Quality assurance Project Plan for Empirical Human Exposure Assessment. Multi-City Study Sampling Task

Quality Assurance Project Plan

for

Empirical Human Exposure Assessment
Multi-City Study Sampling Task

To
(Confidential)

May 14, 1999

Prepared by

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1. PROJECT NAME

Empirical Human Exposure Assessment
Multi-City Sampling Task

2. REQUESTED BY

Confidential

3. DATE OF REQUEST

January 1999

4. DATE OF INITIATION

February 15, 1999

5. PROJECT MANAGEMENT

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7. PROJECT DESCRIPTION

7.1 Background

In the 1950's, surfactants and bath additives based upon perfluorooctyl sulfonyl fluoride (POSF) began limited introduction. Diversification of the POSF-based chemistry in the 1960's and 1970's led to the discovery and introduction of numerous N-methyl or N-ethyl perfluorooctyl sulfonamido ethyl alcohol-based (FOSE) chemicals. The FOSE-based fluorochemicals (FC) were incorporated into textiles, food packaging, and carpets to impart specific properties related to stain, moisture, and fat resistance. Although the number, chemical diversity, and range of applications of FC are quite extensive, all formulations share some similarities. All formulations have trace levels of several impurities in common: perfluorooctane sulfonate (PFOS), N-ethyl (or N-methyl) perfluorooctane sulfonamide (N-EtFOSA), and N-ethyl (or N-methyl) perfluorooctane sulfonamidoethyl alcohol (N-EtFOSE alcohol). In addition, the results of current metabolism studies suggest that all formulation FCs undergo some limited degradation to PFOS, N-EtFOSAmide (or N-MeFOSAmide) and N-EtFOSE alcohol (or N-MeFOSE alcohol) in humans and in the environment, via microbial and/or enzymatic mechanisms.

Recent chemical analyses of pooled human blood samples and selected analyses of biota samples from diverse regions of the United States have shown a general consistency in the detection rate and detected levels of PFOS therein. Because PFOS is unique to FCs, PFOS may be distributed in the greater environment as a result of the use and disposition of products containing FCs. Though limited, the data suggest that increasing levels of PFOS in human blood parallel the introduction and volume/use of FCs. It is unknown whether the PFOS in human blood is due to FC exposures in the residence from the use of products, or to the slow bioaccumulation of FC in the food web due to widespread dispersion of FCs through multiple sources.

Several hypotheses are considered to understand the life cycle of FCs in the environment.

- Dispersion of FC from sources results in long range transport via air and water.
- Effluent discharges, industrial spills, urban surface runoff and fire-fighting foam contribute FCs to surface water bodies. FCs in surface water can affect all aspects of the human diet: local drinking water and fish, and all agricultural products that rely indirectly on that water (meat and dairy, fruits/vegetables, and grains).
- Leachates from solid wastes percolate into groundwater and ultimately contribute FCs to some drinking water sources, surface water and eventually fish.
- Direct air deposition of FCs to food chain constituents and air deposition of FCs to surface waters contributes FCs to human food commodities.
- The FC levels in and around cities associated with FC production and use will be higher than the levels in and around cities where there is only general population use of such products.

7.2 Objectives

This project provides the foundation for all subsequent exposure assessment studies that the client will need to conduct. The initial focus will be the assessment, development and/or validation of analytical methods for representative FC in environmental media. This task will also assemble baseline information about the distribution of FC in selected media that represent environmental dispersion from a source and bioaccumulation in the human food chain.

The objective of the sampling task is to collect representative samples for trace-level analysis of FC residuals (Table 1) to assess sources, dispersion in the environment and human exposure via the food chain. Samples will be collected from 12 cities: major FC production facilities or FC-users are present in

the six "study" cities (Table 2), and the six "control" cities are matched to the "study" cities by general geographic location, population, and type of water supply for drinking water.

Table 1. FC Residuals for Analysis

Polar anions	Moderately polar neutrals
PFOS	
PFOSAA	N-EtFOSE Amide/ N-MeFOSE Amide
M-556	N-EtFOSE Alcohol/ N-MeFOSE Alcohol
PFOSA	N-EtFOSE Chloride/ N-MeFOSE Chloride
POAA	N-EtFOSEA/ N-MeFOSEA

Table 2. Study and Control Cities for Baseline Study

Group[1]	Water Source	Study or Control	City	State	1990 Census Population
High	Ground	Study	Pensacola	FL	58,165
		Control	Port St. Lucie	FL	55,866
Middle	Ground	Study	Kaukauna	WI	11,982
		Control	Englewood	OH	11,432
High 1	Surface	Study	Dalton	GA	21,761
		Control	Greeneville	TN	13,532
High 2	Surface	Study	Decatur	AL	48,761
		Control	Cleveland	TN	30,354
Middle 1	Surface	Study	Mobile	AL	196,278
		Control	Columbus	GA	178,681
Middle 2	Surface	Study	Spartansburg	SC	43,467
		Control	Bowling Green	KY	40,641

[1]Defined by the ratio of FC production or useage:population

7.3 Technical Approach

This quality assurance project plan (QAPP) (Revision 0) is intended to comply with the requirements for Good Laboratory Practice (GLP) protocols defined in 40 CFR Part 792 *Toxic Substances Control Act (TSCA); Good Laboratory Practice Standards; Final Rule* (July 1, 1998) to the extent possible at this point in the program.

The types of samples, sample volumes (or weights) and sampling devices are summarized in Table 3. The total numbers of samples of each type, collected at each site, are listed in Table 4. This listing provides an indication of the type of sample analysis intended for that sample with analysis being either analysis for the polar anions (P), the moderately polar neutrals (N), or Total PFOS. This table also indicates the number of samples that will be collected of each type and/or at each location to provide necessary field and lab QC samples. The QC samples are outlined specifically in Table 5, and the level of

Table 3. Sample Types, Sampling Devices, and Sample Volumes

Sample type	Sampling Device	Volume or Amount collected per sample
Drinking Water		
Surface Water source (3 locations ~ 500 ft apart)	Sample bottle[a]	1 L from each location; bulk water, not surface
Sediment from surface water source (3 locations, match w/ water sample)	Grab sampler or scoop	200 g from top 2 cm
Plant intake	Sample bottle	1 L
Treated water from plant	Sample bottle	1 L
Tap water from retail establishment (from 3 locations in city)	Sample bottle	1 L
Microlayer from surface water[b]	Sample plate	1 L
Water from groundwater source[b]	Sample bottle	1 L
Publicly-Owned Treatment Works (POTW)		
Post-chlorination influent (if available)	Sample bottle	1 L
Sludge	Scoop	200 g
Effluent	Sample bottle	1 L
Landfill		
Leachate	Sample bottle	1 L
Urban Air		
Particulates (glass fiber filter)	General Metal Works Model PS-1 air sampler	12 h at 250 L/min
Vapor (polyurethane foam cartridge)		12 h at 250 L/min
Local Food Supply		
Ground beef (3 stores)	Store packaging	1 lb
Pork chops with bone (3 stores)	Store packaging	1 lb (~ 2 chops)
Boneless, skinless chicken breast (3 stores)	Store packaging	1 lb (1 whole breast)
Pork-and-beef hot dogs (3 stores)	Store packaging	1 lb (1 package)
Regional fish (3 stores)	Store packaging	1 lb (filleted)
Eggs (3 stores)	Store packaging	6 large
Whole milk in plastic or cardboard container (3 stores)	Store packaging	1 qt
White bread (3 stores)	Store packaging	1 loaf
Frozen green beans in plastic bag (3 stores)	Store packaging	1 pkg
Fresh apples (3 stores)	Store packaging	1 lb (at least 2 apples)
Organic bread or flour (1 store)	Store packaging	1 lb or 1 loaf
Fish		
Finfish (electroshock) from surface water source (above)	Smith-Root Type VII backpack shocker	3 fish

(a) Sample bottles will be ESE precleaned, certified polyethylene bottles
(b) Not planned for Multi-City Study

Table 4. Sample Types and Numbers at Sampling Locations at Each City

Matrix	Analysis for Site 1 Sample	Sample Volume			Analysis for Sites 2&3 Samples
		Site 1	Site 2	Site 3	
Surface Water (one water body)	Sample: P&N residuals (P & N)	1 L	1 L	1 L	P & N
	Sample: Total PFOS (in duplicate)	1 L			
	Field duplicate & laboratory duplicate: P	1 L			
	Field spike: P&N	1 L			
	Laboratory spike: P&N	1 L			
	Field Blank: P & N				
	Field Blank: Total PFOS				
Sediment	Samples and laboratory QC (no field spike): P & N; Total PFOS	200 g	200 g	200 g	P&N; Total PFOS
	Field Blank: P & N				
	Field Blank: Total PFOS				
Drinking water (plant influent)	Sample: P&N	1 L			
	Sample: Total PFOS (in duplicate)	1 L			
	Field duplicate & laboratory duplicate: P	1 L			
	Field spike: P&N	1 L			
	Laboratory spike: P&N	1 L			
	Field Blank: P & N				
Drinking water (plant outflow)	Sample: P&N	1 L			
	Sample: Total PFOS (in duplicate)	1 L			
	Field duplicate &laboratory duplicate: P	1 L			
	Field spike: P&N	1 L			
	Laboratory spike: P&N	1 L			
Tap water (retail outlet)	Sample: P&N	1 L	1 L	1 L	P & N
	Sample: Total PFOS (in duplicate)	1 L			
	Field duplicate & laboratory duplicate: P	1 L			
	Field spike: P&N	1 L			
	Laboratory spike: P&N	1 L			
	Field Blank: P & N				
Landfill leachate	Samples and laboratory QC (no field spikes): P & N; Total PFOS	1 L			
	Field Blank: P & N				
POTW influent	Sample and laboratory duplicate: P & N	1 L			
	Sample: Total PFOS (in duplicate)	1 L			
POTW sludge	Samples and laboratory QC (no field spikes): P & N; Total PFOS	200 g			
	Field Blank: P & N				
POTW effluent	Sample and laboratory duplicate: P&N	1 L			
	Sample: Total PFOS (in duplicate) Field duplicate: P & N	1 L			
	Field spike: P & N	1 L			
	Laboratory spike: P & N	1 L			
	Field Blank: P & N				
Urban air	Sample: P&N	Filter/PUF			
	Field spike- no air	Filter/PUF			
	Field Blank: P & N	Filter/PUF			
Food	Samples and laboratory QC (no field blanks/field spikes): P & N; Total PFOS	All	All	All	P&N; Total PFOS
Finfish	Sample and laboratory QC				
Organic flour	Samples and laboratory QC (no field blank/field spike): P & N; Total PFOS	1 lb			
Trip Blank	MilliQ water: P & N	1 L			
Trip Blank	MilliQ water: Total PFOS	1 L			

P= polars: PFOS, POAA, PFOSA, PFOSAA, M556; N= neutrals: Et/Me of FOSE-OH, FOSE-Cl, FOSE-Amide

Table 5. QC Samples by Matrix

Matrix and Analysis Type	Field Sites	Field Rep	Lab Reps	Spikes		Field Blank	Field Spike Conc.
				Field	Lab		
Surface Water							
P & N	3	1	(1)[a]	1	1	1	100 ng/L
Total PFOS	1	0	(1)	0	0	1	
Sediment							
P & N	3	0	(3)[b]	0	(1)	1	
Total PFOS	(3)	0	(3)	0	(1)	1	
Drinking Water (influent)							
P & N	1	1	(1)	1	1	1	100 ng/L
Total PFOS	1	0	(1)	0	0	0	
Drinking Water (outflow)							
P & N	1	1	(1)	1	1	0	100 ng/L
Total PFOS	1	0	(1)	0	0	0	
Tap Water							
P & N	3	1	(1)	1	1	1	100 ng/L
Total PFOS	1	0	(1)	0	0	0	
Landfill Leachate							
P & N	1	0	(3)	0	(1)	1	
Total PFOS	(1)	0	(3)	0	(1)	0	
POTW (influent)							
P & N	1	0	(1)	0	0	0	
Total PFOS	1	0	(1)	0	0	0	
POTW sludge							
P & N	1	0	(3)	0	(1)	1	
Total PFOS	(1)	0	(3)	0	(1)	0	
POTW (effluent)							
P & N	1	(1)	(1)	1	1	1	1000 ng/L
Total PFOS	1	0	(1)	0	0	0	
Urban Air							
P & N	1	0	0	1	0	1	Filter: 100 ng PFOS & POAA PUF: 100 ng Et- & -Me-FOSE-OH
Total PFOS	0	0	0	0	0	0	
Food (including finfish)							
P & N	3[c]	0	(1)[d]	0	(1)	0	
Total PFOS	(3)[c]	0	(1)[d]	0	(1)	0	

[a]Numbers in parentheses indicate samples that will be created from splits or aliquots in the laboratory.
[b]Triplicate analysis of one sediment sample.
[c]Organic flour at one site, only.
[d]Duplicate analysis of the fish samples.
P= polars: PFOS, POAA, PFOSA, PFOSAA, M556; N= neutrals: Et/Me of FOSE-OH, FOSE-Cl, FOSE-Amide

each field QC spike addition is listed also. SOPs are listed in Table 6, and the methods are summarized in this QAPP. The analytical QAPP will be provided under separate cover.

Table 6. Standard Operating Procedures

SOP Title	SOP No.
Collection and Handling of Air Samples for the Multi-Cities Project	M3-F-1
Collection and Handling of Water Samples for the Multi-Cities Project	M3-F-2
Spiking Field Samples for the Multi-Cities Project	M3-F-4
Assigning Sample IDs for the Multi-Cities Project	M3-F-6
Collection and Handling of Sediment Samples for the Multi-Cities Project	M3-F-7
GPS Operation and Calibration (draft)	Battelle 3-164
Sample Shipping for the Multi-Cities Project	Battelle 5-210
Sample Custody	Battelle 6-010

An outline of the survey plan that will describe all sampling logistics is provided in Appendix A.

7.3.1 Permissions

Following an initial Internet search, a list of municipal officials for each target city was compiled. Phone calls were made to initiate contact with the officials and assess who is responsible for granting permissions for the collection of environmental samples. Once determined, this person was informed of the nature of the project and the nature of the samples that we would like to collect (*i.e.*, treated water, sludge, or leachate). Following the phone conversation, a written letter of request to collect a sample was faxed to the municipal official. The letter was then taken under consideration and a decision was issued from the municipal official as to whether or not we can conduct the sampling.

The collection of an atmospheric sample using EPA method TO-13 (EPA 1990) (SOP M3-F-1) requires that the sampler run continuously for twelve hours. To collect this sample we have decided to enlist the assistance of local fire departments for the placement of the sampler. The rational for the use of fire stations is that they are constantly manned and therefore provide secure areas where the sampler will not be subject to interference. The same method for attaining approval from other municipal facilities was employed for the fire stations. This also included an offer to donate $50 to a local charity of the departments' choice. If a donation is needed, then the appropriate approvals must be secured in advance so the donation can be presented when sampling is initiated.

Based on the confidential nature of the study being conducted the following information **may** or **may not** be discussed with the municipal officials.

Information that **MAY** be revealed to the officials includes:

- We are seeking to collect various matrices including POTW influent, effluent, and sludge; raw drinking water, treated drinking water and sediment from the surface water body (if applicable); landfill leachate; and atmospheric samples
- These samples are being collected and analyzed to support a life cycle analysis that is being conducting for a confidential client.

- The chemicals of interest are NOT listed as regulated pollutants or carcinogens by EPA.
- The results of these tests will be reported to our client and only under extenuating circumstances would a disclosure of the results be contemplated

Information that **MAY NOT** be revealed to the officials includes:

- Who the client is
- What chemical we are looking
- What the chemical is used for
- What the nature of the chemical is (chemical class or structure)

These formal requests were made to the various facilities within a given municipality in February and March 1999. Generally the wastewater treatment plant, the drinking water plant, and the landfill required separate requests. These facilities will again be contacted to confirm the permissions granted during the Winter and to establish a sampling schedule based on the matrices to be collected. If an approval is denied, then an alternative site may be sought to collect a sample that is representative of the required matrix. Examples of Requests for Permissions are provided in Appendix B.

Communication logs are maintained and include who was contacted and topics discussed. Any discussion related to data reporting will be clearly documented and summarized in a letter to the client's legal representative.

7.3.2 Precautions

Safety considerations will be incorporated in the Survey Plan. In addition to normal measures taken to avoid sample contamination, such as the of cleaning sampling gear between uses and the use of precleaned sample bottles, the following precautions will be taken to avoid contamination during sample collection.

- Post-Its® will not be used at any time during sample handling, or mobilization/demobilization.
- Field scientists will wear only old, well laundered (at least 6 washings since purchase) clothing. The use of water-resistant clothing will be avoided as much as possible.
- Tyvek® suits will not be worn during sample handling.
- Nitrile gloves will be worn at all times while collecting and handling samples, except in grocery stores and other retail establishments.
- Many food and snack products – microwave popcorn, fast-food (sandwiches chicken, French fries) pizza, bakery items, beverages, candy, cookies – are packaged in wrappers treated with the chemicals of interest. Therefore, hands will be thoroughly washed after handling fast food, carryout food, or snacks. Prewrapped foods or snacks (like candy bars) will not be in the possession of the sampling team during sampling.
- Field personnel may not consume microwave popcorn during the surveys.
- No blue ice will be used during this project

7.3.3 Sampling Locations within Each City

The location, including street address, of samples collected from municipal facilities will be recorded on the sampling log. A Garmin 12XL hand-held GPS (global positioning system) or equivalent will be used to determine the exact location (coordinates) at each sample collection location. The position will be read

from the display and recorded by hand on the Site Log. The unit will be operated according to SOP No. 3-164. Also, each sampling location will be marked on a local map.

7.3.4 Air Sampling

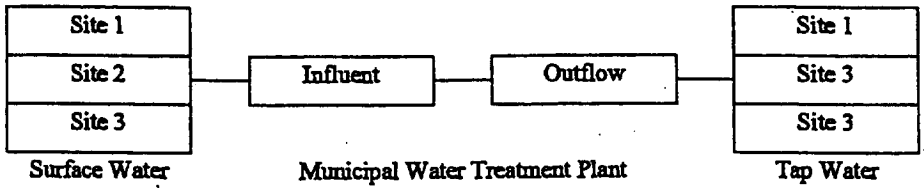
Air sampling will be accomplished by using a General Metal Works Modal PS-1 Air Sampler. The PS-1 sampling head (shown in Attachment 1), which is contained within the sampler, consists of a 4" diameter inlet filter (made of Teflon coated glass fiber filter medium) and a 2.3" diameter x 5" glass cartridge containing a PUF, which is 3" in length and fits snugly into the cartridge.

The high volume (~250 lpm) polyurethane foam (PUF) sampling method based on U. S. EPA's Method TO-13 is applicable to measuring ambient air concentrations of organic components at concentrations from 0.001-50 $\mu g/m^3$ over a 4-24 hour sampling period. The procedure allows for the collection of the semi-volatile organic chemicals present in the air on a glass-fiber filter (particulate) and PUF (vapor phase). The limits of detection are specific to the nature of the analyte and the length of the sampling period.

One 12-hour air sample, consisting of a particulate fraction collected on a glass fiber filter and a vapor fraction collected on polyurethane foam (PUF), will be collected at each city. Air samples will be collected at ground level at any site for which permission to sample can be obtained is acceptable. Ideally, a fire station should be chosen because it is somewhat secure and usually has personnel on-site 24 h per day. Other locations may include a local college or university, retail establishment, the POTW plant, or drinking water plant if the facility staff are willing to accommodate the sampler. The sampler requires 120 V power, and should not be run if it is raining. Sampling also is not performed if there are consistent high winds (>25 mph). If possible, a copy of the weather section from the local daily newspaper will be obtained and added to the field log book for the sampling date to document weather conditions. Once the field sample is collected, routine air sampler cleaning is performed and the quality control samples are collected as described in Section 11.2.3.

7.3.5 Water Sampling

Water samples will be collected from several points within the municipal drinking water system, as shown below. [Note: Microlayer samples will not be collected during the Multi-City Study but may be collected during subsequent samplings under the program].



Whole (bulk) water will be collected from three sites (at least 500 ft apart) within a surface-water source (e.g., lake, pond, reservoir) of drinking water, and at the water treatment plant influent and outflow. Tap water will be collected from three retail establishments within the city. One-liter water samples will be collected into I-L ESE pre-cleaned (certified) polyethylene sample bottles by either directly placing the container into the water stream, or, if a valve withdrawal system is available, by using the valve. Due to the difficulty in obtaining a true surface sample with a bottle, these samples will be from bulk water to minimize variability due to sampling technique. For the environmental samples (lake, river, reservoir), the bottle will be lowered below the surface of the water and will be filled with bulk water. Once the field sample is collected the quality control samples are collected as described in Section 11.3.2.

If the drinking water source is ground-water then the surface water samples will be collected from any selected lake, pond, or river, using methods described above.

7.3.6 Sediment Sampling from Municipal Water Source

Sediment samples will be collected synoptically with the bulk water from three sites within surface-water sources. The sites will be located at least 500 ft apart. After the water sampling is completed, the sediment will be collected at the same site by using a 0.04-m^2 Young grab sampler that is hand-deployed. The top 2 cm of sediment will be retained for analysis. Alternatively, a stainless steel spoon or scoop will be used.

7.3.7 POTW Sampling

Battelle will provide appropriate sample containers and detailed written instructions to the designated POTW official, who will collect each influent (post-chlorination), sludge, and effluent sample. Battelle will assume custody of the samples and will be responsible for packing and shipping the samples to BCL for analysis. Once the field samples are collected, the quality control samples are collected as described in Section 11.4.2.

7.3.8 Landfill Leachate Sampling

Battelle will provide appropriate sample containers to the designated municipal landfill official, who will collect each sample according to detailed written instructions provided by Battelle. Battelle will assume custody of the samples and will be responsible for packing and shipping the samples to BCL for analysis. No industrial landfills will be sampled.

7.3.9 Food Sampling

In each city, two or three major grocery-store chains will be identified and representative food samples will be collected from each chain. The intent of this sampling is to determine the dietary exposures of residents within each region based on typical foods consumed. The food products will be collected as listed, and as packaged. For the milk and eggs, the selection of these foodstuffs in the store will be checked to determine whether there are any from regional or local sources, and these will be selected. If there are no local or regional sources, any type is acceptable. The grocery store fish should be representative of a fish that is typically raised or caught in that general region of the U.S. For many of the inland southeastern US cities, this would include catfish. Fish may be fresh or frozen, and should be scaled, filleted, with the head removed. In addition, one organic grocery store in each city will be identified and either a loaf of organic bread or a pound of organically raised flour will be purchased.

Each foodstuff will be packaged individually in a zip-seal bag, with bubble wrap if necessary (e.g., for the eggs) for transport. The bag labels will indicate the grocery store from which the food items were purchased.

7.3.10 Finfish

Finfish species (i.e., perch and bluegill) will be collected from waterbodies (i.e., small streams or ponds) in the vicinity of the area in which water samples are collected. Finfish will be collected through electrofishing or seining. Electrofishing is a fisheries technique which involves generating a DC or an AC electric current (either with a gasoline-powered generator or batteries) through various styles of electrodes into the water to create an electric field. Fish that pass through the field are stunned, then collected by dipnet. Seining involves encircling a shoreline area with a fine-mesh net and entrapping fish present in this location. [Note: Finfish samples will not be collected during the Multi-City Study but may be collected during subsequent samplings under the program].

8. SCHEDULE OF MILESTONES AND DELIVERABLES

The schedule of deliverables and milestones is shown in Table 7.

Table 7. Milestones and Deliverables

Milestone (M) or Deliverable (D)		Due Date
Preliminary analyses from pilot study		Dec 98 – Jan 99
Client approves Multi-City Study (M)		Jan 99
Collect Multi-City Study Samples (M)		May 1999 - June 1999
Team 1	Cleveland, TN	May 24-25, 1999
	Decatur, AL	May 26-27, 1999
Team	Port St. Lucie, FL	To be determined.
	Pensacola, FL	To be determined.
	Greenville, TN	To be determined.
	Bowling Green KY	To be determined.
	Englewood, OH	To be determined.
	Kaukauna, WI	To be determined.
	Mobile, AL	To be determined.
	Columbus, GA	To be determined.
	Spartansburg, SC	To be determined.
	Dalton, GA	To be determined.
Sampling Letter Report for Each City		2 weeks after completing each city sampling

9. ORGANIZATION AND RESPONSIBLITIES

9.1 Project Personnel

The organization and lines of communication for this project are illustrated in Figure 9.1. Dr. Joseph Fiksel is the Program Manager for this study. Marcia Nishioka, the Project Manager, will be responsible for the coordination and communication with the client, as well as the evaluation of analytical methods, the coordination of the field effort, and the reporting of data. Ms. Susan Abbgy is the Program Quality Sampling Task Assurance Officer. Don Gunster, the Sampling Task Leader, will be responsible for selection of media associated with environmental dispersion, and will coordinate the collection of these samples. Ms. Rosanna Buhl is the Battelle Sampling Task QA Officer, and is responsible for ensuring that all field activities are conducted according to the QAPP. This includes reviewing and approving field SOPs, ensuring that staff training is complete and documented, conducting at least two field inspections, identifying areas for corrective action, and preparing reports to management for this task. She will report quality assurance issues to the Program QA Officer. Mr. Wayne Trulli, the Battelle Duxbury Field Coordinator, and will provide technical guidance to the Sampling Team Leaders. The Sampling Team Leaders, Mr. Scott Macomber (lead) and Mr. Chris Gagnon, will be responsible for all sampling activities, including mobilization, demobilization and reporting. They will also be responsible for identifying problems and corrective action while in the field, and communicating these activities to the Sampling Task Leader, the Duxbury QA Officer, and the Project Manager, as appropriate. Addresses and telephone numbers of key personnel are shown in Table 8.

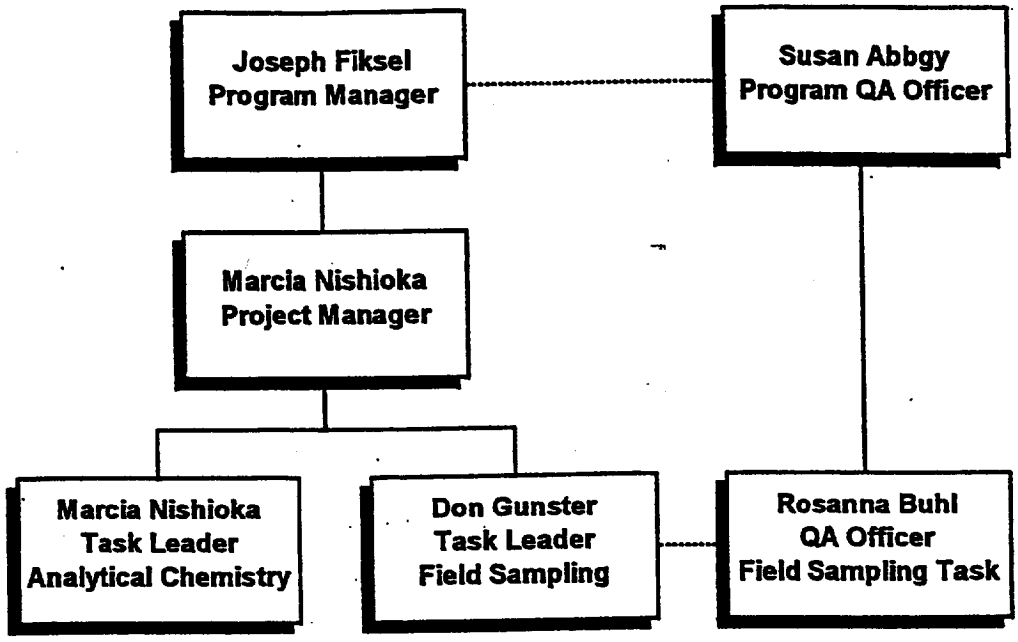


Figure 9-1. Project Organization Chart for the Empirical Human Exposure Assessment Multi-City Study

9.2 Training

No special certifications are required for the performance of this project. A QAPP review meeting will be conducted prior to the first survey to ensure that field personnel are familiar with the requirements of the QAPP. In addition, field personnel will be trained on each sampling SOP prior to the first survey to ensure that they are familiar with all sampling procedures.

Table 8. Key Personnel, Addresses, and Telephone Numbers

Name	Address	Phone
Marcia Nishioka Program Manager	Battelle Columbus 505 King Avenue Room 5-2-28 Columbus, OH 43201	614-424-4964 (work)
Don Gunster Sampling Task Leader	Battelle Duxbury 397 Washington Street Duxbury, MA 02332	781-952-5378 (work)
Rosanna Buhl Sampling QA Officer	Battelle Duxbury 397 Washington Street Duxbury, MA 02332	781-952-5309 (work)
Wayne Trulli Duxbury Field Operations Manager	Battelle Duxbury 397 Washington Street Duxbury, MA 02332	781-952-5380 (work) 508-888-6652 (home)
Michael Meara Duxbury Sample Custodian	Battelle Duxbury 397 Washington Street Duxbury, MA 02332	781-952-5270 (work)
Scott Macomber Sampling Team Leader	Battelle Duxbury 397 Washington Street Duxbury, MA 02332	781-952-5379 (work)
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10. QUALITY ASSURANCE OBJECTIVES

Requirements for ensuring that the data are fit for their intended use (that is, are of suitable quality) include accuracy, precision, representativeness, comparability, and completeness. When these requirements are met, the final data product is technically defensible. Data elements for this project are discussed in terms of the appropriate characteristics as defined below. The field quality control program is designed to provide data to assess field procedures and issues that could affect data quality.

10.1 Accuracy

Accuracy is the extent of agreement between a measured value and the true value of interest. "Accuracy" of the field activities will be assessed by the collection and analysis of field blanks, trip blanks, field spikes, and through the acceptable calibration of the air sampler and the hand-held GPS.

- Air sampling field blanks are described in Section 11.2.3. For all other matrices, field blanks will be empty sample containers that are handled as if they were filled with a sample but are actually left capped throughout the sampling process and are not filled with sample. This sample will allow the analysts to assess contamination introduced by the sampling conditions.
- Trip blanks will be sample containers (one per city) filled with deionized water prior to shipment to the sampling site that are shipped (one per city) from the field to the laboratory and remain unopened until analysis. This sample allows the analysts to assess contamination introduced by sample shipment.
- Equipment blanks will not be collected, as the only tool to be used (the sampler for sediment samples) will be deployed for only one matrix.
- The collection of field spike samples is matrix-specific and is described in Section 11. SOP M3-F-4 details field sample spiking for the program.

The Garmin 12XL GPS unit has a designed positional accuracy of 15 m. The absolute accuracy may be ± 100 m depending on the level of degradation imposed by the United States Department of Defense. Although detection limit is not strictly applicable to this unit, the minimum detection limit is defined by the digital display: 0.001 minutes or approximately 6 feet.

10.2 Precision

Precision is the extent of mutual agreement among independent, similar, or related measurements. Sampling precision will be assessed by the collection and analysis of duplicate samples as indicated in Table 5.

10.3 Representativeness

Representativeness is the extent to which measurements represent true systems. The representativeness of all the data generated under this QAPP depend primarily upon the selection of the sampling sites and matrices, which were determined by initial program studies conducted prior to the initiation of the Multi-City Study. Representativeness of the field procedures will be ensured through the use of documented, standard sampling methods and trained field staff.

10.4 Comparability

Comparability is the extent to which data from one study can be compared directly to similar studies. The comparability of all the data generated under this QAPP depends to some extent upon the selection of the sampling sites and matrices, which were determined by initial program studies conducted prior to the initiation of the Multi-City Study. Comparability is ensured through the use of standard sampling procedures.

10.5 Completeness

Completeness is the measure of the amount of data acquired versus the amount of data required to Fulfill the statistical criteria for the intended use of the data. The Multi-City Study is intended to develop a baseline of data against which future sampling efforts can be designed. Sampling will be conducted at every site where permission has been granted; the completion goal is 100% but the project goals will not be compromised if 80% of the intended samples are collected. Sampling will continue at each site even if not all samples can be collected as planned. Further, sampling will be conducted at one site (study or control) even if the site pair (study or control) cannot be sampled.

11. SAMPLING PROCEDURES

11.1 Documentation and Shipping

All documentation will follow SOP 6-017: data will be recorded in ink; pencil, erasable pen, and white-out will not be used. All raw data will be recorded in real time and will be maintained as part of the project files. Errors will be corrected by drawing a single line through the incorrect entry so that the original data are still readable. An explanation will accompany each cross-out, which will be initialed and dated at the time of the entry.

11.1.1 Sampling Logs

A 3-ring Field Sampling Logbook will be maintained by each field team. All documentation of field activities will be maintained in the Logbook. A Site Log will be completed for each sampling location. A separate sampling form will be completed for each matrix sampled at a site. The sheets will include all site sampling information: sampling date, sample collector (and recorder, if different), sampling location, sample description (attach grocery receipts to document purchases), and any other pertinent information. Examples of sampling forms are provided in Appendix C.

11.1.2 Sample Shipping

All samples will be shipped via overnight (morning) delivery to Ms. Kim Andrews at the address shown in Table 8 and according to the specifications listed in Table 9. Each cooler will contain the sampling forms, which include a Chain of Custody section. These forms identify sample being shipped. Sample labeling procedures are described in Section 11.1.4. Sample shipping is described in SOP 5-210.

11.1.3 Sampling Location

Sample locations will be determined during telephone contacts with Municipal officials. The site coordinates will be determined at every location using a Garmin GPS 12XL Personal Navigator or equivalent hand-held global positioning system (GPS) unit. The unit will be operated according to Battelle SOP No. 3-164; the sample site coordinates will be recorded on the sampling form.

Table 9. Sample Containers, Storage Conditions, and Shipping

Sample Source and Type	Sample Containers	Preservation and Storage Conditions
Urban Air		
Particulate phase	Glass fiber filter	Place filter in zip-lock bag, seal. Store cool (4° C)
Vapor phase	Polyurethane foam sorbent	Wrap cartridge in precleaned foil. Place wrapped cartridge in zip-lock bag and wrap in bubblewrap. Store cool (4° C)
Drinking Water		
• Surface-water source • Plant intake • Treated water from plant • Tap water from retail establishment	1-L precleaned (certified) polyethylene jars	No preservation. Store cool (4° C)
Sediment from surface-water source	200ml precleaned (certified) polyethylene jars	Store cool (4° C)
POTW		
• Post-chlorination influent • Sludge • Effluent	1-L precleaned (certified) polyethylene jars	Store cool (4° C)
Landfill		
Leachate		Store cool (4° C)
Local Food		
• Ground beef • Pork chops (bone in) • Boneless, skinless chicken breasts • Pork-and-beef hot dogs • Regional fish • Eggs • Whole milk • White bread • Frozen green beans • Fresh apples • Organic bread or flour	Keep each item in its original container, and keep items separated in store-specific coolers.	Store cool (4° C)
Fish		
Finfish (bluegill or perch) (electroshock)	Methanol rinsed aluminum foil; plastic bags.	Store cool (4° C)

11.1.4 Sampling Labeling

Matrix and sample-specific sampling forms will be prepared by the program manager for each sampling site. The forms will also serve as custody forms. Each form will include a list of the samples that must be collected at the site (site replicates, field duplicates, field spikes, etc). Two preprinted labels will be provided for each sample to be collected. One label is placed on the sample container and the other is placed in the field log book. The labels provide a narrative description of the sample as well as a unique number, which is documented on the sampling forms. Appendix 3 provides example sampling forms for one city. SOP M3-F-6 describes the assignment of unique sample IDs for this project.

11.2 Urban Air

11.2.1 PUF and Filter Preparation

PUF and air filters are precleaned in Battelle's air analysis laboratory. The PUF will be cleaned by Soxhlet extraction with dichloromethane (DCM) for 16 hours and dried with a nitrogen gas stream. The PS-1 glass cartridges and aluminum foil (to be used as a protective wrapper) will be rinsed with dichloromethane and placed in a muffle oven at 450°C overnight. The clean PUF will be placed in the glass cartridge and wrapped in clean foil, then packaged in bubble-wrap. The filters will be rinsed with dichloromethane and dried. The clean filters will be placed in zip-lock bags. The glass cartridge containing the PUF and the cleaned filter will be sent to the field sites. The assembly is shown in Figure 1.

11.2.2 Air Sample Collection

1. While wearing disposable gloves, carefully remove the packaging from the glass cartridge to be used for sample collection. Retain the foil, zip-lock bag and bubble wrap.

2. Inspect the sampling head to insure there is a gasket at the top and bottom of the adsorbent support. Insert the glass cartridge into the adsorbent support.

3. Screw the filter support base onto the adsorbent support. Do not over-tighten.

4. Place a rubber gasket on top of the filter support base. Place the filter on top of the gasket and place a second rubber gasket on top of the filter. Retain the foil and zip-lock bag. The gaskets are not shown in Attachment 1. Place the filter retaining ring on the top gasket and attach it to the filter support base with the three wing nuts.

CAUTION: If the sampling head is assembled away from the sampling site, place the protective cover plate on the sampling head. The cover plate must be removed immediately prior to the start of sample collection.

1. Connect the sample head to the vacuum pump by securing it with the ring clips on top of the vacuum pump.

2. Plug the vacuum pump into a timer. Start the vacuum pump and allow to run for at least one minute. Adjust the air flow to approximately 250 lpm (based on the calibration) using the variator. Record the start parameters, such as date, time, magnahelic reading, and running time meter reading from the air sampler on the data sheet. An example data sheet is shown in Attachment 2.

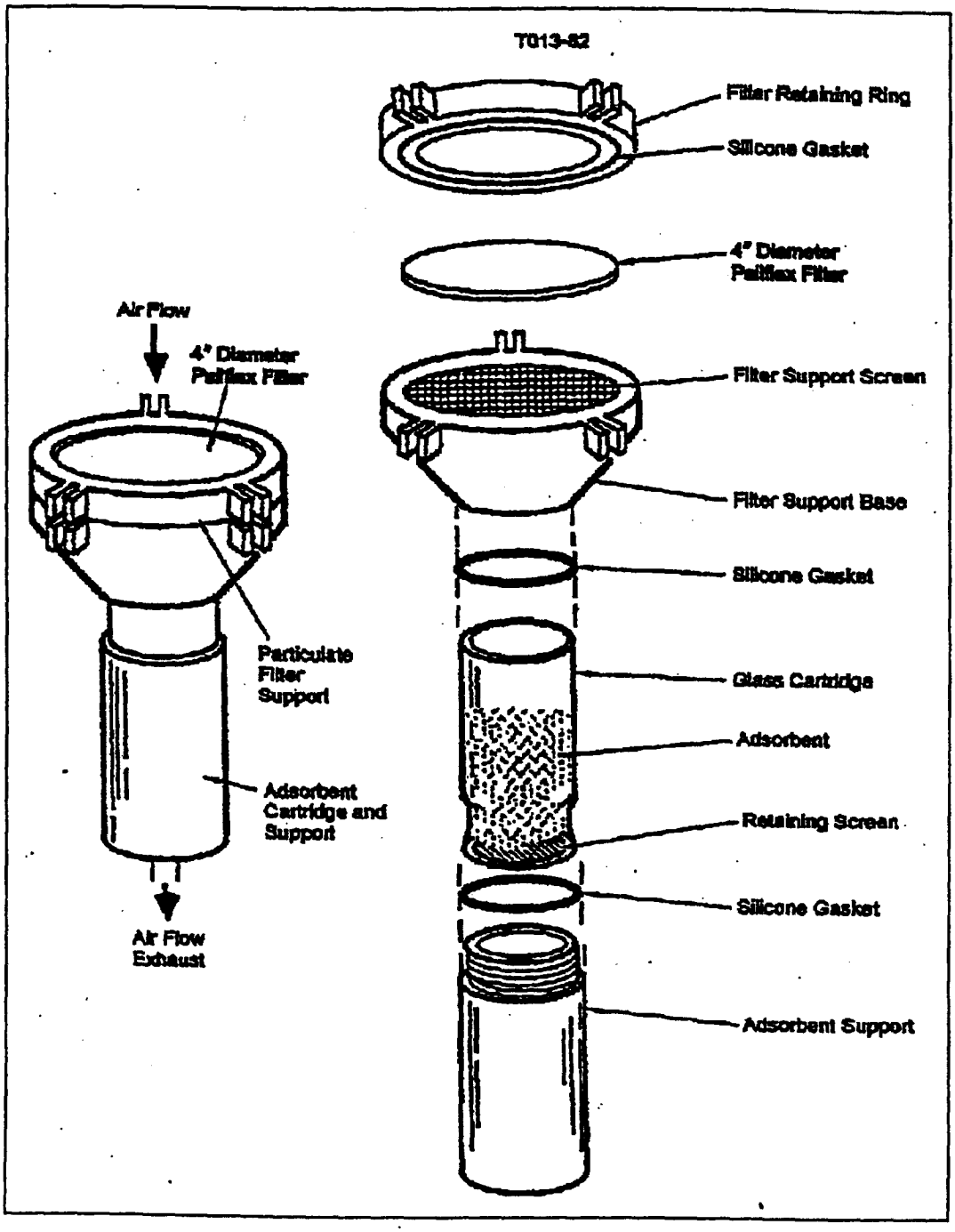

Figure 11-1. PS-1 Sampling Head

3. Set the timer to shut off after 12 hours.

4. Prior to disassembling the sampling head after the sampling is complete, turn the vacuum pump on and allow to run for at least 1 minute. Record the reading from the air sampler magnahelic gauge on the data sheet. Shut the vacuum pump off. Record the date and the reading on the air sampler running time meter on the data sheet. Determine the ending lpm from the graph based on the magnahelic gauge in the same manner as during air sampler calibration (Section 5.8).

5. Calculate the total time and average flow rate and record on the data sheet. Attach the calibration graph to the data sheet.

11.2.3 Air Quality Control Samples

Due to the difficulties in getting a properly placed field spike onto the filter and PUF media, the field spike sample will be prepared at Battelle and then shipped to the field location. In the field,

- the spiked filter will be placed in a sampler head as if installed to collect a real sample. The spiked filter is then removed, folded and replaced in its storage bag for return shipment. As indicated in Table 5 the field spike will be 100 ng each of PFOS and POAA.
- the bag containing the spiked PUF will be opened for about 15 seconds, then resealed for return shipment. As indicated, in Table 5, the field spike will be 100 ng of Me- & -Et-FOSE-OH.
- the field blank filter and PUF will be placed in a sampler head as if installed to collect a real sample, then removed and replaced in storage bags for return shipment.
- the bag containing the field blank PUF will be opened for about 15 seconds, then resealed for return shipment.

11.2.4 Air Sample Shipment

1. Remove the filter retaining ring from the sampling head. While wearing disposable gloves, remove the filter from the sampling head. Fold the filter in half so the dirt particles are turned in. Fold the filter in half again. Wrap the filter in the foil and place in the labeled filter zip-lock bag. Record the city and date information on the label on the bag.

2. Remove the filter support base from the adsorbent support. Carefully remove the glass cartridge containing the PUF from the adsorbent support. Wrap the glass cartridge containing the PUF in foil and place in the labeled zip-lock bag. Record the city and date information on the label on the bag. Wrap the zip-lock bag in bubble-wrap.

3. Immediately place samples in coolers with ice to maintain a cool temperature. Place the Air Sample Collection Data Sheet in a zip-lock bag and place in the container with the sample. Fresh ice should be added to the cooler in preparation for shipping.

11.3 Drinking Water

Water samples in rivers, ponds, or reservoirs are collected by submerging the capped sample bottle, filling the bottle once it is totally submerged, and re-capping the bottle while submerged. Sample bottles will not be prerinsed with site water prior to collecting the sample.

11.3.1 Surface-Water Collection

Sample collections of drinking water require prior permission before attempting to collect a sample. Once approval is received, samples may be collected by either Battelle or the facility personnel, depending on the agreement with the facility. If facility personnel will collect the samples they will be provided with written instructions to facilitate comparability. Water samples are collected according to SOP M3-F-2 and summarized below.

1. Using Nitrile gloves to prevent contamination, collect the water samples in 1-L precleaned (certified) polyethylene sample containers by either directly placing the container into the water stream, or if a valve withdrawal system is available, using the valve.
2. When collecting through a valve system flush the system by running the water for a minimum of two minutes prior to collection.
3. Once the sample has been collected place the cover on the container, dry and label according to Section 11.1.4.

11.3.2 Water Quality Control Samples

A separate screw-cap vial will be prepared in the laboratory to contain the pre-measured aliquots of spiking solution required for each field spike sample. The field-spiked sample will be prepared by field personnel after collection of the water samples as follows.

1. The outside of the vial will be rinsed with high purity methanol (HPLC grade) and wiped dry with a Chem wipe.
2. The cap of the spiking solution vial will be unscrewed and the contents of the vial will be poured into the sample container (marked with a line for approximately a 1 L quantity).
3. The vial that contained the spiking solution will be dropped into the field spike sample bottle.
4. The bottle will be capped and then shaken, and inverted several times to assure mixing and dispersion of the spike solution.

11.3.3 Water Sample Shipment

Place samples in coolers with ice to maintain a cool temperature. Fresh ice should be added to the cooler in preparation for shipping.

11.4 Sediment from Drinking-Water Source

11.4.1 Sediment Sample Collection

Sediment will be collected synoptically with the three surface water samples. Sediment samples will be collected according to SOP M3-F-7 with either a 0.04 m^2 Young grab sampler or a stainless steel spoon or scoop. Undisturbed samples will be achieved by careful attention to established deployment and recovery procedures. Battelle's procedures cover the following aspects of sediment sample collection:

- thorough wash-down of the equipment before each deployment using deionized water and methanol;
- for the grab sampler, control of penetration by adding or removing weights to the frame and adjusting the applied downward pressure;
- slow recovery until the sampler breaks the water surface;

Each grab sample will be inspected for signs of disturbance. The following criteria identify ideal characteristics for an acceptable grab sample.

- Sampler is not overfilled with sediment; the jaws must be fully closed and the top of the sediment below the level of the opening doors.
- Overlying water is present and not excessively turbid.
- Sampler is at least half full, indicating that the desired penetration was achieved.

In certain locations, however, slight over-penetration may be accepted at the discretion of the sampling scientist. Mild over-penetration may be accepted according to the following standards:

- the sediment surface is intact on at least one side of the grab and
- there is little or no evidence that the surface sediment has pushed through the grid surface of the grab, i.e. no visible imprint from the screening outside of that grid
- No evidence that sediment has squirted out through the hinge or the edges.

If the grab sample meets the acceptability criteria, the water overlying the sample will be siphoned from the grab and the (top 2 cm) sediment will be collected with a stainless steel scoop and transferred to a certified, pre-cleaned sample container. To minimize exposure to airborne contaminants, the sediment will be not be homogenized in the field before being transferred to the precleaned, certified containers.

Scoop samples will be considered acceptable if the scoop is remains 50% filled after breaking the water surface.

Given the difficulty of obtaining undisturbed sediment in areas with exceptionally fine sediments, these standards may have to be relaxed further. The field team leader will make the final decision regarding acceptability of all grabs, and the overall condition of the grab (i.e. "slight overpenetration on one side") will be documented on the sampling log.

11.4.2 Sediment Quality Control

Sediment quality control samples will not be prepared in the field. Rather, bulk sediment samples will be shipped to the laboratory.

11.4.3 Sediment Sample Shipping

Place samples in coolers with ice to maintain a cool temperature. Fresh ice should be added to the cooler in preparation for shipping.

11.5 Publicly-Owned Treatment Works

11.5.1 POTW Sample Collection

Influent, effluent, and sludge samples will be collected at the POTWs. It is anticipated that Battelle personnel will not be granted access to the POTWs. Written instructions for sample collection are provided in SOP M3-F-2 and will be provided to plant personnel to achieve comparable sampling techniques. Samples will be collected and shipped according to the methods described for drinking water samples (Section 11.3).

11.5.2 POTW Quality Control

One field spike will be prepared for the POTW effluent sample collected at each site as follows:

1. The outside of the vial will be rinsed with high purity methanol (HPLC grade) and wiped dry with a Chem wipe.
2. The cap of the spiking solution vial will be unscrewed and the contents of the vial will be poured into the sample container (marked with a line for approximately a 1 L quantity).
3. The vial that contained the spiking solution will be dropped into the field spike sample bottle.
4. The bottle will be capped and then shaken, and inverted several times to assure mixing and dispersion of the spike solution.

No field quality control samples will be collected for influent or sludge samples.

11.5.3 POTW Sample Shipping

Place samples in coolers with ice to maintain a cool temperature. Fresh ice should be added to the cooler in preparation for shipping.

11.6 Landfill Leacheate

Landfill leachate samples will be collected by the methods used to collect and ship drinking water samples (Section 11.3). No field quality control samples will be prepared.

11.7 Food

In each city identified, representative food samples will be collected to provide an estimation of the dietary intake of FC by local residents. The intent of this sampling is to determine the dietary exposures of residents within each region based on typical foods consumed. Ideally, foods grown, produced, or processed locally or regionally are preferred, however, it is recognized that such products may not always be available.

The first step upon arriving in the designated city will be to identify three local grocery stores, each representing different regional retail chains if possible. In some cities, it may not be possible to identify three distinct chains; two should be identified at a minimum. Larger supermarkets will be selected preferentially over smaller convenience stores or specialty food shops as they are more likely to have all of the food types required and are more representative of the typical consumer. Samples of all products identified for evaluation will be purchased in each store.

As previously stated, an effort will be made to purchase products produced or processed locally or regionally as indicated on packaging labels or on signs or labels posted by the retail establishment. If a local or regional brand of a specific product cannot be located, than the next closest location for which products are available for that food type should be selected.

Food products selected should represent items that would be purchased by the typical consumer. Therefore, national brands, specialty or gourmet foods or brands should be avoided, unless they are the only products produced locally or regionally. When selecting fresh food (e.g., meat, fruit, milk, bread etc.) factors normally considered by the consumer (i.e., fat content, date packaged, general appearance or ripeness) should be considered to ensure that the sample is representative of typical consumer purchases.

The method of sample collection should duplicate the activities of the typical consumer as closely as possible in terms of handling, transport and packaging. Food items selected should be transported to the checkout counter and handled by the clerk in the typical manner. After purchases have been made, the food items from each store should be placed in separate coolers for shipment to the laboratory. Perishable food items should be packed with sufficient ice to ensure that they will not spoil enroute. Food products should be labeled with the site city, the store ID, and a unique ID. The Site Log and sampling form will link this information to the store location (address), the food brand purchased, and the date of purchase.

11.7.1 Meat and Fish

From each store identified, meat and fish products will be collected for analysis as described below.

11.7.1.1 Fresh Meat Products

Approximately 1 lb of the following products will be selected from the meat counter:

- Ground beef
- Pork chops with bone (~2)
- Whole chicken breast (2 - boneless, skinless)

Quantities indicated are the minimum requirements; variation may be necessary depending on the packages available. In addition to quantity, consideration should be given to the date indicated on the label, as well as the general appearance and fat content (i.e., 15% or less) of the product to ensure that it is fresh and otherwise representative of typical consumer purchases. If pre-packaged products are not available, the specified amounts should be requested from the clerk. All packages selected should be handled in a manner consistent with the activities of the typical consumer.

As previously discussed, an effort should be made to identify products produced or processed locally. If this information cannot be determined based on a review of the label, it may be possible to identify the source through conversations with store employees. Any information obtained in this manner should be recorded in the logbook. If the source of available brands cannot be identified through either review of the packaging or discussions with the store employees, the generic brand should be purchased.

11.7.1.2 Processed Meat Products

One package of hot dogs (i.e., approximately 1 lb) shall be selected from the prepackaged deli section of the grocery store. A pork-beef mixture is to be preferred. It is likely that numerous brands of hot dogs will be available; preference should be given to brands that are processed locally as determined by the information available on the package label. In the event that local brands are not available, selection should be based on relative cost; generic brands are preferred. All packages selected should be handled in a manner consistent with the activities of the typical consumer.

11.7.1.3 Fish

Fish representing a local fishery should be identified from the fish counter in each store. In selecting fish, information may need to be obtained from a store clerk to determine which is most representative of local or regional fisheries. Fish obtained via a commercial fishery are preferable, however, in the absence of a local commercial fishery, fish raised on a local fish farm are acceptable. Fish may be frozen or fresh, depending on availability. Fish fillets are preferred; however, in the absence of fillets whole fish may be collected. A minimum of 1 lb is required. The fish should be handled by store personnel according to standard procedures (e.g., weighed, wrapped, etc.) prior to purchase. All packages selected should be handled in a manner consistent with the activities of the typical consumer.

11.7.2 Dairy and Eggs

A carton of eggs (12) and 1 quart of whole milk in plastic or cardboard packaging should be obtained from the dairy section of each grocery store. As previously discussed, an effort should be made to identify products produced or processed locally. If this information cannot be determined based on a review of the label, it may be possible to identify the source through conversations with store employees. Any information obtained in this manner should be recorded in the logbook. If the source of available brands cannot be identified through either review of the packaging or discussions with the store employees, the generic brand should be purchased. In addition, the dates indicated on the packaging should be considered to ensure that the product is fresh.

11.7.3 Produce

Fresh and frozen produce (i.e., fruits and vegetables) will be collected from each store, as described below.

11.7.3.1 Frozen vegetables

One package of frozen green beans (i.e., approximately 1 lb) shall be selected from the frozen food section of the grocery store. Cut green beans are preferred. It is likely that numerous brands of green beans will be available; preference should be given to brands that are processed locally as determined by the information available on the package label. In the event that local brands are not available, selection should be based on relative cost; generic brands are preferred. All packages selected should be handled in a manner consistent with the activities of the typical consumer.

11.7.3.2 Fresh produce

Two fresh apples (~ 1 lb) should be selected from the produce section of each grocery store. Select apples based on general appearance, freshness, color etc. Care should be taken to avoid apples with obvious bruises or other defects that would render the sample unattractive to the average consumer. The type of apple (i.e., granny smith versus macintosh) is not important; however, the type should be recorded in the logbook. As previously discussed, an effort should be made to identify products produced or processed locally through either signs or labels posted by the store. The source or origin of the apples should be recorded in the notebook. It is recognized that many of the locations specified are not within regions of the country conducive to the growth and production of apples. As a result, finding apples produced locally is unlikely, particularly in the winter months.

11.7.4 Bread

Bread products will be collected from each grocery store as described below.

11.7.4.1 White bread

One loaf of bread should be selected from the bread aisle of each grocery store. White, pre-sliced bread is preferred. Preference should be given to brands that are processed locally as indicated by the information available on the package label. In the event that local brands are not available, selection should be based on relative cost, and generic brands are preferred. All packages selected should be handled in a manner consistent with the activities of the typical consumer.

11.7.4.2 Organically produced bread

One loaf of organically grown and produced bread should be obtained. In the event that organic bread is not available, organic flour may be substituted. Preference should be given to a brand that is processed locally as determined by the information available on the package label or through conversations with the store personnel. In the event that local brands are not available, selection should be based on relative

cost; generic brands are preferred. All packages selected should be handled in a manner consistent with the activities of the typical consumer.

11.8 Fish Other than Food

11.8.1 Finfish (Electrofishing)

A stream reach should be designated for sampling by field personnel. The reach should be adjacent to or in the vicinity of the surface-water source of drinking water, and also should include habitat appropriate for the target species (i.e., perch and bluegill). In the absence of physical barriers, block nets should be set at the upstream and downstream ends of the reach prior to the initiation of the any sampling activities. Seining may be used as an alternate or supplementary method for collecting finfish.

11.8.1.1 Method

A stream reach or pond should be designated for sampling by field personnel. Digital photographs should be taken of the sampling site and the location should be recorded using a hand held GPS. The reach should be adjacent to or in the vicinity of the area in which the water samples have been collected and should include habitat appropriate for the target species (i.e., perch and bluegill). In the absence of physical barriers, block nets should be set at the upstream and downstream ends of the reach prior to the initiation of any sampling activities.

Once the block nets are set, electrofishing may begin at the downstream limit of the sample reach. One crew member, identified as the electrofisher unit operator, carries the backpack unit and manipulates the anode and cathode poles. A side to side or bank to bank sweeping technique should be used to maximize area coverage. To maximize visibility and subsequent sampling efficiency, each team member should wear polarized sunglasses, and sampling should be conducted only during periods of optimal water clarity and flow.
The remaining crew members should follow the electrofisher unit operator and net the fish with dip nets. All fish netted should be placed in buckets or live wells for further examination and identification. Upon the completion of sampling, each fish collected should be identified with regard to species and all species except bluegill and perch returned to the stream. In the event that perch and bluegill are not available, a similar, substitute species will be identified by the field personnel.

An alternate fish collection method may involve a small mesh (e.g. 12 mm) seine (10 m long by 1 m high) may be used for collecting finfish. One individual will wade to a depth of 1 m and walk parallel to they shoreline for a distance of ~20 m. Then, both individuals will haul the net in to the shoreline, encircling any fish present in that location. Fish will be placed in a bucket for further examination and identification.

Immediately upon capture, each fish will be killed by cervical dislocation and wiped dry with a paper towel. They will be placed into a separate Ziploc plastic bag and sealed with tape. Each bag will be labeled with the city and site ID and a unique sample ID. This information will be linked on the sampling forms to the collection procedures, species name and related sampling information. Fish will be placed on ice in a cooler for same-day shipment to Battelle's Duxbury laboratory for processing. The ice will be replaced with fresh ice prior to shipping.

11.8.1.2 Data recorded

Fish collected will be counted, examined for external anomalies (i.e., deformities, eroded fins, lesions, and tumors); all observations will be recorded in the field logbook. Fish length and weight will also be recorded to the nearest mm and g, respectively. The fish collected from each site will be weighed using a

hand-held balance to ensure that the tissue mass is adequate for analysis. Fish lengths will be measured using a fish measuring board as required by the collection permit. The start time, ending time, duration of sampling, and estimated maximum and minimum stream widths will also be recorded. Comments will also include sampling conditions such as visibility and flow rate.

11.8.1.3 Special Precautions

All field team members must be trained or briefed in the electrofishing safety precautions and unit operation procedures identified by the manufacturer. Each team member must be insulated from the water and the electrodes with chest waders and rubber gloves. Electrode and dip net handles must be constructed of insulating materials (e.g., woods, fiberglass). Electrofishers/electrodes must be equipped with functional safety switches.

12. SAMPLE CUSTODY

12.1 Evidentiary Chain of Custody

Battelle field activities will be conducted to ensure that a full paper trail exists for each sample. Sample custody procedures are described in SOP 6-010 and include the requirements for evidentiary chain of custody which is defined as *A special type of sample custody which requires that the physical possession, transport and storage of a sample be documented in writing. The records must account for all periods of time from sample container acquisition through sample disposal.* The following key elements comprise the sample custody requirements for this project.

- Battelle's full-time sample custodian will be responsible for the custody records of the precleaned bottles.
- One member of each field team will be designated as the team sample custodian and will be responsible for sample custody and for maintaining all sample custody records.
- The custody of each sample begins with the receipt of precleaned, certified (ESE) sample bottles that are received by the laboratory custodian and relinquished to the field custodian.
- It is the responsibility of Battelle air analysis lab personnel to maintain records of air filter and PUF cleaning. Materials received in the field should be labeled such that the units can be traced back to documented cleaning procedures. The field custodian will receive custody of these materials.
- The custodian is responsible for the custody of all materials received (signed for). Samples are considered to be in a person's custody if
  - The samples are in a person's actual possession
  - The samples are in a person's view after being in that person's possession
  - The samples were in a person's possession and then were locked or sealed up to prevent tampering
  - The samples are in a secure area
- The sample collection form will document the certified bottle lot number and, for air samples, the cleaning lot number.
- Any field equipment decontamination performed prior to the collection of a sample will be documented, including cleaning of foil used to wrap samples, etc.

- The location of each sample container from receipt at the laboratory through shipment to Battelle for analysis will be traceable through the custody records.
- The field custodian will relinquish the samples when they are packed for shipment and place the original sampling forms in a sealed plastic bag inside each shipping container. The field custodian will retain a copy of all sampling forms and the shippers copy of the shipping bill in the Survey Logbook.

12.2 Sample Shipping

Samples will be shipped at the end of each collection day for next-day delivery. Environmental samples will be packed in coolers with ice and bubble wrap sufficient to ensure that damage will not occur during shipping. Non-perishable foods will be shipped dry in coolers with sufficient bubble wrap to prevent damage. The sampling form(s), which should be sealed in Ziploc bags and taped to the inner lid of the cooler. The cooler is then taped shut and the address labels attached. All samples except the electroshocked fish are shipped to Kim Andrews at the address listed in Table 8. Electroshocked fish are sent to Mr. Michael Meara at the address listed in Table 8. Ms. Andrews and Mr. Meara should be called and alerted to the delivery date and time, the number of coolers being shipped, the number of coolers, and the number and type of samples. SOP M3-F-5 defines sample shipping procedures for the project.

13. CALIBRATION PROCEDURES, REFERENCES, AND FREQUENCY

13.1 PS-1 Air Sampler

The PS-1 air sampler will be calibrated according to SOP M3-F-1 immediately prior to use in the field using a General Metals G40 Calibration kit, consisting of a calibration orifice and a manometer. The sample head will contain a PUF and filter during the calibration process. A multiple point calibration curve, which brackets the targeted air flow of 250 liter per minute (lpm), will be generated using the lpm from the calibration orifice graph versus the inches of water from the magnahelic gauge on the sampler. The calibration orifice will be removed from the sampler after calibration is completed. The calibration is considered acceptable if the calibration points are within 10% of expected. If a point is not within this range, the outlying point or points should be repeated.

13.2 12XL Global Positioning System

SOP 3-164 describes the calibration, operation, and maintenance of the Garmin 12XL hand-held GPS. The Garmin GPS will be checked for relative positional accuracy once at each city. The latitude/longitude coordinates from a known or charted location will be compared with the GPS coordinates. The coordinates for the known location will be entered into the GPS as a waypoint (in accordance with the user manual). The GPS unit will be hand carried to the known location and allowed to stabilize for 5 minutes. The GPS coordinates will be recorded to the nearest 0.01′ in the survey log on navigation check log form. These coordinates will be compared to the known coordinates (entered as a waypoint). The distance and bearing to the known coordinates displayed on the Garmin compass page will be recorded in the survey log on the navigation check log form. If the GPS unit fails to attain a reading that is within 100 meters of the actual position then the manual should be consulted for possible sources of error and the reference position verified.

14. ANALYTICAL PROCEDURES

Procedures for analyzing samples collected under this QAPP are described under separate cover.

15. DATA REDUCTION, VALIDATION, AND REPORTING

No data reduction will be required to report the results of the field activities.

16. INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

Acceptable quality control limits for field spike samples, field blanks, and field duplicates/triplicates are documented under separate cover.

17. QUALITY ASSURANCE PERFORMANCE AUDITS, SYSTEM AUDITS, AND FREQUENCY

Quality assurance encompasses all planned and systematic activities necessary to assure management that the products generated, and the services performed by Battelle meet corporate standards. The primary mechanism for accomplishing this goal is audits. Audits refer to the formal assessment of conformance to the QA Program and its effectiveness. During an audit, the agreement with QA policy documents (*e.g.*, SOPs) is evaluated, deficiencies are identified, and corrective action is taken. Ideally, audits also serve to increase awareness and understanding of QA policies and procedures. The following QA audits are planned for the sampling program.

- A technical system (initiation) audit is conducted as part of the review of this QAPP to (1) ensure that the scope of work and all required elements are addressed adequately, (2) verify that all required SOPs are approved and current, and (3) to verify that all participants have the required qualifications and documented training to perform their assigned tasks. At the time of the preparation of this QAPP several SOPs are being developed for the field program. It is anticipated that these will be finalized prior to the first survey.
- The QA Officer will perform a field inspection for each survey team to verify that sampling activities are being conducted and documented according to the QAPP and associated SOPs.
- The survey reports will be reviewed for completeness and accuracy.

18. QUALITY ASSURANCE REPORTS TO MANAGEMENT

Results of QA audits will be reported to the Sampling Task Leader and the Program Manager. The audit reports will define any errors, deficiencies, or deviations from the QAPP and SOPs. The responsible analyst documents the corrective action on the audit report and submits the audit report to the program manager for review and approval. The Program Manager must approve all audit report responses before data are released as final. Any deviations must be documented and reported with the final survey report.

19. PREVENTIVE MAINTENANCE PROCEDURES AND SCHEDULES

19.1 Air Sampler

The air sampler will be kept in its protective housing when not in use. The protective cover is kept on the sampling head at all times until the sampling apparatus is being readied for sample collection. The air sampler is cleaned between samples as follows:

1. Disassemble the sampling head prior to sample collection.
2. Wipe out the sampling head with a Kim wipe wetted with methanol prior to installing the glass cartridge.
3. Check to make sure that the gaskets are inside the sampling head at the top and bottom of the cartridge seat.

19.2 Global Positioning System

The hand-held global positioning system has no maintenance procedures that can be performed by laboratory personnel other than replacement of batteries. All other maintenance is performed by the manufacturer.

19.3 Young Grab Sampler

The grab sampler (or alternative stainless steel spoon or scoop) will be rinsed and scrubbed with deionized water and rinsed with methanol between samples.

19.4 Fish Measuring Apparatus

The balance and fish measuring board used to weight and measure fish after electroshock collection will be cleaned with a methanol-soaked Kim wipe between each sample.

20. CALCULATION OF DATA QUALITY INDICATORS

The calculation of data quality indicators will be addressed in the analytical QAPP that will be provided under separate cover.

21. CORRECTIVE ACTION

All technical personnel share responsibility for identifying and resolving problems encountered in the routine performance of their duties. Ms. Marcia Nishioka, Battelle's Project Manager, will be accountable to the client and to Battelle management for overall conduct of the project, including the schedule, costs, and technical performance. She is responsible for identifying and resolving problems that have not been addressed timely or successfully at a lower level, influence multiple components of the project, necessitate changes in this CW/QAPP, or require consultation with Battelle management or with the client.

Problems identified by the QA Officer will be reported and corrected as described earlier.

22. REPORTS

One letter survey report will be prepared for each city survey. The report will list the samples collected, sampling locations, on-site sampling observations, and any SOP or QAPP deviations, etc. The format will be identical to the pilot study survey report submitted in December 1998 to the Program Manager.

23. REFERENCES

EPA, 1990. Method TO13, *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Supplement*, US EPA, Research Triangle Park, NC, EPA-600/4-90-010, May, 1990.

APPENDIX A

Outline
for
Multi-City Study Survey Plan

Survey Plan

Empirical Human Exposure Assessment
Multi-City Study Sampling Task

1. GENERAL INFORMATION
   - Project Title
   - Project Manager and Survey Task Manager
   - Organization Responsible for Survey; Address and Telephone Number

2. OBJECTIVES

3. SCHEDULE
   - Generic sampling schedule
   - The City Survey Plan will detail the survey schedule for each survey loop

4. SURVEY LOCATIONS
   - Generic description of sampling collection locations and matrices
   - The City Survey Plan will detail the specific sampling locations for each matrix, including addresses and contacts at each location

5. SURVEY/SAMPLING METHODS
   - The QAPP will be referenced for all methods.

6. SEQUENCE OF SURVEY TASKS/EVENTS
   - The step-by-step sequence of sample collection and quality control preparation will be detailed.

7. NAVIGATION CONTROL
   - The use of the GPS will be described generically.
   - The City Survey Plan will define specific calibration instructions for each city.

8. EQUIPMENT AND SUPPLIES
   - Check lists of expendable and non-expendable supplies will be created.
   - Solvent and waste containment will be addressed.

9. QA/QC PROCEDURES
   - Decontamination procedures will be described
   - The QAPP will be referenced

10. HEALTH AND SAFETY CHECKLIST

11. SURVEY TEAM
    - The general requirements for a survey team will be defined.
    - The City Survey Plan will define the specific sampling teams and Team Leaders for each city

12. REPORTING REQUIREMENTS
    - The contents of each survey report will be defined.

APPENDIX B

Examples of Requests for Permissions

Battelle
. . . Putting Technology To Work

VIA FACSIMILE

Duxbury Operations
397 Washington Street
Duxbury, Massachusetts 02332
Telephone 781-934-0571
Fax: 781-934-2124

February 25, 1999

Chief Wayne Collins
Columbus Georgia Fire Department
Columbus, GA 31907
706-653-3500

Subject: Request to Collect Samples

Dear Chief Collins:

I appreciate the time your associate Captain Schmidt took to speak with me today. As per our conversation, I would like to formally request permission from the Columbus Fire Department to allow Battelle Memorial Institute to place an outdoor air sampler at a fire station in the city to obtain a representative air sample.

We would like to sample outdoor air for 12 hours starting about 3 pm in the afternoon. We have selected the fire station as a sampling location because it is a secure facility and power would be available throughout the day and evening. We will be on site for set-up and take-down operations, and simply request an available 120 V outlet for power. The air sampler pump is programmed to halt at the conclusion of the 12 hour sampling period and will not require attention from fire station personnel during its operation. The sampler itself looks like a small house: approximately 3.5 foot high and 1.5 foot by 1.5 foot.

By way of introduction, Battelle is a very prominent contract-research organization in all scientific areas. My particular department conducts a variety of environmental sampling and analysis studies throughout the U.S. and world. Currently one of our clients has asked us to conduct a Life Cycle analysis of their products. As part of this investigation, we have statistically identified a set of cities throughout the U.S. where we would like to collect representative air and water samples. These samples will be analyzed for a specific marker compound that is not regulated by EPA nor is it listed as a hazardous chemical. The planned analyses are specific to this investigation only. The results of these analyses will be combined with raw material inventories, release inventories of manufacturing facilities and information on product consumers to understand the life cycle of these products.

Our staff will make every effort to minimize any inconvenience to your staff and facility operations. We would like to provide a $50 gratuity to the fire station, or a charity of their choice, for the use of your facility's power. Please let us know in advance to whom to address this check.
Our desire is to collect these samples sometime during the first two weeks of March 1999. With your approval, we can have staff in schedule the trip appropriately. If you have any questions concerning this request, please feel free to contact me at 781-952-5379 or Don Gunster at 781-952-5378.
Thank you in advance for your assistance.

Sincerely,

Scott C. Macomber
Research Associate
Battelle Duxbury
cc: Donald Gunster

Battelle
. . . Putting Technology To Work

February 25, 1999

Mr. Ken Carr
Decatur Utilities
Wastewater Treatment Department
1002 Central Pky S,
Decatur, AL 35601-4848

Duxbury Operations
397 Washington Street
Duxbury, Massachusetts 02332
Telephone 781-934-0571
Fax: 781-934-2124

Subject: Request to Collect Samples

Dear Mr. Carr:

I appreciate the time you took to speak with me on December 9. As per our conversation, I would like to formally request permission from Decatur Utilities to allow Battelle to obtain samples of influent and effluent water and sludge from your wastewater treatment facility and influent and effluent water from the drinking water treatment facility.

Battelle is a scientific research organization that conducts a variety of environmental sampling and analysis throughout the U.S. and the world. Currently one of our clients has asked us to conduct a Life Cycle analysis of their products. As part of this investigation, we have statistically identified a number of cities throughout the U.S. from which to collect representative samples of wastewater and drinking water. These samples will be analyzed for a specific chemical compound that serves as a marker for our clients products. This chemical is not regulated by EPA nor is it listed as a hazardous chemical. The planned analyses are specific to this investigation only. The results of these analyses will be combined with raw material inventories, release inventories of manufacturing facilities, and information on product consumers to understand the life cycle of these products.

Our staff will make every effort to minimize any inconvenience to your staff and facility operations. We are willing to collect the samples ourselves, with your supervision, or provide the appropriate containers and allow your staff to collect the samples. The samples we are interested in collecting from your facilities are summarized in the following table.

Sample Location	Media	Number of Samples	Volume/Amount of Sample
WWTP Influent	Water	1	2 liters
WWTP Effluent	Water	1	2 liters
WWTP Sludge Tank	Sludge	1	200 grams
Municipal Drinking Water Influent	Water	1	2 liters
Municipal Drinking Water Effluent	Water	1	2 liters

We would like to collect these samples the week of December 14, 1998. With your approval, we can have staff in Decatur on December 15, 1998. If you have any questions concerning this request, please feel free to contact Donald Gunster or me at 781-934-0571.

Sincerely,

Scott Macomber
Research Associate
cc: Donald Gunster

APPENDIX C

Sampling Forms

FINFISH DATA SHEET

Project: N100666-01

Date	
Time	
Collector	
Gear type	
Sampling location	
DGPS Coordinates	
Water Temperature	
Water Depth	
Air Temperature	
Wind Speed	

Species	Length (cm)	Weight (g)	Sample ID

Signature_____ Date_____

AIR SAMPLE COLLECTION DATA SHEET

Project: N100666-01

City: _____ Sampling Site: _____

Collected By: _____ Air Sampler ID: _____

PUF Cleaning Lot No.: _____ Filter Cleaning Lot No.: _____

Calibration: Calibration Orifice No.: _____

Reading from Magnahelic Gauge on Sampler	Inches of Water on Calibrator Orifice	lpm[a]

Manually graph the calibration curve (Magnahelic reading on the x-axis; calculated lpm on the y-axis). Attach the graph to this sheet.

Sample Collection:

Parameter	Start	Stop
Date		
Time		———
Magnahelic Reading		
Running Time Meter		
Determined lpm (from graph)		

Total Sample Time, min = Stop running time meter value–Start running time meter value

= _____

Average Flow Rate = (Determined lpm at Start + Determined lpm at Stop)/2

= _____

[a] Liter/min (lpm) is determined from the calibration curve.

DECATUR, AL - SURFACE WATER SAMPLING

Location: _____ Date: _____

Bottle Lot Number: _____ Collected By (*Initials*)_____

A total of nine bottles will be used (seven 1L water samples and 2 empty bottles for field blanks).

Recorded by (*Initials*)

_____ **MC-101: Surface water- Decatur- Site 1-P/N**

_____ **MC-102: Surface water -Decatur- Site 1-Total PFOS**

_____ **MC-103: Surface water –Decatur- Site 1-Field/Lab Dup-P**

_____ **MC-104: Surface water –Decatur- Site 1-Field Spike-P/N**

_____ **MC-105: Surface water- Decatur- Site 1-Lab Spike-P/N**

_____ **MC-106: Surface water –Decatur- Site 2-P/N**

_____ **MC-107: Surface water –Decatur- Site 3-P/N**

_____ **MC-108: Surface water -Decatur-Field Blank-P/N**

_____ **MC-109: Surface water -Decatur-Field Blank – Total PFOS**

Example Labels:

Surface water –Decatur- Site 1-P/N MC-101	**Surface water -Decatur-Site 1-Total PFOS MC-102**	**Surface water -Decatur-Site 1-Field/Lab Dup-P MC-103**
Surface water –Decatur-Site 1-Field Spike-P/N MC-104	**Surface water-Decatur-Site 1-Lab Spike-P/N MC-105**	**Surface water –Decatur- Site 2-P/N MC-106**
Surface water -Decatur- Site 3-P/N MC-107	**Surface water –Decatur- Field Blank-P/N MC-108**	**Surface water -Decatur-Field Blank – Total PFOS MC-109**

Samples should be sent to Battelle Columbus in the presence of ice.

Relinquished By: _____ Date: _____ Ice included: Y N

Received By: _____ Date: _____ Condition:_____

DECATUR, AL - SEDIMENT SAMPLING

Location: _____ Date: _____

Bottle Lot Number: _____ Collected By (*Initials*)_____

A total of 5 bottles will be used (three containing 200 gram samples and 2 empty bottles for field blanks).

Recorded by (*Initials*)

_____ **MC-110: Sediment - Decatur- Site 1-P/N/Total PFOS/QC**

_____ **MC-111: Sediment –Decatur- Site 2-P/N/ Total PFOS/QC**

_____ **MC-112: Sediment –Decatur- Site 3-P/N/ Total PFOS/QC**

_____ **MC-113: Sediment -Decatur-Field Blank-P/N**

_____ **MC-114: Sediment -Decatur-Field Blank – Total PFOS**

Example Labels:

Sediment –Decatur- Site 1-P/N/ Total PFOS/QC MC-110	**Sediment –Decatur- Site 2-P/N/ Total PFOS/QC MC-111**	**Sediment –Decatur- Site 3-P/N/ Total PFOS/QC MC-112**
Sediment -Decatur-Field Blank-P/N MC-113	**Sediment -Decatur-Field Blank – Total PFOS MC-114**	

Samples should be sent to Battelle Columbus in the presence of ice.

Relinquished By: _____ Date: _____ Ice included: Y N

Received By: _____ Date: _____ Condition:_____

DECATUR, AL - DRINKING WATER (INTAKE) SAMPLING

Location: _____ Date: _____

Bottle Lot Number: _____ Collected By (*Initials*)_____

A total of six bottles will be used (five 1L water samples and 1 empty bottle for field blank).

Recorded by (*Initials*)

_____ **MC-115: Drinking water- intake-Decatur- P/N**

_____ **MC-116: Drinking water –intake-Decatur- Total PFOS**

_____ **MC-117: Drinking water –intake-Decatur- Field/Lab Dup-P.**

_____ **MC-118: Drinking water –intake-Decatur- Field Spike-P/N**

_____ **MC-119: Drinking water- intake-Decatur- Lab Spike-P/N**

_____ **MC-120: Drinking water –intake-Decatur-Field Blank-P/N**

Example Labels:

Drinking water- intake-Decatur- P/N MC-115	**Drinking water - intake-Decatur- Total PFOS MC-116**	**Drinking water - intake-Decatur- Field/Lab Dup-P MC-117**
Drinking water - intake-Decatur- Field Spike-P/N MC-118	**Drinking water- intake-Decatur- Lab Spike-P/N MC-119**	**Drinking water - intake-Decatur- Field Blank-P/N MC-120**

Samples should be sent to Battelle Columbus in the presence of ice.

Relinquished By: _____ Date: _____ Ice included: Y N

Received By: _____ Date: _____ Condition:_____

DECATUR, AL - DRINKING WATER (OUTFLOW) SAMPLING

Location: _____ Date: _____

Bottle Lot Number: _____ Collected By (*Initials*)_____

A total of five bottles will be used (five 1L water).

Recorded by (*Initials*)

_____ **MC-121: Drinking water- outflow-Decatur- P/N**

_____ **MC-122: Drinking water - outflow-Decatur- Total PFOS**

_____ **MC-123: Drinking water – outflow-Decatur-Field/Lab Dup-P**

_____ **MC-124: Drinking water – outflow-Decatur- Field Spike-P/N**

_____ **MC-125: Drinking water- outflow-Decatur- Lab Spike-P/N**

Example Labels:

Drinking water- outflow-Decatur- P/N MC-121	**Drinking water - outflow-Decatur- Total PFOS MC-122**	**Drinking water - outflow-Decatur- Field/Lab Dup-P MC-123**
Drinking water - outflow-Decatur- Field Spike-P/N MC-124	**Drinking water- outflow-Decatur- Lab Spike-P/N MC-125**	

Samples should be sent to Battelle Columbus in the presence of ice.

Relinquished By: _____ Date: _____ Ice included: Y N

Received By: _____ Date: _____ Condition:_____

DECATUR, AL - TAP WATER SAMPLING

Location: _____ Date: _____

Bottle Lot Number: _____ Collected By *(Initials)*_____

A total of eight bottles will be used (seven 1L water samples and 1 empty bottle for field blank).

Recorded by *(Initials)*

_____ **MC-126: Tap water- Decatur- Site 1-P/N**

_____ **MC-127: Tap water -Decatur- Site 1-Total PFOS**

_____ **MC-128: Tap water –Decatur- Site 1-Field/Lab Dup-P**

_____ **MC-129: Tap water –Decatur- Site 1-Field Spike-P/N**

_____ **MC-130: Tap water- Decatur- Site 1-Lab Spike-P/N**

_____ **MC-131: Tap water- Decatur- Site 2-P/N**

_____ **MC-132: Tap water- Decatur- Site 3-P/N**

_____ **MC-133: Tap water -Decatur-Field Blank-P/N**

_____ **MC-134: Tap water -Decatur-Field Blank – Total PFOS**

Example Labels:

Tap water- Decatur- Site 1-P/N **MC-126**	**Tap water -Decatur-Site 1-Total PFOS** **MC-127**	**Tap water –Decatur-Site 1-Field/Lab Dup-P** **MC-128**
Tap water -Decatur-Site 1-Field Spike-P/N **MC-129**	**Tap water-Decatur-Site 1-Lab Spike-P/N** **MC-130**	**Tap water –Decatur- Field Blank-P/N** **MC-133**
Tap water -Decatur-Field Blank – Total PFOS **MC-134**	**Tap water- Decatur- Site 2-P/N** **MC-131**	**Tap water- Decatur- Site 3-P/N** **MC-132**

Samples should be sent to Battelle Columbus in the presence of ice.

Relinquished By: _____ Date: _____ Ice included: Y N

Received By: _____ Date: _____ Condition:_____

DECATUR, AL - LANDFILL LEACHATE SAMPLING

Location: _____ Date: _____

Bottle Lot Number: _____ Collected By *(Initials)*_____

A total of one bottle will be used (1L landfill leachate sample).

Recorded by *(Initials)*

_____ **MC-135: Landfill Leachate- Decatur- P/N/Total PFOS/QC**

_____ **MC-136: Landfill Leachate -Decatur-Field Blank-P/N**

Example Labels:

Landfill Leachate - Decatur- P/N/Total PFOS/QC MC-135	**Landfill Leachate -Decatur- Field Blank-P/N MC-136**	

Samples should be sent to Battelle Columbus in the presence of ice.

Relinquished By: _____ Date: _____ Ice included: Y N

Received By: _____ Date: _____ Condition:_____

DECATUR, AL - POTW INFLUENT SAMPLING

Location: _____ Date: _____

Bottle Lot Number: _____ Collected By *(Initials)*_____

A total of two bottles will be used (two 1L water samples).

Recorded by *(Initials)*

_____ **MC-137: POTW Influent- Decatur- P/N**

_____ **MC-138: POTW Influent -Decatur- Total PFOS**

DECATUR, AL - POTW EFFLUENT SAMPLING

Location: _____ Date: _____

A total of five bottles will be used (four 1 L samples and one empty bottle for the field blank).

Recorded by *(Initials)*

_____ **MC-139: POTW Effluent- Decatur- P/N**

_____ **MC-140: POTW Effluent -Decatur- Total PFOS/P&N Dup**

_____ **MC-141: POTW Effluent- Decatur- Field Spike-P/N**

_____ **MC-142: POTW Effluent -Decatur- Lab Spike-P/N**

_____ **MC-143: POTW Effluent -Decatur- Field Blank-P/N**

DECATUR, AL - POTW SLUDGE SAMPLING

Location: _____ Date: _____

A total of two bottles will be used (one 200 g and one empty bottle for the field blank).

Recorded by *(Initials)*

_____ **MC-144: POTW Sludge- Decatur-P/N/Total PFOS/QC**

_____ **MC-145: POTW Sludge -Decatur- Field Blank-P/N**

Example Labels:

POTW Influent- Decatur- P/N MC-137	**POTW Influent –Decatur- Total PFOS MC-138**	**POTW Effluent- Decatur- P/N MC-139**
POTW Effluent -Decatur- Total PFOS/P&N Dup MC-140	**POTW Effluent- Decatur- Field Spike-P/N MC-141**	**POTW Effluent -Decatur- Lab Spike-P/N MC-142**
POTW Effluent -Decatur- Field Blank-P/N MC-143	**POTW Sludge- Decatur- P/N/Total PFOS/QC MC-144**	**POTW Sludge -Decatur- Field Blank-P/N MC-145**

Samples should be sent to Battelle Columbus in the presence of ice.

Relinquished By: _____ Date: _____ Ice included: Y N

Received By: _____ Date: _____ Condition:_____

DECATUR, AL - URBAN AIR SAMPLING

Location: _____ Date: _____

Puf Cleaning Lot Number: _____ Filter Cleaning Lot Number: _____

A total of three samples will be generated (one sample from the PS-1air sampler , one sample for a field spike, and one sample for a field blank).

Recorded by *(Initials)* Collected by *(Initials)*_____

_____ **MC-146: Urban Air- Decatur- PUF**

_____ **MC-147: Urban Air -Decatur- Filter**

_____ **MC-148: Urban Air –Decatur- PUF-Field Spike**

_____ **MC-149: Urban Air –Decatur- Filter-Field Spike**

_____ **MC-150: Urban Air- Decatur- PUF-Field Blank**

_____ **MC-151: Urban Air- Decatur-Filter-Field Blank**

Example Labels:

Urban Air- Decatur- PUF MC-146	**Urban Air -Decatur- Filter MC-147**	**Urban Air –Decatur- PUF- Field Spike MC-148**
Urban Air –Decatur- Filter- Field Spike MC-149	**Urban Air- Decatur- PUF-Field Blank MC-150**	**Urban Air- Decatur-Filter- Field Blank MC-151**

Samples should be sent to Battelle Columbus in the presence of ice.

Relinquished By: _____ Date: _____ Ice included: Y N

Received By: _____ Date: _____ Condition:_____

DECATUR, AL - FOOD SAMPLING

A maximum of three samples of each food type will be purchased (one sample from up to three grocery stores).

Grocery Store 1: _____ Date_____ Initials_____

Grocery Store 2: _____ Date_____ Initials_____

Grocery Store 3: _____ Date_____ Initials_____

Organic Store: _____ Date_____ Initials_____

Sample	Description	✓ when sample is obtained		
		Store 1	Store 2	Store 3
Ground beef	1# package	MC-152	MC-153	MC-154
Pork chops	With bone, at least 2	MC-155	MC-156	MC-157
Chicken breast	Boneless, skinless, 1#	MC-158	MC-159	MC-160
Hot dogs	Beef and pork, 1#	MC-161	MC-162	MC-163
Fish	Regional species	MC-164	MC-165	MC-166
Eggs	6-12 large	MC-167	MC-168	MC-169
Whole milk	1 quart, plastic or cardboard	MC-170	MC-171	MC-172
Bread	White	MC-173	MC-174	MC-175
Green beans	Cut, in plastic bag	MC-176	MC-177	MC-178
Apples	Fresh, at least 2	MC-179	MC-180	MC-181
Organic flour *	1# bag	MC-182	—	—
Organic bread *	1 loaf	MC-183	—	—

* Collect one sample of either organic bread or organic flour. It is not necessary to collect both matrices or three sources of one of these matrices.

Example Labels:

Ground beef- Decatur-Store 1 MC-152	**Ground beef- Decatur-Store 2 MC-153**	**Ground beef- Decatur-Store 3 MC-154**
Pork chops- Decatur-Store 1 MC-155	**Pork chops - Decatur-Store 2 MC-156**	**Pork chops - Decatur-Store 3 MC-157**
Chicken breast-Decatur-Store 1 MC-158	**Chicken breast - Decatur-Store 2 MC-159**	**Chicken breast - Decatur-Store 3 MC-160**
Hot dogs-Decatur-Store 1 MC-161	**Hot dogs - Decatur-Store 2 MC-162**	Hot dogs - Decatur-Store 3 MC-163
Fish-Decatur-Store 1 MC-164	**Fish - Decatur-Store 2 MC-165**	**Fish - Decatur-Store 3 MC-166**
Eggs-Decatur-Store 1 MC-167	**Eggs - Decatur-Store 2 MC-168**	**Eggs - Decatur-Store 3 MC-169**
Milk-Decatur-Store 1 MC-170	**Milk - Decatur-Store 2 MC-171**	**Milk - Decatur-Store 3 MC-172**
Bread-Decatur-Store 1 MC-173	**Bread - Decatur-Store 2 MC-174**	**Bread - Decatur-Store 3 MC-175**
Green beans-Decatur-Store 1 MC-176	**Green beans - Decatur-Store 2 MC-177**	**Green beans - Decatur-Store 3 MC-178**
Apples-Decatur-Store 1 MC-179	**Apples - Decatur-Store 2 MC-180**	**Apples - Decatur-Store 3 MC-181**
Organic bread-Decatur MC-182	**Organic Flour- Decatur MC-183**	

Samples should be sent to Battelle Columbus in the presence of ice.

Relinquished By: _____ Date: _____ Ice included: Y N

Received By: _____ Date: _____ Condition:_____