sampling to understand how modeling predictions relate to measured ambient air concentrations of perfluorooctanoic acid (PFOA). To evaluate this objective, actual ambient air monitoring of PFOA will be performed during multiple sampling events at various locations surrounding Washington Works. These results will be compared with air dispersion modeling results that simulate identical meteorological and operating conditions as they occurred at the time of sampling. Results of monitoring and modeling will be compared using appropriate statistical analysis.

II. MONITORING PLAN

1. Objectives

A monitoring program will be conducted to collect and analyze air samples near the Washington Works site to evaluate concentrations of PFOA in ambient air. Details of the monitoring program are described in the following sections.

2. Site Description

Monitoring will be conducted at the E. I. DuPont manufacturing facility located in Washington, West Virginia.

3. Target Compound

The target compound for this monitoring program is perfluorooctanoic acid (PFOA), the free acid form of ammonium perfluorooctanoate (APFO).

4. Sampling Strategy

Air Sampling Events, Duration and Locations

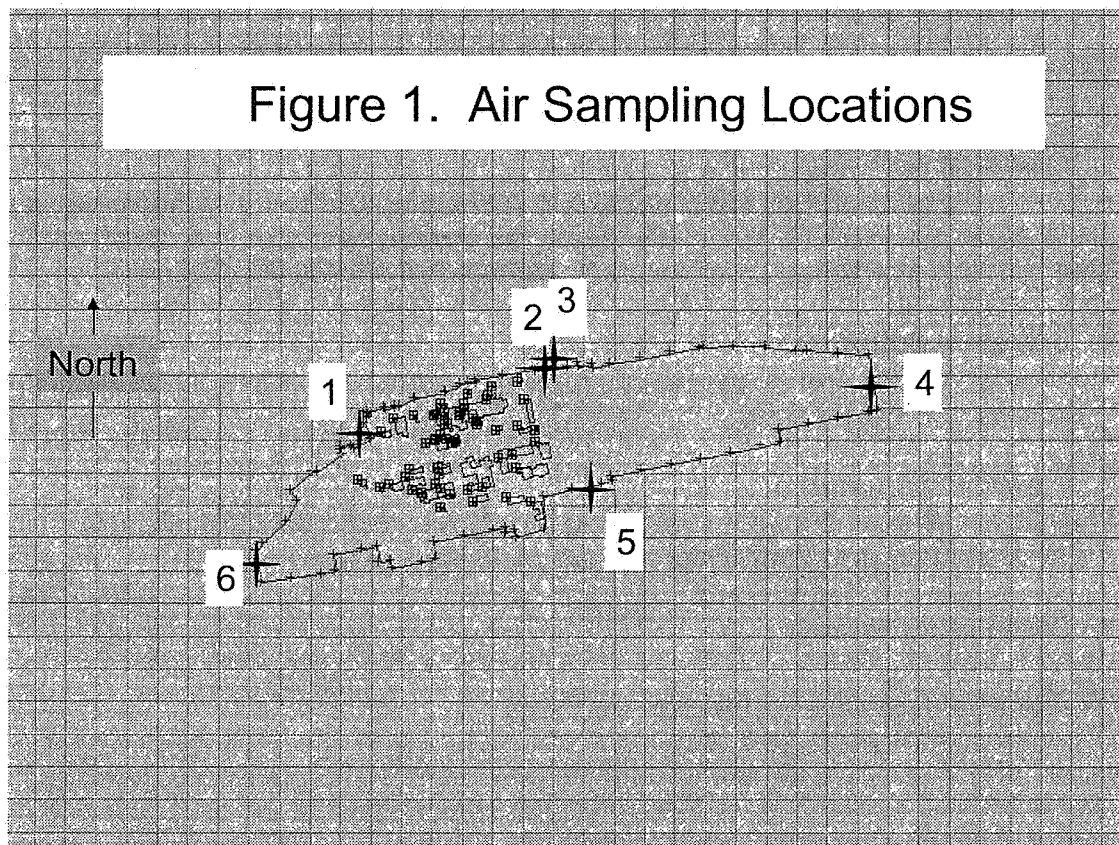
The air monitoring program will consist of 7 sampling events conducted over a period of 6 weeks. During each sampling event, one sample will be collected over a 24-hour period at each location. One sampling event will occur every 6 days during the 6-week period. Sampling will begin and end as close to 7 am as possible to coincide with shift changes at the Washington Works site.

The sample network will consist of 6 locations around the site perimeter, as shown in Figure 1. These locations were selected to represent each of the major wind directions (N, S, E, W) to ensure the prevailing wind direction on a given day of sampling has been captured. Locations on the northern perimeter were selected to capture areas where previous modeling has indicated maximum ground level ambient air concentrations occur. In addition, sample locations 2 and 3 shown on Figure 1 have been co-located in order to provide duplicate samples during each event.

Number of Samples

A total of 49 samples will be analyzed over the duration of the program. The samples will include:

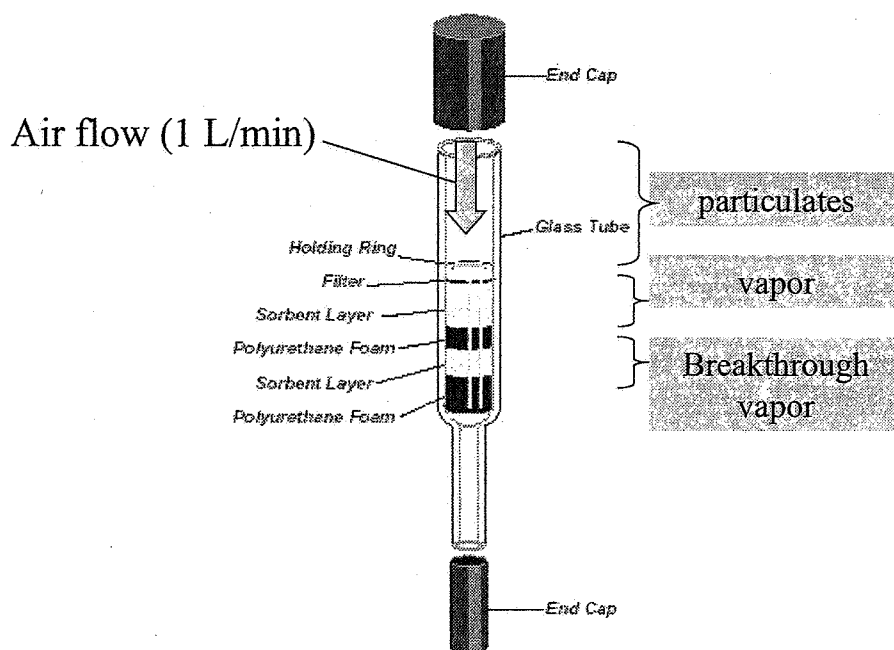
- One field blank per sampling event
- One sample from each of the six sampling locations per event (where sampling location #3 serves as a duplicate sample due to its co-location with location #2)
- A total of 7 samples per event x 7 events = 49 samples



5. Sampling Equipment and Methods

Sampling will be conducted using a sorbent method for collection and analysis. In general, this method involves drawing ambient air through a medium and adsorbing the analyte of concern onto that medium. The collected species are preserved and shipped to a laboratory for analysis. The laboratory desorbs the analyte from the medium and proceeds with analysis.

Figure 2. OVS Tube



For collection and analysis of PFOA, the OSHA Versatile Sampling (OVS) tube with a 0.3 micron filter will be used (cat # 226-58 or equivalent, SKC, Eighty Four, PA). This tube is uniquely designed to simultaneously capture aerosols and vapors. (See Figure 2 below.) Details describing the tube design are included in Appendix A.

Pumps will be required at each sampling location to provide airflow through sample tubes. Sample pumps, such as the Universal PCXR4, capable of 500 mL to 1500 mL/minute flowrate will be specified. The samplers will be set to run at approximately 1 liter per minute for a total volume of 1.44 cubic meters over the 24-hour sampling period. Sampling equipment will be mounted on poles and covered as needed to provide protection from weather and other potential damage. Power will be supplied to each location via AC power.

Field personnel will be trained by professional industrial hygienists familiar with OVS equipment. Field logs will be provided to record pertinent information during sampling events. (See Appendix B for sample log sheet.)

6. Analytical Methods

Ambient air samples will be analyzed by Exygen Research of State College, PA. Exygen will use analytical methodology that has undergone third-party validation and has been submitted to the public docket under OPPT-2003-0012-0317 through 0318. The methodology uses a methanol extraction with liquid chromatograph/mass spectrometer (LC/MS) system to detect PFOA. Method detection limits are approximated at 0.1 ug/m^3 .

Contents of sample tubes will be analyzed separately for vapor and particles greater than 0.3 microns, then composited for a total concentration at each sampling location.

7. Meteorological Monitoring

Meteorological measurements will be taken during each sampling event using an on-site meteorological station. The use of an on-site meteorological station ensures the data are representative of conditions at the perimeter of the site.

Data collected during each 24-hour sampling event will include:

- Hourly average wind speed
- Hourly average wind direction
- Hourly average ambient air temperature
- Calculation of stability class

8. Quality Assurance and Quality Control

Quality Assurance (QA) includes a description of actions taken to ensure data measurements are of sufficient quality to meet the overall goals of the program. QA consists of things such as personnel training, standardization of procedures, documentation, data validation and data quality evaluations. Quality control (QC) describes the operational techniques and activities that are used to fulfill requirements for quality. QC consists of activities such as routine instrument checks, flow rate checks, duplicate samples, blanks, and calibration. Various QA/QC procedures are described in this section.

Shipping Protocol

Samples will be shipped to Exygen Research in State College, PA for analysis. A standardized protocol for sample preservation, transport and storage and chain-of-custody information are included in Appendix C.

Calibration Procedures

The calibration of samplers will be performed prior to each of the 7 sampling events. A protocol is provided in Appendix D.

Preventative Maintenance

Preventative maintenance is a combination of actions taken to prevent or correct failure of monitoring systems. Preventative maintenance for this apparatus includes inspection and cleaning of inlets and replacement of sample tubes and pumps, as needed. Preventative maintenance will be performed prior to and during each 24-hour sampling event.

QC Samples

QC field blanks will be collected during each sampling event to measure possible contamination introduced by sampling procedures, media, equipment, or shipment. Field blanks will be handled in the same manner as actual samples. A total of seven field blanks will be collected for the monitoring program, which constitutes over 15% of the primary samples collected.

III. MODELING PLAN

1. Objectives

Air dispersion modeling will be performed to predict concentrations of PFOA in ambient air at monitoring locations near the Washington Works facility.

2. Emission Inventory

2.1. Source Characterization

The following information will be collected and used as input into air dispersion modeling:

- Stack locations
- Stack heights
- Stack diameters
- Stack gas exit temperatures
- Stack gas flow rates or exit velocities
- Emission rates

2.2. Methods for Estimating Emissions

Site-specific operational data will be used to relate production data to emissions levels using a factor. Through a combination of actual stack monitoring (for vents with highest emissions) and mass balance estimates (for vents with very small emissions), a factor has been established for each PFOA emission point to estimate the quantity of emissions released at a given production rate. This factor will be combined with production data to calculate PFOA emissions during each 24-hour sampling event.

3. Meteorological Data

On-site meteorological data will be collected during each sampling event, as described in section II.7. Concurrent twice-daily upper air observations will be collected from the upper air station located in Wilmington, OH in order to compute hourly mixing depth. Both sets of data will be combined and preprocessed by Trinity consultants of Dallas, Texas, to be used as input to the air dispersion model. Missing data and measured wind speeds of less than 1.0 m/s will be treated consistent with the recommendations in EPA's "Meteorological Monitoring Guidance for Regulatory Model Applications". An anemometer height of approximately 9.14 meters will be used for modeling analysis.

4. Model Selection and Methodology

The Industrial Source Complex Short Term Model (ISCST3), version 02035 will be used to conduct air dispersion modeling. All modeling will be performed in accordance with the procedures in EPA's Guideline on Air Quality Models (40 CFR Part 51, Appendix W). All model options will be set to the U.S. EPA default version of ISCST3.

PFOA emission sources will be evaluated for downwash effects from surrounding buildings. EPA's Building Profile and Input Program (BPIP) will be used to

provide wind direction specific building parameters. All buildings on site will be evaluated to determine if they could potentially impact the stack by causing building downwash effects.

The area surrounding Washington Works is primarily non-urban. The U.S. EPA procedures classify land use within 3 kilometers of the site by the Auer method. Previous review of the U.S. Geological Survey (USGS) maps, aerial photographs, and site visits indicate the area is well over 50% non-urban. The Washington Works facility is located within the Ohio River valley, and is surrounded by significant terrain features on both sides of the river valley. As a result, terrain elevations will be considered in the modeling analysis.

An averaging time of 24-hours will be used to simulate the duration of field sampling.

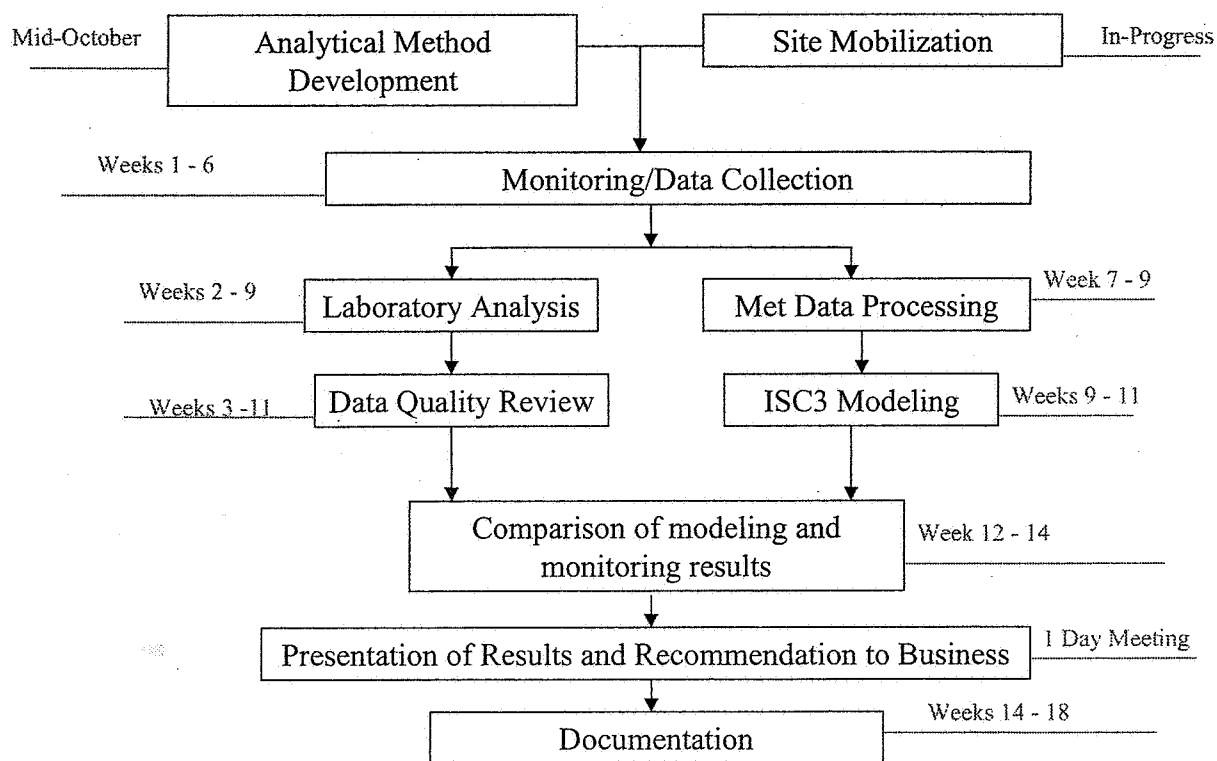
5. Receptor Selection

Receptors will be placed at exact coordinates of the perimeter sampling locations shown in Figure 1. A Global Positioning System (GPS) will be used to identify UTM coordinates of each sample location. The aboveground elevation of intake tubing for each sample location will also be measured and input into the ISCST3 model.

IV. COMPARISON OF RESULTS

Following the completion of laboratory analysis and modeling simulations, it is expected that 35 pairs of measured/modeling data sets will be available for comparison. These data will be analyzed using a variety of statistical tools to evaluate the correlation between monitored and modeled data.

V. PROJECT TIMING



REFERENCES

Auer, Jr., A.H., 1978. Correlation of Land Use and Cover with Meteorological Anomalies. *Journal of Applied Meteorology*, 17(5): 636-643.

Environmental Protection Agency, OAQPS February 2000. Meteorological Monitoring Guidance for Regulatory Modeling Applications.

Environmental Protection Agency, 1993. Air/Superfund National Technical Guidance Study Series; Volume IV – Guidance for Ambient Air Monitoring at Superfund Sites (Revised). EPA-451/R-93-007.

Environmental Protection Agency. Guideline on Air Quality Models (Revised) EPA-450/2-78-027R-C, 1999. (also codified in 40 CFR Part 51, Appendix W).

Appendix A
OSHA Versatile Sampling Tube Information

Refer to SKC Product Data Bulletin

<http://www.skcinco.com/instructions/1094.pdf>

Appendix B Sample Field Log

DuPont Washington Works Air Sampling Program

Sampler(s):

FedEx Airbill #:

Event Number

Pump #	Station #	Oxygen ID	Calibration (pre)	Date	Start Time	Date	Stop Time	Calibration (post)	Total Minutes	Total Volume
669842	AMS-1									
669908	AMS-2									
669878	AMS-3									
669809	AMS-4									
669769	AMS-5									
669848	AMS-6									

Field Blank: yes
yes or no

Weather:

SAFER operational:
yes or no

Comments:

Appendix C

Sample Shipment Protocol

SUGGESTED SAMPLE HANDLING, CHAIN-OF-CUSTODY, PRESERVATION and SHIPPING – AIR SAMPLES

The person collecting the sample should wear clean latex or nitrile disposable lab or exam gloves and should limit his/her contact with the samples.

Sample tubes (OVS) will be provided by the contracted laboratory and should be stored in a clean, dry location. Sample tubes and collected samples are not required to be chilled, however sample tubes and collected samples should not be subjected to temperature extremes.

In order to minimize the possibility of introducing APFO contamination into samples, the following protocol should be followed:

- ☐ Avoid polytetrafluoroethylene (PTFE).
- ☐ Avoid aluminum foil.
- ☐ Do not use self-stick memo notes.
- ☐ Avoid blue ice (the OVS tubes are shipped at ambient temperature).
- ☐ Avoid pre-wrapped foods or snacks.
- ☐ Wear clothing that has been washed at least six times.
- ☐ Use only containers supplied by contract laboratory.

Following sample collection, the OVS tubes are capped and placed in a zip-loc bag. Seal the zip-loc bag.

Complete the sample label and chain-of custody (COC) form, including the volume of air sampled through the tube. The completed sample label is attached to the outside of the zip-loc bag.

Pack the samples in a small box or cooler with bubble wrap. Include the completed COC form.

Seal the box or cooler with at least one (1) custody seal.

Complete a mailing label and airbill and ship by overnight carrier to:

Exxygen Research
3058 Research Drive
State College, PA 16801

814-272-1039

Contacts at the laboratory are Shawn Robb and John Flaherty.

Samples should be shipped to the laboratory same day as collection, and will be received at the laboratory within 72 hours of collection.

Appendix D
Equipment Calibration Procedures
Procedure for the Collection of Air Samples

1 Calibration of Personal Pumps

Each personal pump must be calibrated with the tubes set up as they will be used. Refer to the sampling/analytical method to determine the appropriate flow rate. Record flow rate value, pump number, and tube number on a work sheet.

1 Collection of Samples

1. Immediately before sampling, uncap the ends of the tube(s).
2. See arrow on tube for direction of flow. Insert the tube into the sampling hose so that the inlet is open to the air and the other end is connected to the sampling hose. Air being sampled should not be passed through any hose or tubing before entering the sampling tube.
3. The adsorption tube should be placed in a vertical direction during sampling to minimize channeling through the adsorbent.
4. If collecting personal samples, place the field monitor unit over either shoulder and attach the pump to belt or pocket so that it does not interfere with the worker's operations. Make sure the sampling head is located in the worker's breathing zone, i.e. should or upper chest.
5. Turn on the pump, record the time and observe the counter or rotameter to make sure it is operating.
6. The flow, time, and/or volume must be measured as accurately as possible. Record this information on the worksheet and also record the location, sample number, worker's name (if personal sample) and type of operation.
7. Check on the sampling train periodically for proper flow rate and observe the work practices of the person being monitored.
8. Turn off the pump and record the end time on the worksheet. Calculate and record the total sampling time in minutes.
9. Recheck and record the final flow rate. Calculate and record the total air volume in liters.
10. Seal the sample collection tubes immediately.
11. One tube should be handled in the same manner as the sample tube (open, seal, and transport) except that no air is drawn through the tube. Label this tube as the field blank.