# Exposure Investigation

**Airborne Exposures to Sulfur Dioxide, Particulate Matter, and Selected Metals**

**Mirant Potomac River Generating Station (Mirant)**
**Alexandria, VA**

Cost Recovery Number A08K

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# Introduction

## Purpose of the Exposure Investigation

In order to better assess potential human exposure to airborne concentrations of sulfur dioxide ($SO_2$), particulate matter with aerodynamic particle size of 10 microns or less ($PM_{10}$), particulate matter with aerodynamic particle size of 2.5 microns or less ($PM_{2.5}$), and selected metals (antimony, arsenic, beryllium, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, and selenium), the Agency for Toxic Substances and Disease Registry (ATSDR) will conduct an Exposure Investigation (EI). During this EI, an ambient and limited indoor air monitoring/sampling program will be conducted over a four to six week period to obtain representative concentration data of $SO_2$, $PM_{10}$, $PM_{2.5}$, metals, as well as meteorological parameters in residential and community areas near the Mirant Potomac River Generating Station (Mirant) located in Alexandria, VA.

This Exposure Investigation is designed to provide information that can be used in the evaluation of public health implications of possible community exposures to airborne contaminants in areas near the Mirant facility. As part of the public health evaluation, the information collected from this Exposure Investigation will be used to evaluate the need for additional air dispersion modeling and type of modeling needed and if additional air monitors are needed to more fully evaluate public health impacts in the investigation area. This investigation is not designed to determine adherence to any National Ambient Air Quality Standards (NAAQS).

## Objectives of the Exposure Investigation

### *Sulfur Dioxide*

The primary objective of the Exposure Investigation is to determine if community exposures to $SO_2$ are occurring in areas near the Mirant facility. Possible community exposures to sulfur dioxide have been suggested by 1-hour air dispersion modeling as potential areas for short-term health impacts. Adverse health effects (in controlled clinical studies with exercising asthmatic volunteers) from $SO_2$ exposures have been reported at concentrations as low as 260 $\mu g/m^3$ (ATSDR's MRL is 26 $\mu g/m^3$ based on the same study). For the Mirant facility, modeled 5-year maximum1-hour concentrations averaged from 300-900 $\mu g/m^3$ for one generator unit operating for 16 hours/day (8 hours at maximum output, 8 hours at minimum output). The Mirant facility has five generator units.

The data collected through this EI will allow ATSDR to determine whether people living near the Mirant facility are being exposed to $SO_2$ at concentrations that pose a public health hazard. Air monitors will be placed both indoors and outdoors at two to three locations to attempt to determine correlations of ambient $SO_2$ measurements and indoor (point of exposure) $SO_2$ concentrations. ATSDR will examine the data for public health implications by considering the concentrations of sulfur dioxide measured, the frequency, duration, and location of exposure as well as meteorological conditions and emissions information (if available).

***Particulate Matter10, Particulate Matter2.5, and Metals***

The secondary objective of the Exposure Investigation is obtain $PM_{10}$, $PM_{2.5}$, and metals data. Currently, only limited concentration data is available for metals and particulates in the investigation area. For public health evaluation purposes, ATSDR will monitor/sample for metals, $PM_{10}$, and $PM_{2.5}$ to determine the presence of these contaminants in the investigation area where limited or no monitoring/sampling information is currently available.

The data collected through this EI will allow ATSDR to determine whether $PM_{10}$, $PM_{2.5}$, and metals exposures may be occurring in populations near to the Mirant facility. ATSDR will examine the data for public health implications by considering the concentrations of $PM_{10}$, $PM_{2.5}$ and metals measured, the frequency, duration, and location of exposure as well as meteorological conditions and emissions information (if available).

**Exposure Investigation Definition**

An exposure investigation is defined as the collection and analysis of site- specific information and biologic tests (when appropriate) to determine whether people have been exposed to hazardous substances.

An exposure investigation is an approach ATSDR uses to fill data gaps in evaluating community exposure pathways. Its purpose is to better characterize past, present, and possible future exposures to hazardous substances in the environment and evaluate possible health effects related to those exposures.

Exposure investigations must meet four criteria. They are

1. Can an exposed population be identified?
2. Does a data gap exist that affects your ability to determine if a health hazard exists?
3. Can an exposure investigation be designed that will address this data gap?
4. Will the EI results impact the public health decision for the site?

An exposure investigation is NOT a study. Rather, it is a biased attempt at identifying the individuals most highly exposed and sampling their exposure. Our results are a public health service directed to individual participants and are not generalizable to other populations.

**Background**

The Mirant Potomac River Generating Station is a 482-MW electricity generating facility located on the Potomac River in Alexandria, Virginia (see Figure 1). The plant consists of five generating units. It is three miles from the Ronald Reagan Washington National Airport and five miles from the U.S. capitol building. The plant uses oil to pre-heat each of its units and then burns coal, which it receives via rail car, to generate electricity. The plant site was relatively remote in 1949 when the plant began operating, but residential and commercial properties now surround the facility. In particular, a condominium building (Marina Towers) was built only 300 yards from the facility in the 1960s. Since 2001, nearby residents have complained about health concerns related to air quality problems that they have attributed to the facility (DOE, 2006).

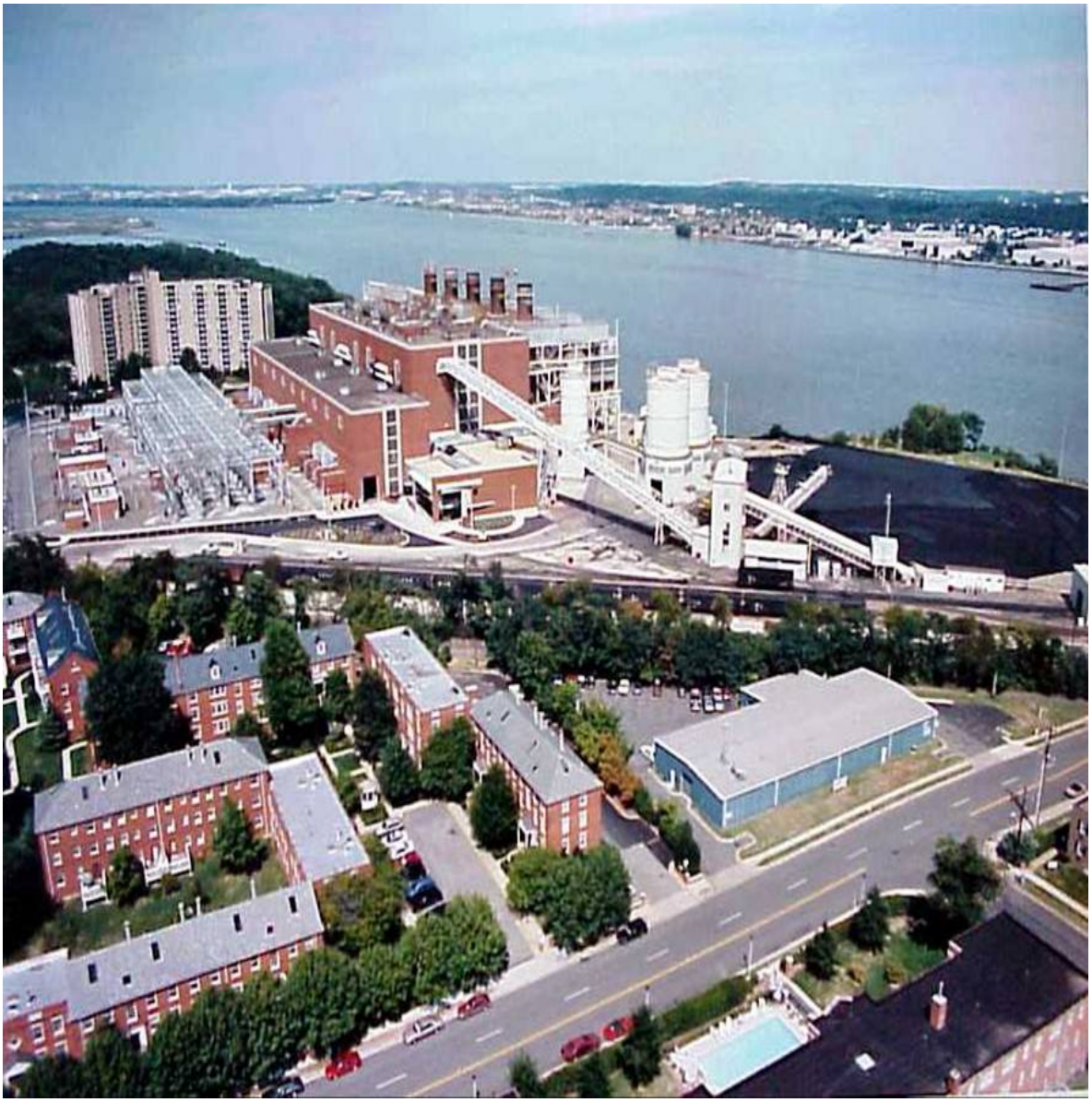
Since 2003, state and Federal environmental agencies have been working with Mirant to settle alleged violations of the plant's operating permit limit for NOx. These efforts resulted in an EPA judicial consent decree in September 2004; this decree was further amended in May 2006. The 2004 settlement required Mirant to perform modeling analysis to predict the effect of "downwash" from the plant on ambient concentrations of several NAAQS pollutants. The resulting study showed significant modeled exceedances of three NAAQS pollutants from downwash – $SO_2$, $NO_2$, and $PM_{10}$. Based on these findings and VA DEQ's subsequent August 19, 2005 letter to the facility, the plant voluntarily shutdown for approximately one month. The District of Columbia Public Service Commission subsequently filed an emergency petition with DOE arguing that the shutdown had a drastic and potentially immediate effect on the reliability of the electricity supply of the central DC area. On September 21, 2005, Mirant decided to restart the plant on a limited basis, and began experimental use of measures to control $SO_2$ (e.g., combustion of low-sulfur coal and injection of trona into flue gases). On December 20, 2005, DOE issued an emergency order to Mirant to operate the plant under certain conditions based on their finding that the plant was necessary to meet critical reliability (electrical energy) needs (DOE, 2006).

In January 2006, Dr. Charles Konigsberg, Health Director of the Alexandria Health Department requested that the ATSDR review existing air quality and other environmental data related to operations at Mirant. He also asked ATSDR to assess whether existing data indicated a potential for health effects for nearby residents and to recommend next steps (Konigsberg, 2006). This is a standard request from a Health Department to ATSDR. When ongoing exposures are suspected, ATSDR evaluates the available data to determine if a public health intervention is needed to minimize any acute exposures. On February 13, 2006, this request was evaluated and accepted by ATSDR's Triage Review committee. ATSDR began its review of the available modeling data and the health department's concerns in March 2006.

On June 1, 2006, EPA issued an Administrative Compliance Order to Mirant, directing the plant to operate the plant under the conditions specified under the DOE order during line outage situations but requiring the facility to take all reasonable steps to limit $SO_2$, $PM_{10}$, and NOx emissions. In non-line outage situations, the EPA order authorizes the plant to operate under "daily predictive modeling" after certain conditions are met. The order entailed the installation and operation of a network of ambient $SO_2$ monitors in the vicinity of the plant (DOE, 2006).

On January 4, 2007, ATSDR sent a response to Dr. Konigsberg with the results of ATSDR's initial review of the public health concerns regarding this facility. ATSDR's review of air dispersal modeling suggested a hazard to vulnerable populations from short-term, acute sulfur dioxide exposures based on ATSDR health-based guidance values. However, ATSDR found significant uncertainty with the modeling data and this interpretation (ATSDR, 2007). Until additional data is collected and reviewed, ATSDR is unable to determine if a public health hazard exists. To fill the data gaps identified, ASTDR proposed to conduct this exposure investigation.

**Figure 1. Mirant Potomac River Generating Station.**



## Exposure Investigation Parameters

### Investigators/Collaborators

#### *Agency for Toxic Substances and Disease Registry*

The EI Principal Investigator and Technical Monitor for field activities for this project will be Ms. Debra Gable. In the capacity of EI Principal Investigator, Ms. Gable will serve as the primary liaison between ATSDR and Eastern Research Group (ERG). Eastern Research Group, as ATSDR's mission support contractor, will assist ATSDR with the exposure investigation. Ms. Gable will be responsible for providing direction on the overall goals and approaches of the EI to ensure that the objectives of the monitoring project are met. She will develop, review, and/or provide comments on the EI Protocol, Monitoring Protocol and Health and Safety Plan, progress reports, and the Draft and Final EI Field Reports. Ms. Gable will be responsible for obtaining consent agreements from potential program participants identified. In the capacity of Technical Monitor, Ms. Gable will be responsible for overseeing overall coordination and logistics, approving project costs, approving changes to the Monitoring Program, and will serve as a technical advisor. Ms. Gable will also serve as a Field Scientist.

Dr. David Fowler and Ms. Lora Werner will serve as Co-Site Leads for the public health consultation. They will be responsible for development of the health consultation (health report) and coordination of consultation activities. Dr. Fowler and Ms. Werner will also be the primary contacts with other interested agencies (i.e., federal, state, and local).

Dr. Ketna Mistry will serve as the EI Medical Officer. Dr. Mistry will interface with medical staff in the City of Alexandria, will direct health education activities, and will assist with data interpretation and report generation.

#### ***Eastern Research Group, Inc.***

The ERG Project Co-Directors for this EI will be Mr. Dave Dayton and Mr. Scott Sholar. They will report directly to the ATSDR EI Principal Investigator. In the capacity of Project Co-Directors, Mr. Dayton and Mr. Sholar will be responsible for the overall quality of the work conducted by ERG. They will oversee all activities associated with the monitoring project, from planning through reporting.

As well as managing the monitoring project, Mr. Dayton and Mr. Sholar will also serve as Field Scientists. In this capacity, they will secure equipment, perform the pre-deployment check out of the measurement and sample collection systems, deploy those systems, perform daily site visits, perform the sample collections, perform data downloading, and conduct the equipment recovery efforts.

Ms. Donna Tedder will serve as the ERG Analytical Task Leader. In this capacity she will oversee the analysis of project samples for total suspended particulates (TSP) mass and toxic metals at the ERG laboratory, and be a point of contact for the field staff.

## Description of Target Populations

### *Demographics*

Alexandria is a medium sized city of approximately 133,479 people in northeastern Virginia, across the Potomac River from Washington D.C. The median household income (in 2005 inflation adjusted dollars) is $66,116 [Appendix B]. (U.S. Census Bureau, 2000).

### *Age and Gender of the Target Population*

In Alexandria there are 70,897 women (53.1%) and 62,582 men (46.9%). The median age is 36.2 years. Approximately 9.1% of the population is less than 5 years old and 10% of the population is older than 65 years (U.S. Census Bureau, 2000).

### *Race/ Ethnicity of the Target Population*

The percentage of population in Alexandria is as follows: White (91,052), black or African American (26,784), American Indian and Alaska Native (374), Asian (7,584).

### *Special Populations*

Pregnant women, children, the elderly, and people with chronic health conditions are considered as populations that may have increased susceptibility within the general target population. To address this concern, the EI will include areas where children range in age from 5 to 17 years and areas where residents live.

## Exclusion Criteria

Biologic sampling will not be conducted.

## Rationale for Environmental Sampling (Pollutants to be Measured)

"Air emissions from the stack gases from coal- and oil-fired boilers include four of the six criteria pollutants regulated through the National Ambient Air Quality Standards (NAAQS) under the Clean Air Act (CAA) as amended: NOx, CO, $SO_2$, and PM. Amounts of $SO_2$ emitted depend largely on the amount of sulfur present in the coal or oil and the method used to generate steam.

Other emissions regulated by the CAA commonly contained in emission gases are total organic carbon as methane, non-methane hydrocarbons, and VOCs. Traces of lead, another criteria pollutant, and other metals and minerals are also found. These metals are present in the coal and oil. Sulfur is also found in these fuels (more in coal than in oil), and fly ash is the product of sulfur and other minerals materials that do not combust." (EPA, 1997)

This EI will focus on the ambient air monitoring/sampling of sulfur dioxide, particulates, and select metals. In addition, sulfur dioxide monitors will be placed at a few indoor locations. These pollutants were selected for monitoring during this EI because these compounds present a high potential to be emitted from coal-fired power plants, and have measurable health endpoints or will be useful during the health implication evaluation. Table 1 lists pollutants that will be measured during the EI and associated comparison values, if available.

Indoor and ambient sulfur dioxide measurements will be collected at a few locations to better characterize $SO_2$ point of exposure by identifying the concentrations of contaminants in indoor air relative to outdoor air. Determining indoor concentrations are particularly crucial because individuals spend, on average, about 90% of their time indoors (70% in homes).

**Rationale for Selection of the Investigation Time Period and Duration (Length of Time Sampling/Monitoring Will Occur)**

Exposure investigations are not designed to be long-term environmental sampling programs. If a need for longer term sampling is identified as a result of an exposure investigation, ATSDR may recommend to the appropriate agency or authority that additional sampling data be collected and indicate the sampling duration needed. An EI is also not designed to characterize emissions from a facility or monitor facility emissions. The objectives of an EI, by design, are to fill data gaps relating to community exposures to environmental contaminants.

For the Mirant EI, the monitoring period for the EI was chosen to coincide with the expected worst case emissions from the Mirant facility. That is, Mirant is expected to operate at or near full operating capacity in May-June 2007 (due to maintenance work on the electrical power grid transmission lines, it is anticipated Mirant will need to provide extra electrical power to the Washington D.C. area that may normally be supplied or supplemented by other electrical power suppliers on the grid). Although the monitoring duration of the EI will be only 4-6 weeks, conducting community-based monitoring during worst case facility emissions is expected to provide information regarding worst case community exposures.

**Table 1. Pollutants to be Measured During EI and Health Comparison Values.**

| Pollutant | Comparison Value | Source |
|---|---|---|
| Sulfur dioxide | 10 ppb<br>0.03 ppm<br>0.14 ppm<br>0.5 ppm | ATSDR: Acute MRL<br>EPA: NAAQS, Annual Primary<br>EPA: NAAQS, 24 hr Primary<br>EPA: NAAQS, 3 hr Secondary |
| PM 10 | 150 $\mu g/m^3$ | EPA: NAAQS, 24 hr Primary |
| PM 2.5 | 35 $\mu g/m^3$<br>15 $\mu g/m^3$ | EPA: NAAQS, 24 hr Primary<br>EPA: NAAQS, Annual Primary |
| *Metals* | | |
| Antimony (trioxide) | 0.2 $\mu g/m^3$ | EPA: RfC |
| Arsenic | 0.0002 $\mu g/m^3$<br>0.19 $\mu g/m^3$<br>0.03 $\mu g/m^3$ | ATSDR: CREG<br>CA: Acute REL<br>CA: Chronic REL |
| Beryllium | 0.0004 $\mu g/m^3$<br>0.02 $\mu g/m^3$ | ATSDR: CREG<br>EPA: RfC |
| Cadmium | 0.0006 $\mu g/m^3$<br>0.02 $\mu g/m^3$ | ATSDR: CREG<br>CA: Chronic REL |
| Chromium, hexavalent | 0.00008 $\mu g/m^3$<br>1 $\mu g/m^3$<br>0.1 $\mu g/m^3$ | ATSDR: CREG<br>ATSDR: Intermediate MRL<br>EPA: RfC |
| Cobalt | 0.1 $\mu g/m^3$ | ATSDR: Chronic MRL |
| Lead | 1.5 $\mu g/m^3$ | EPA: NAAQS |
| Manganese | 0.04 $\mu g/m^3$ | ATSDR: Chronic MRL |
| Mercury | 0.2 $\mu g/m^3$ | ATSDR: Chronic MRL |
| Nickel | 0.09 $\mu g/m^3$<br>0.2 $\mu g/m^3$ | ATSDR: Chronic MRL<br>ATSDR: Intermediate MRL |
| Selenium | 18 $\mu g/m^3$ | EPA: Region III RBC (n) |

CREG: cancer risk evaluation guide
MRL: minimal risk level
NAAQS: national ambient air quality standards
NA: none available
RBC (n): risk-based concentration – non-cancer
REL: reference exposure level for no adverse effects
RfC: reference concentration
ppb: parts per billion
$\mu g/m^3$: micrograms per cubic meter
Health-based screening values are periodically updated.

## Criteria for Choosing the Target Area (Siting)

It is anticipated that the program will include a network of monitoring/sampling locations staged in a grid pattern. The network is expected to consist of as few as six, or as many as eleven, monitoring/sampling locations (sites). Figure 2 presents a map of areas near the Mirant plant laid out in 0.25 mile grid rings. The technical approach to siting will be to place two to four sites in the 0.00 - 0.25 mile grid ring, two to four sites in the 0.25 - 0.50 mile grid ring, and two to four sites in the 0.50 - 0.75 mile grid ring – to the Northwest, West, and South or Southwest of Mirant. The actual placement of monitoring/sampling equipment will depend on whether viable sites and willing participants can be identified. Sites are not currently planned due North of the facility since the closest suitable community site is farther than 0.75 miles from the facility. In addition, sites are not planned east of the facility since Mirant and the closest communities are bounded on the east by the Potomac River.

This grid pattern for monitoring/sampling siting was chosen to ensure suitable sites are identified; to attempt to determine if building downwash is occurring and if so, downwash characteristics; and to account for the various meteorological conditions that may occur during monitoring/sampling activities. The final number and location of sites will be dependent on actual site conditions at the time of equipment deployment. Some sites may only collect a subset of the target pollutants.

As part of the site selection process, ATSDR and ERG staff will conduct a pre-site survey. During the pre-site survey, ATSDR and ERG will visit the proposed EI area and meet with Mirant and the City of Alexandria representatives. The team will become familiar with the layout of the city at and near the Mirant plant to identify areas of both high and low exposure potential or impact. This information will be used to determine candidate monitoring site locations and prepare the overall design of the monitoring approach. To aid in the site selection process, 2005/2006 Annual and Springtime Average Wind Roses presenting data from the National Weather Service station located at Reagan National Airport have been prepared (see Figures 3 and 4). Reagan National Airport is located approximately 2 miles to the north of Mirant. These wind rose assessments are considered representative and will be used to establish the typical wind flow patterns for the expected investigation area, and the relationship to sites being considered (see Appendix C, Monitoring and Health and Safety Plan, Section 3.2).

ATSDR will identify candidate participants (i.e., private and/or public sector) located in the proposed study area who may agree to have monitoring equipment located on their properties during the EI monitoring program. ATSDR will inform potential participants of what is generally involved with program participation. After the recruiting efforts have been completed, ATSDR will select participants to host monitoring site locations. ATSDR will secure signed consent forms for each of the host sites.

**Figure 2. Map of Proposed Monitoring Locations**

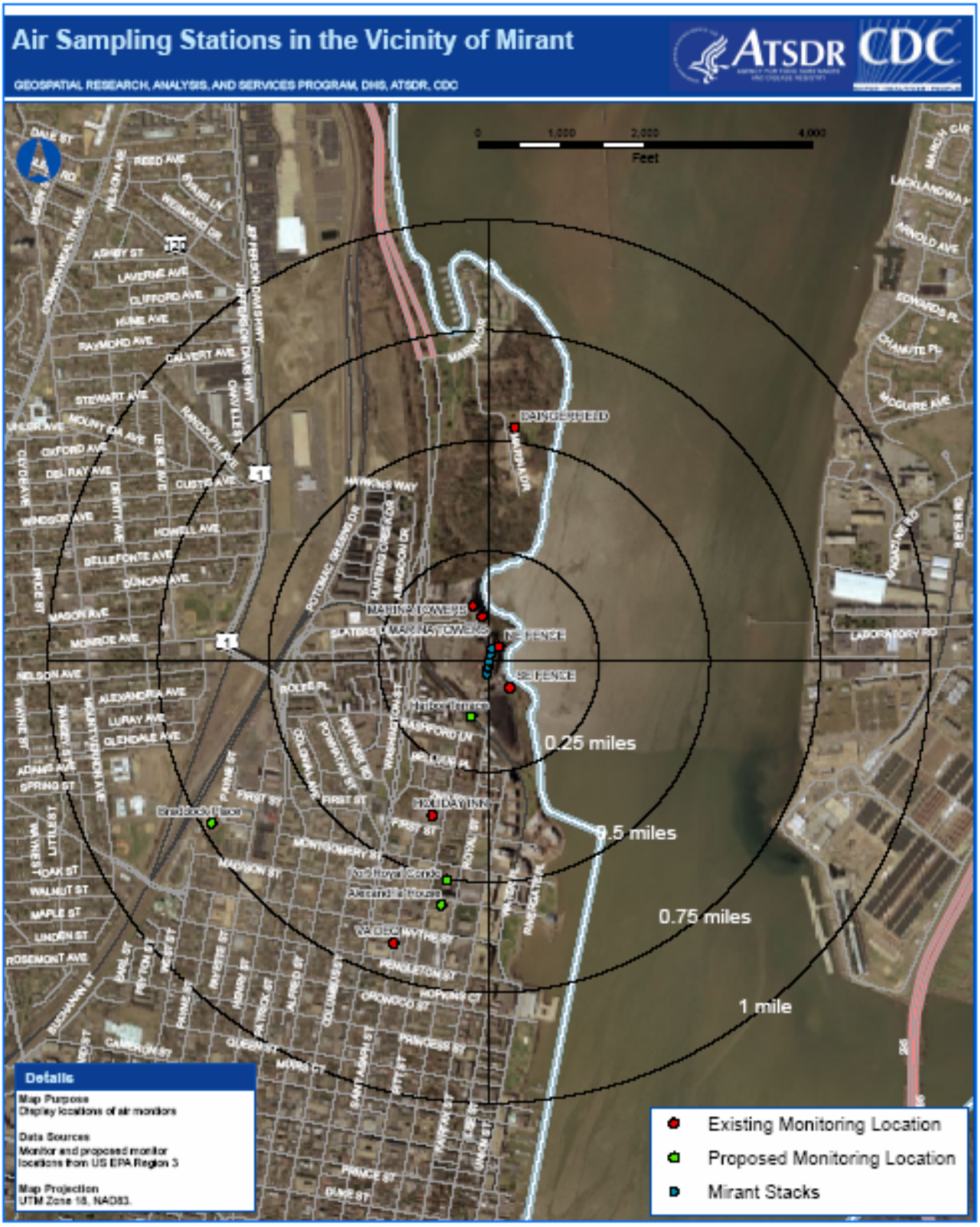


**Figure 3. 2005/2006 Annual Wind Rose for Reagan National Airport**

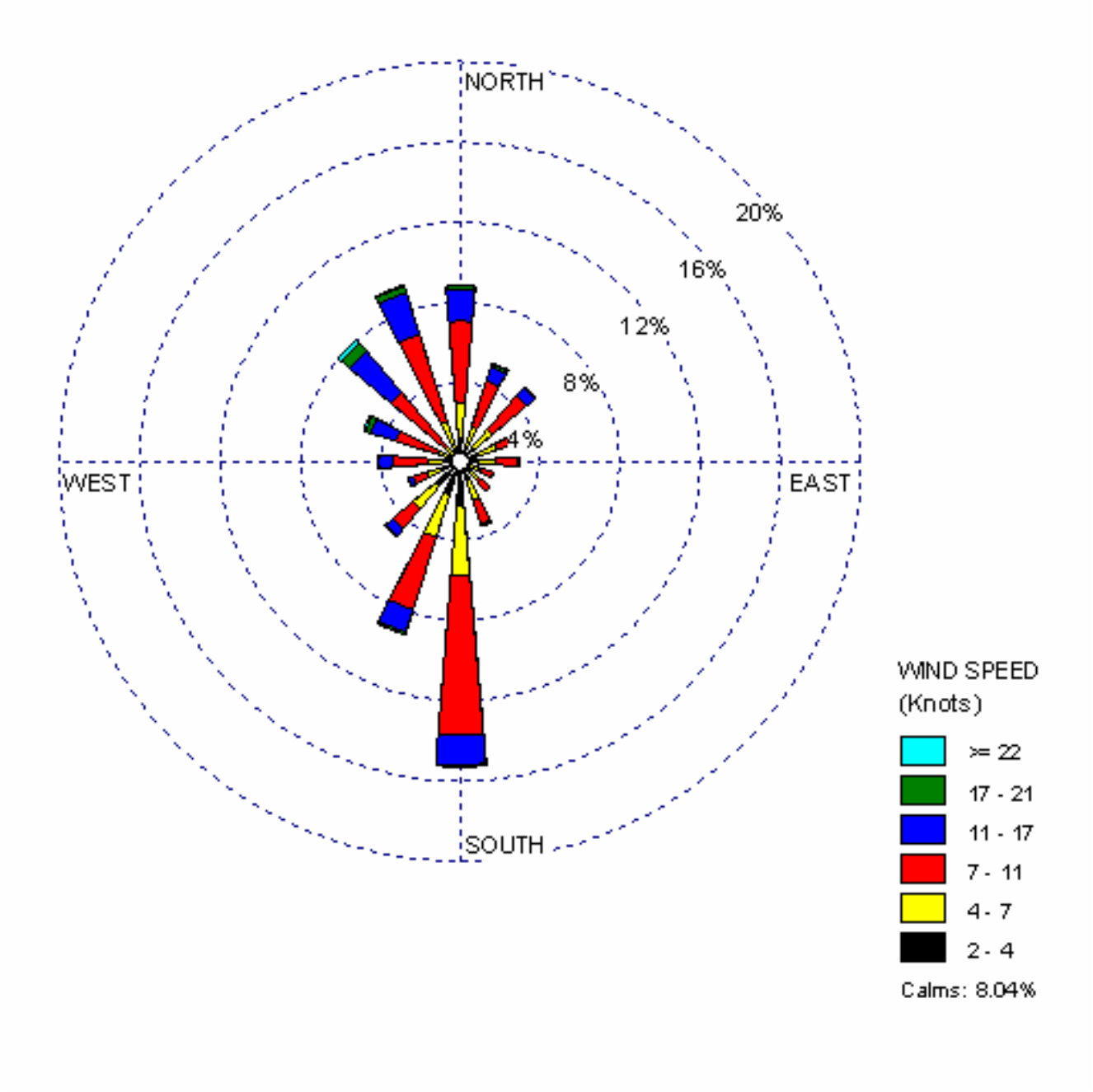
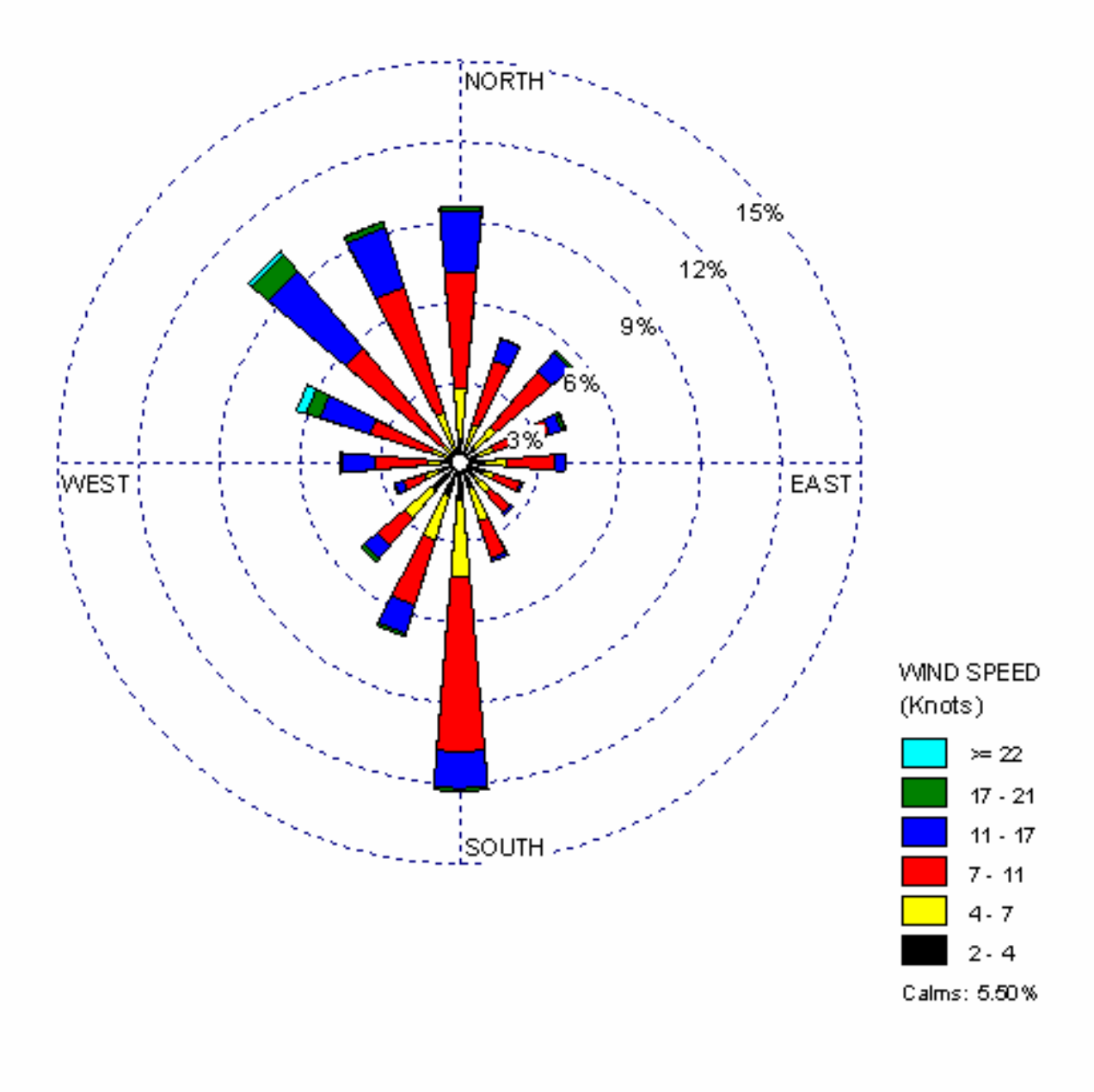


**Figure 4. 2005/2006 Springtime Average (Mar-May) Wind Rose for Reagan National Airport**



## Confidentiality

The only personal identifiers collected during the EI will be adult names and property addresses for correlation with sampling results. Names will be used to ensure a point of contact for reporting results of testing. These personal identifiers will not be included in any data sets produced for the investigation and will not be used for any other purpose.

## Risks/Benefits Information

There are minimal risks associated with this exposure investigation. The primary risks are that property owners/occupants could be slightly inconvenienced during set-up, checks, and demobilization of equipment. To reduce any inconvenience associated with the operation of the EI, field personnel will adhere to predetermined timeframes as agreed by participants to access property. The second risk is that electric power will be required to operate monitoring/sampling equipment. A single 110 power source will be needed for most monitoring/sampling locations. Field personnel will provide all supplies and equipment needed to access electrical power and will ensure all equipment are secured.

The potential benefits for this EI are that participants will learn whether they and/or their children are being exposed to the measured EI target compounds at levels of health concerns. The results of the EI are expected to provide ATSDR or other agencies information to evaluate public health concerns of community members in the areas of Alexandria in the vicinity of the Mirant facility. The results of this EI may also be used to inform decisions by the Mayor of Alexandria, school superintendents, the Virginia Department of Health and the affiliated Alexandria Health Department, the U.S. EPA, the City of Alexandria Transportation and Environmental Services, the Virginia Department of Environmental Quality, and other agencies.

## Informed Consent Procedures

If participants indicate a willingness to allow air monitoring/sampling near or on their property, ATSDR personnel will explain what the exposure investigation will entail, and will obtain written, informed consent [Appendix A]. It will be stressed that participation in the EI is strictly voluntary, and if they choose to participate, participants may withdraw from the investigation at any time without penalty.

## Methods

The methodologies to be followed in this EI are provided in the attached Monitoring and Health and Safety Plan [Appendix C]. Detailed information regarding the EI include monitoring/sampling methods, equipment siting, staging, data collection, monitoring, monitoring schedules, project schedule, data quality objectives, quality assurance and control, and the site health and safety plan. A summary of sample collection methods for sulfur dioxide, $PM_{10}$, $PM_{2.5}$, TSP, metals, and meteorological parameters are given below.

### *Sulfur Dioxide*

Measurements of $SO_2$ will be made using Honeywell SPMs owned by ATSDR. Primary calibration of these instruments is performed at the factory. Two-point internal optical calibration performance checks will be conducted (i.e., initially before deployment, weekly onsite, and again after equipment recovery). Two range setting ChemKeys® will be used as necessary during the program, based on concentrations measured during pre-monitoring and program monitoring activities. The linear detection range for the low range ChemKey® is 5-200 parts per billion by volume (ppbV). However, the instruments will be calibrated from 0-200 ppbV. The linear detection range for the high range ChemKey® is 0.2-6.0 parts per million by volume (ppmV). Ambient air is drawn into the instrument through a length of Teflon tubing (i.e., 0.250 inch outside diameter), outfitted with an inverted glass funnel connected at the inlet end. Electronic signals from the $SO_2$ systems will be collected and stored using HOBO Micro Station® DASs with 4-20 mA adapters and BoxCar® Pro 4.3 software. Each DAS is capable of collecting four channels of amperage input simultaneously, and offers internal storage for 1 million data points per system.

As an element of the EI quality assurance and control (QA/QC) program, ATSDR and ERG staff will conduct a pre-monitoring $SO_2$ survey. The purpose of this survey will be to establish the level of $SO_2$ present in the anticipated EI monitoring area prior to the actual start of the monitoring program. The data obtained will be used to ensure that the instruments are properly configured (i.e., have the correct range key and collection tape material) for the $SO_2$ concentration level expected during the EI.

ATSDR and ERG will set up and operate ATSDR $SO_2$ single-point monitors (SPMs) at two sites in the investigation area. One site will be located within the 0.00 - 0.25 mile grid ring (see Figure 2), and the other site will be located within the 0.25 - 0.50 mile grid ring. The systems will measure $SO_2$ concentrations in the outside ambient air for 3-5 days. If possible, two additional systems will be set-up to simultaneously measure the concentration of $SO_2$ indoors at the same locations over the same duration.

### *Particulate Matter*

Measurements of continuous $PM_{10}$ and $PM_{2.5}$ particulate will be made using Met One Instruments EBAM real-time beta attenuation monitors. The EBAMs are portable self-contained units that meet or exceed all EPA requirements for automated particulate measurement. The measurement range for these units is 0-10 $mg/m^3$. These units will provide measurement data on an hourly basis. Data is stored automatically to a unit specific internal DAS. The monitors used to measure $PM_{2.5}$ will incorporate a $PM_{10}$ pre-cutter inlet followed by a Sharp Cut $PM_{2.5}$ cyclone. The monitors used to measure $PM_{10}$ will incorporate a $PM_{10}$ pre-cutter inlet only.

### *Meteorological Parameters*

Measurements of meteorological parameters will be made using two stand alone meteorological monitoring systems, attached to secured tripods or mast assemblies. Each system incorporates a cup anemometer to measure wind speed, a directional mast and vane to measure wind direction,

a wound bobbin assembly to measure relative humidity, and a thermistor temperature probe to measure ambient temperature. Measurements will be made at a height of approximately 10-12 feet above grade or roof top level (site dependent). Electronic signals from the meteorological monitoring systems will be collected and stored using HOBO Micro Station DASs and BoxCar® Pro 4.3 software. Each DAS is capable of collecting four channels of input signal simultaneously, and offers internal storage for 1 million data points per system.

***Total Suspended Particulate***

Samples for determining mass gain of TSP by gravimetric analysis will be made in accordance with EPA Method IO-2.1. Method IO-2.1 employs high volume samplers to volumetrically collect representative aliquots of suspended particulate matter with an aerodynamic particle size above 0.01µm. Five-point flow rate calibration curves will be compiled for each sampler at the ERG lab prior to deployment. Single-point flow rate checks will be made in the field, prior to and after each collection event. All TSP filters will present a unique filter identification number. Each filter will be equilibrated and weighed prior to transport to the field (i.e., pre-sampling), and then equilibrated and re-weighted when received at the ERG laboratory after each collection event (post-sampling). The mass gain is determined by subtracting the pre-sampling weight from the post-sampling weight.

***Metals***

Determination of the concentration of toxic metals will be performed on the TSP filter samples after gravimetric analysis has been completed. Analyses for toxics metals will be made in accordance with EPA Method IO-3.5, as described in the "*Technical Assistance Document for the National Ambient Air Toxics Trends and Assessment Program*". ERG is National Environmental Laboratory Accreditation (NELAC) Program accredited laboratory, and is NELAC certified to perform this analysis. Target metals for this EI, and their associated method detection limit (MDL), are presented in Table 2.

**Table 2. Target Metals and Associated MDLs**

| Target Metal | MDL (ng/filter) |
|---|---|
| Antimony | 20.0 |
| Arsenic | 17.9 |
| Beryllium | 40.0 |
| Cadmium | 16.9 |
| Chromium | 284 |
| Cobalt | 19.9 |
| Lead | 36.2 |
| Manganese | 31.2 |
| Mercury | 18.6 |
| Nickel | 176.0 |
| Selenium | 35.9 |

EPA Compendium Method IO-3.5 provides the procedures for the multi-element determination of trace elements by ICP/MS. Ambient air is pulled through filter media using a high volume sampler. Particulate phase sample is collected on the filter, and the filter is digested yielding the sample material in solution. Sample material in solution is introduced by pneumatic nebulization into a radio frequency plasma where energy transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially pumped vacuum interface and separated on the basis of their mass-to-charge ratio by a quadrupole mass spectrometer having a minimum resolution capability of 1 amu peak width at 5% peak height. The ions transmitted through the quadrupole are registered by a continuous dynode electron multiplier, and the ion information is processed by a data handling system.

**Data Quality Objectives**

The project Data Quality Objectives (DQOs) provide the answer to the critical question of how good data must be in order to achieve the project goals. DQOs are used to develop the criteria that a data collection design should satisfy including where to conduct monitoring, when to conduct monitoring, measurement frequency, and acceptable measurement precision and

accuracy. Considering the targeted compounds, information obtained during the site selection survey, and specifications associated with the monitoring and sample collection systems that will be utilized, DQOs for this EI are presented in Table 3.

**Table 3. Data Quality Objectives**

| Element | Objective |
|---|---|
| Where to Conduct Monitoring | All sites must be located in close proximity to the potentially impacted populous, in accordance with the grid ring approach presented in the Criteria for Choosing the Target Area section. |
| When to Conduct Monitoring | Daily – from 0000 to 2359 hours |
| Frequency of Monitoring | Continuous for $SO_2$, $PM_{10}$, $PM_{2.5}$, and meteorological parameters so that short duration excursions can be assessed, and hourly and daily average concentration can be calculated. TSP and metals samples will be collected on an every-other-day schedule. |
| Overall Completeness | 80 % data capture |
| Acceptable Measurement Precision for SPMs | +/- 20 % relative standard deviation (RSD) |
| Acceptable Measurement Accuracy for SPMs | +/- 15 % RSD |
| Acceptable Measurement Precision for metals | +/- 20 % RSD |
| Acceptable Measurement Accuracy for metals | +/- 25 % RSD |

## Reporting of Results

### *Reporting Results to Participants*

ATSDR will evaluate the results of this EI for health significance. Upon completion of the investigation ATSDR will send a copy of the EI report to each exposure investigation participant.

### *Final Report*

At the conclusion of this investigation, ATSDR will prepare a written summary in the form of an exposure investigation along with an overall public health interpretation. If contaminants are found at levels of health concern, appropriate local, state, and/or federal environmental and health agencies will be notified**.** The report will be available to community residents, the City of Alexandria Mayor, the Alexandria Health Department, the City of Alexandria Transportation and Environmental Services, Mirant Potomac River, LLC, the VA Department of Health, the U.S. EPA, and other federal, state, and local environmental and public health agencies. Depending on the findings, recommendations for follow-up activities may include, but are not limited to, additional monitoring/sampling, modeling, educating community members on mitigating exposures, and/or further study.

**Limitations of Exposure Investigation**

This EI has two main limitations. The first is that the EI will only capture ambient and a few selected indoor air quality locations during a four-six week period. This time frame may not be long enough to fully evaluate characteristic exposures to community members/residents. However, by choosing four weeks in June-July as the monitoring period, the EI will collect data during what is expected to be the worst case scenario and will allow ATSDR to measure ambient air when the Mirant facility will be expected to operate at or near full generating capacity..

The second limitation of the EI is that only a few of the numerous potential contaminants will be measured. All efforts in this EI have been made to measure those contaminants considered most likely to be of health concerns based on information provided by community members, public health and environmental representatives, and currently available information from the Mirant facility.

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Bureau of the Census. Census 2000 Demographic Profile Highlights for Alexandria, VA. Washington: US Department of Commerce. Available from: URL: http://factfinder.census.gov/servlet/SAFFFacts?_event=ChangeGeoContext&geo_id=05000US51510&_geoContext=01000US%7C04000US17%7C16000US1708186&_street=&_county=Alexandria&_cityTown=Alexandria&_state=04000US51&_zip=&_lang=en&_sse=on&ActiveGeoDiv=geoSelect&_useEV=

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**Attachments**

Appendix A: Consent Form

Appendix B: U.S. Census Bureau

Appendix C: Monitoring and Health and Safety Plan

## Appendix A: Consent Form

# Consent for Environmental Testing

## Alexandria, Virginia

We are from the Agency for Toxic Substances and Disease Registry (ATSDR). We would like to invite you to be part of an Exposure Investigation to learn what levels of sulfur dioxide ($SO_2$) and particulate matter (PM) may be present in outdoor, and in some cases, indoor air in your community. We have asked you to help in this investigation because your home/school/property or business is located in areas in Bridgeport that may have high levels of the chemicals we want to measure. We want to test the outside, and in some cases, indoor air of several areas in your city for 4 weeks.

**Procedure**
We will place air measuring equipment, about the size of a briefcase, on your property. The air equipment will be on your property for 4 to 8 weeks. We will set-up the air monitoring equipment. It will take a few hours to set-up. Some of the equipment contains a small pump that draws in air for measuring. The pump sounds like a fish tank air pump. We will need to plug the equipment into one or two of your electric outlets.

Once a day, we will schedule a time to visit your home to check that the air monitors are working properly. These visits will be scheduled at a time that is good for you. These checks will take about 30 minutes. We will give you a phone number to call if the air monitors stop working properly or if you want us to take them away.

**Benefits**
Being part of this project will benefit you because you will find out if any of the chemicals we measure are in the outdoor, and in some cases, indoor air near your home or property. Also, by being part of this project you will also help your community find out if any of the chemicals we measure are in the outdoor, and in some cases, indoor air in your community.

**Risks**
You may be bothered by the air monitors on your property. You may also be bothered by our contractor checking the equipment. We will arrange a time with you for us to be on your property so that we bother you as little as possible. You may also have a small increase in your electric bill since we will need to use your power outlets.

**Participation**
You are free to choose whether or not to be part of this project. If you agree to help us, you may change your mind any time and drop out of the project. If you do this nothing will happen to you. You must sign this form to be part of the project.

**Results**
We expect to mail you the results of the air test within nine to twelve months of when we remove the air measuring equipment.

**Confidentiality**
We will protect your privacy as much as the law allows. The reports we write about this project will group all of the results together. We will not use your name or address in any of our reports. Still we are only including a small number of people in this project and it might be possible for someone to know that you were part of this. We will keep the forms with your personal information in a locked cabinet at ATSDR. We may share the results of the project with other federal, state, or local government agencies. They will also protect your information in the same way.

**Contacts**
If you have any more questions, you may contact Debra Gable or David Fowler at ATSDR toll-free at 1 (888) 422-8737.

**Consent**

This exposure investigation has been explained to me. My questions have been answered. I agree of my own free will to allow the air monitoring described in this paper.

I, (print) _____, agree to have air monitoring on my property.

Signature: _____ Date: _____

Address: _____
Street

_____
City State Zip Code

Phone #: _____

Witness: _____
(signature)

## Appendix B: U.S. Census Bureau
## Alexandria, VA

United States | Virginia | **Alexandria city**

## Alexandria city, Virginia

street address search tips

city or town state ZIP code GO

clear « back

United States | Virginia | **Alexandria city**

## Alexandria city, Virginia

GO

View a Fact Sheet for a **race, ethnic, or ancestry group**

Reference Map

**Census 2000 Demographic Profile Highlights:**

| **General Characteristics - show more >>** | **Number** | **Percent** | **U.S.** | | |
|---|---|---|---|---|---|
| Total population | 128,283 | | | map | brief |
| Male | 61,974 | 48.3 | 49.1% | map | brief |
| Female | 66,309 | 51.7 | 50.9% | map | brief |
| Median age (years) | 34.4 | (X) | 35.3 | map | brief |
| Under 5 years | 7,962 | 6.2 | 6.8% | map | |
| 18 years and over | 106,746 | 83.2 | 74.3% | | |
| 65 years and over | 11,605 | 9.0 | 12.4% | map | brief |
| One race | 122,800 | 95.7 | 97.6% | | |
| White | 76,702 | 59.8 | 75.1% | map | brief |
| Black or African American | 28,915 | 22.5 | 12.3% | map | brief |
| American Indian and Alaska Native | 355 | 0.3 | 0.9% | map | brief |
| Asian | 7,249 | 5.7 | 3.6% | map | brief |
| Native Hawaiian and Other Pacific Islander | 112 | 0.1 | 0.1% | map | brief |
| Some other race | 9,467 | 7.4 | 5.5% | map | |
| Two or more races | 5,483 | 4.3 | 2.4% | map | brief |
| Hispanic or Latino (of any race) | 18,882 | 14.7 | 12.5% | map | brief |
| Household population | 126,382 | 98.5 | 97.2% | map | brief |
| Group quarters population | 1,901 | 1.5 | 2.8% | map | |
| Average household size | 2.04 | (X) | 2.59 | map | brief |
| Average family size | 2.87 | (X) | 3.14 | map | |
| Total housing units | 64,251 | | | map | |
| Occupied housing units | 61,889 | 96.3 | 91.0% | | brief |
| Owner-occupied housing units | 24,745 | 40.0 | 66.2% | map | |
| Renter-occupied housing units | 37,144 | 60.0 | 33.8% | map | brief |

| | | | | | |
|---|---|---|---|---|---|
| Vacant housing units | 2,362 | 3.7 | 9.0% | map | |

| **Social Characteristics - show more >>** | **Number** | **Percent** | **U.S.** | | |
|---|---|---|---|---|---|
| Population 25 years and over | 95,730 | | | | |
| High school graduate or higher | 83,133 | 86.8 | 80.4% | map | brief |
| Bachelor's degree or higher | 51,982 | 54.3 | 24.4% | map | |
| Civilian veterans (civilian population 18 years and over) | 11,828 | 11.3 | 12.7% | map | brief |
| Disability status (population 5 years and over) | 17,559 | 15.0 | 19.3% | map | brief |
| Foreign born | 32,600 | 25.4 | 11.1% | map | brief |
| Male, Now married, except separated (population 15 years and over) | 23,861 | 45.4 | 56.7% | | brief |
| Female, Now married, except separated (population 15 years and over) | 23,378 | 41.0 | 52.1% | | brief |
| Speak a language other than English at home (population 5 years and over) | 36,038 | 30.0 | 17.9% | map | brief |

| **Economic Characteristics - show more >>** | **Number** | **Percent** | **U.S.** | | |
|---|---|---|---|---|---|
| In labor force (population 16 years and over) | 80,949 | 74.4 | 63.9% | | brief |
| Mean travel time to work in minutes (workers 16 years and over) | 29.7 | (X) | 25.5 | map | brief |
| Median household income in 1999 (dollars) | 56,054 | (X) | 41,994 | map | |
| Median family income in 1999 (dollars) | 67,023 | (X) | 50,046 | map | |
| Per capita income in 1999 (dollars) | 37,645 | (X) | 21,587 | map | |
| Families below poverty level | 1,921 | 6.8 | 9.2% | map | brief |
| Individuals below poverty level | 11,279 | 8.9 | 12.4% | map | |

| **Housing Characteristics - show more >>** | **Number** | **Percent** | **U.S.** | | |
|---|---|---|---|---|---|
| Single-family owner-occupied homes | 16,836 | | | | brief |
| Median value (dollars) | 252,800 | (X) | 119,600 | map | brief |
| Median of selected monthly owner costs | (X) | (X) | | | brief |
| With a mortgage (dollars) | 1,772 | (X) | 1,088 | map | |
| Not mortgaged (dollars) | 433 | (X) | 295 | | |

(X) Not applicable.
Source: U.S. Census Bureau, Summary File 1 (SF 1) and Summary File 3 (SF 3)

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## Appendix C: Monitoring Protocol Health and Safety Plan

# Exposure Investigation

## Monitoring and Health and Safety Plan

**Mirant Potomac River Power Generation Plant**
**Alexandria, VA**

**Contract No. GS-10F-0036K**
**Order No. 200-2005-F-13562**

Prepared by:

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Mr. Dave Dayton
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May 2007

APPROVED BY

Ms. Debra Gable
Exposure Investigation Manager
Technical Monitor
Agency for Toxic Substances
and Disease Registry _____

Mr. Dave Dayton
Mr. Scott Sholar _____
Co-Project Directors
Eastern Research Group, Inc. _____

DISTRIBUTION LIST

Copies of this plan and all revisions will be provided to the following individuals:

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Lexington, MA 02421

## TABLE OF CONTENTS

## TABLE OF CONTENTS

## LIST OF TABLES AND FIGURES

## ACRONYMS

| Acronym | Definition |
|---|---|
| ATSDR | Agency for Toxic Substances and Disease Registry |
| CMSA | Consolidated Metropolitan Statistical Area |
| DAS | Data Acquisition System |
| DOE | Department of Energy |
| DQOs | Data Quality Objectives |
| EBAM | Beta Attenuation Monitor |
| EI | Exposure Investigation |
| ERG | Eastern Research Group, Inc. |
| F | Fahrenheit |
| FAA | Federal Aviation Administration |
| GPS | Global Positioning System |
| HASP | Health and Safety Plan |
| HAZWOPER | Hazard Waste Operations |
| MDL | Method Detection Limit |
| $mg/m^3$ | Milligrams per cubic meter |
| NAAQS | National Ambient Air Quality Standards |
| NELAC | National Environmental Laboratory Accreditation |
| $NO_x$ | Oxides of Nitrogen |
| OSHA | Occupational Health and Safety Administration |
| ppbV | Parts per billion by volume |
| PPE | Personal Protective Equipment |
| $PM^{10}$ | Particulate Matter ≤ 2.5 micron |
| $PM^{2.5}$ | Particulate Matter ≤ 10.0 micron |
| ppmV | Parts per million by volume |

## ACRONYMS (Continued)

| Acronym | Definition |
|---|---|
| QA | Quality Assurance |
| QC | Quality Control |
| RSD | Relative Standard Deviation |
| $SO_2$ | Sulfur Dioxide |
| SOP | Standard Operating Procedures |
| SPM | Single Point Monitor |
| U.S. EPA | United States Environmental Protection Agency |

# A – EXPOSURE INVESTIGATION OVERVIEW

## SECTION 1
## PROBLEM DESCRIPTION

### 1.1 Background

The Mirant Potomac River Power Generation (Mirant) plant is located on 26 acres within the city limits of Alexandria, Virginia. Mirant operates five coal-fired boilers and electric generators. Each has its own emissions stack. The plant is located on the flight path for Reagan National Airport. Accordingly, the emissions stacks are very short, as required by the Federal Aviation Administration (FFA), compared to the stack height that would typically be required as an operating permit specification for a facility of this type. The facility, completed in 1955, operated continuously until it was voluntarily shut down on August 24, 2005. This voluntary shutdown was based on down wash dispersion modeling data that indicated that there was a great potential for exceeding the National Ambient Air Quality Standards (NAAQS) for oxides of nitrogen ($NO_X$), sulfur dioxide ($SO_2$), and fine particulate matter. However, on September 21, 2005, at the request of the Department of Energy (DOE) under the War Powers Act, Mirant re-opened and began operating on a limited basis to provide electricity as needed to feed the New Jersey-Pennsylvania power grid.

Alexandria is a medium-sized city located in northern Virginia along the Potomac River. It is part of the Washington, D.C., consolidated metropolitan statistical area (CMSA). According to the 2004 United States census, approximately 137,000 people live within the greater Alexandria area, which encompasses approximately 15 square miles.

### 1.2 Problem Definition

The Alexandria Department of Health requested that the Agency for Toxic Substances and Disease Registry (ATSDR) review emerging information about Mirant plant emissions and possible negative health impacts to people living and working in the community. ATSDR reviewed available modeling data and emissions data, and performed its own dispersion modeling. Based on an initial review of modeling data, ATSDR has determined the need to

conduct an exposure investigation (EI) in Alexandria to further assess air quality. Contaminants of potential concern include $SO_2$, particulate matter (total suspended, inhalable, and respirable), and toxic metals.

### 1.3 Project Objectives

The objectives of the ATSDR EI to be conducted in Alexandria, Virginia, are as follows:

- To obtain sufficient information to calibrate the different air models run to date.
- To obtain data to determine the indoor-to-outdoor ratios of contaminants of interest (where possible).
- To determine whether the highest human impact areas are being adequately captured by existing monitoring networks (e.g., those installed by the city of Alexandria and Mirant).

To meet these objectives, an air monitoring program will be conducted to obtain representative ambient and selected indoor air measurements data for:

- $SO_2$ concentrations
- Toxic metals concentrations
- Total suspended particulate (TSP) mass
- Particulate matter ≤10 micron ($PM^{10}$) mass
- Particulate matter ≤2.5 micron ($PM^{2.5}$) mass
- Meteorological parameters

This exposure investigation will be conducted by ATSDR. The monitoring program of the exposure investigation will be operated primarily by Eastern Research Group, Inc. (ERG) under the guidance of ATSDR.

The components that will be measured during the EI were selected because they present a high potential to be emitted from the Mirant Plant.

# SECTION 2
# PROJECT ORGANIZATION

## 2.1 Agency for Toxic Substances and Disease Registry

The EI Manager and Technical Monitor for this project will be Ms. Debra Gable. In the capacity of EI Manager, Ms. Gable will serve as the primary interface between ATSDR and ERG. She will be responsible for providing direction on the overall goals and approaches of the EI to ensure that the objectives of the monitoring project are met. Ms. Gable will review and provide comments on the Exposure Investigation Monitoring and Health and Safety Plan, progress reports, and the Draft and Final EI Monitoring Reports. She will also be the primary contact with other interested agencies (i.e., federal, state, and local) and be responsible for obtaining consent agreements from potential program participants identified. In the capacity of Technical Monitor, Ms. Gable will be responsible for overseeing overall coordination and logistics of the program, and serve as a technical advisor. Ms. Gable will also serve as a Field Scientist.

## 2.2 Eastern Research Group, Inc.

The Project Co-directors for this EI will be Mr. Dave Dayton and Mr. Scott Sholar. They will report directly to the ATSDR EI Manager. In the capacity of Project Co-Directors, Mr. Dayton and Mr. Sholar will be responsible for the overall quality of the work conducted by ERG. They will oversee all activities associated with the monitoring project, from planning through reporting.

As well as managing the monitoring project, Mr. Dayton and Mr. Sholar will also serve as Field Scientists. In this capacity, they will secure equipment, perform the pre-deployment check out of the measurement and sample collection systems, deploy those systems, perform daily site visits, perform the sample collections, perform data downloading, and conduct the equipment recovery efforts.

Ms. Donna Tedder will serve as the Analytical Task Leader. In this capacity she will oversee the analysis of project samples for TSP mass and toxic metals at the ERG laboratory,

and be a point of contact for the field staff.

# SECTION 3
# PROJECT DESCRIPTION

## 3.1 Siting

Siting will be the joint responsibility of ATSDR and ERG. It is anticipated that the program will include a network of monitoring/sampling locations staged in a grid pattern. The network is expected to consist of as few as six, or as many as eleven, monitoring/sampling locations (sites). Figure 2 presents a map of areas near the Mirant plant laid out in 0.25 mile grid rings. The technical approach to siting will be to place two to four sites in the 0.00 - 0.25 mile grid ring, two to four sites in the 0.25 - 0.50 mile grid ring, and two to four sites in the 0.50 - 0.75 mile grid ring – to the Northwest, West, and South or Southwest of Mirant. The actual placement of monitoring/sampling equipment will depend on whether viable sites and willing participants can be identified. Sites are not currently planned due North of the facility since the closest suitable community site is farther than 0.75 miles from the facility. In addition, sites are not planned east of the facility since Mirant and the closest communities are bounded on the east by the Potomac River.

This grid pattern for monitoring/sampling siting was chosen to ensure suitable sites are identified; to attempt to determine if building downwash is occurring and if so, downwash characteristics; and to account for the various meteorological conditions that may occur during monitoring/sampling activities. The final number and location of sites will be dependent on actual site conditions at the time of equipment deployment. Some sites may only collect a subset of the target pollutants. See additional siting strategies described in Section 3.2.

ATSDR will identify candidate participants (i.e., private and/or public sector) located in the proposed investigation area who may agree to have monitoring equipment located on their properties during the EI monitoring program. ATSDR will inform potential participants of what is generally involved with program participation. After the recruiting efforts have been completed, ATSDR and ERG will select participants to host monitoring site locations. ATSDR will secure signed consent forms for each of the host sites. ATSDR will not release any vital information pertaining to the participants, except to government agencies, and then only with

prior consent from each participant. After the sites have been selected, and participation consent has been obtained, ERG will contact the participants directly to schedule site events (i.e., deployment, operation, and recovery).

ERG will locate a mobile laboratory at one of the selected sites to serve as a field base of operations and central support for the program. The ERG mobile laboratory is spacious and has appropriate power circuitry to accommodate monitoring requirements. The ERG mobile laboratory will house $SO_2$ measurement systems and one of the systems used to collect meteorological parameters data. The laboratory will also provide a place to store ancillary equipment and supplies, and facilitate equipment repair if required.

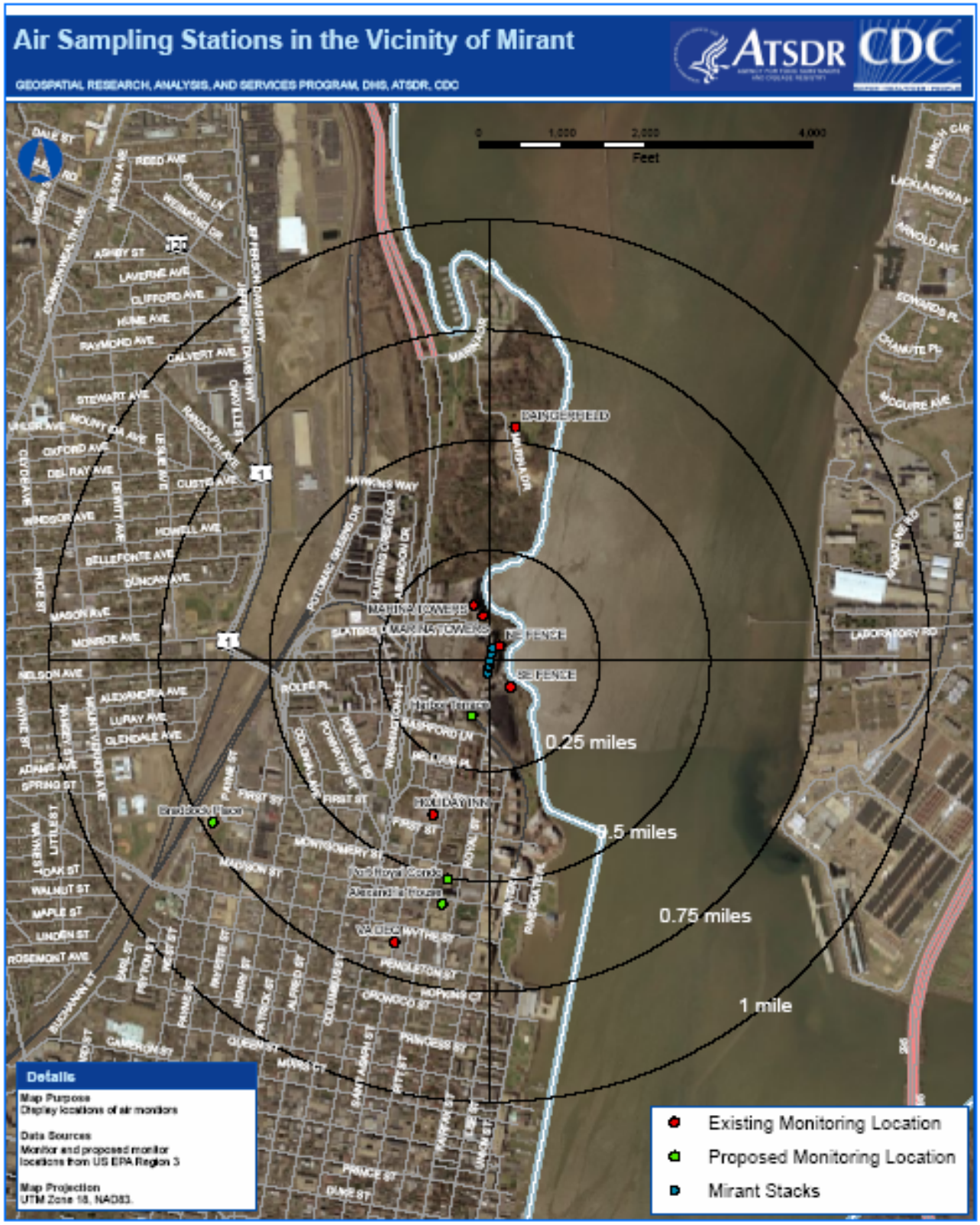


**Figure 1. Grid ring map of Alexandria in 0.25 mile increments.**

It must be noted that ERG will not assume any liability for damages or injuries resulting from locating/operating the ambient air monitoring equipment that will be used during the monitoring program. Should liabilities be encountered they will be project/contract borne.

### 3.2 Pre-Site Survey

As part of the site selection process, ATSDR and ERG staff will conduct a pre-site survey. During the pre-site survey, ATSDR and ERG will visit the proposed EI area and meet with Mirant and the City of Alexandria representatives. The team will become familiar with the layout of the city at and near the Mirant plant to identify areas of both high and low exposure potential or impact. This information will be used to determine candidate monitoring site locations and prepare the overall design of the monitoring approach. To aid in the site selection process, 2005/2006 Annual and Springtime Average Wind Roses presenting data from the National Weather Service station located at Reagan National Airport have been prepared. Reagan National Airport is located approximately 2 miles to the north of Mirant. These wind rose assessments are considered representative and will be used to establish the typical wind flow patterns for the expected investigation area, and the relationship to sites being considered. The 2005/2006 Annual Average Wind Rose (i.e., March - May) is presented in Figure 2. The 2005/2006 Springtime Average Wind Rose (i.e., March - May) is presented in Figure 3.

After the pre-site survey is completed, ATSDR and ERG will visit each of the selected monitoring site locations. Site locations will be documented by longitude and latitude using a hand-held global positioning system (GPS). ATSDR and ERG will determine all site specific needs associated with installing and operating the monitoring systems (i.e., access, ability to utilize sampling probes, adequate power, internal/external physical constraints, compatibility with the specifications of the equipment to be deployed, special materials needed) prior to deployment, or identify problems that may preclude use of a selected site. If, needed, ERG will also arrange for the power drop to be installed to supply the ERG mobile laboratory.

### 3.3 Pre-Monitoring Survey

As an element of the EI quality assurance and control (QA/QC) program, ATSDR and ERG staff will conduct a pre-monitoring $SO_2$ survey. The purpose of this survey will be to

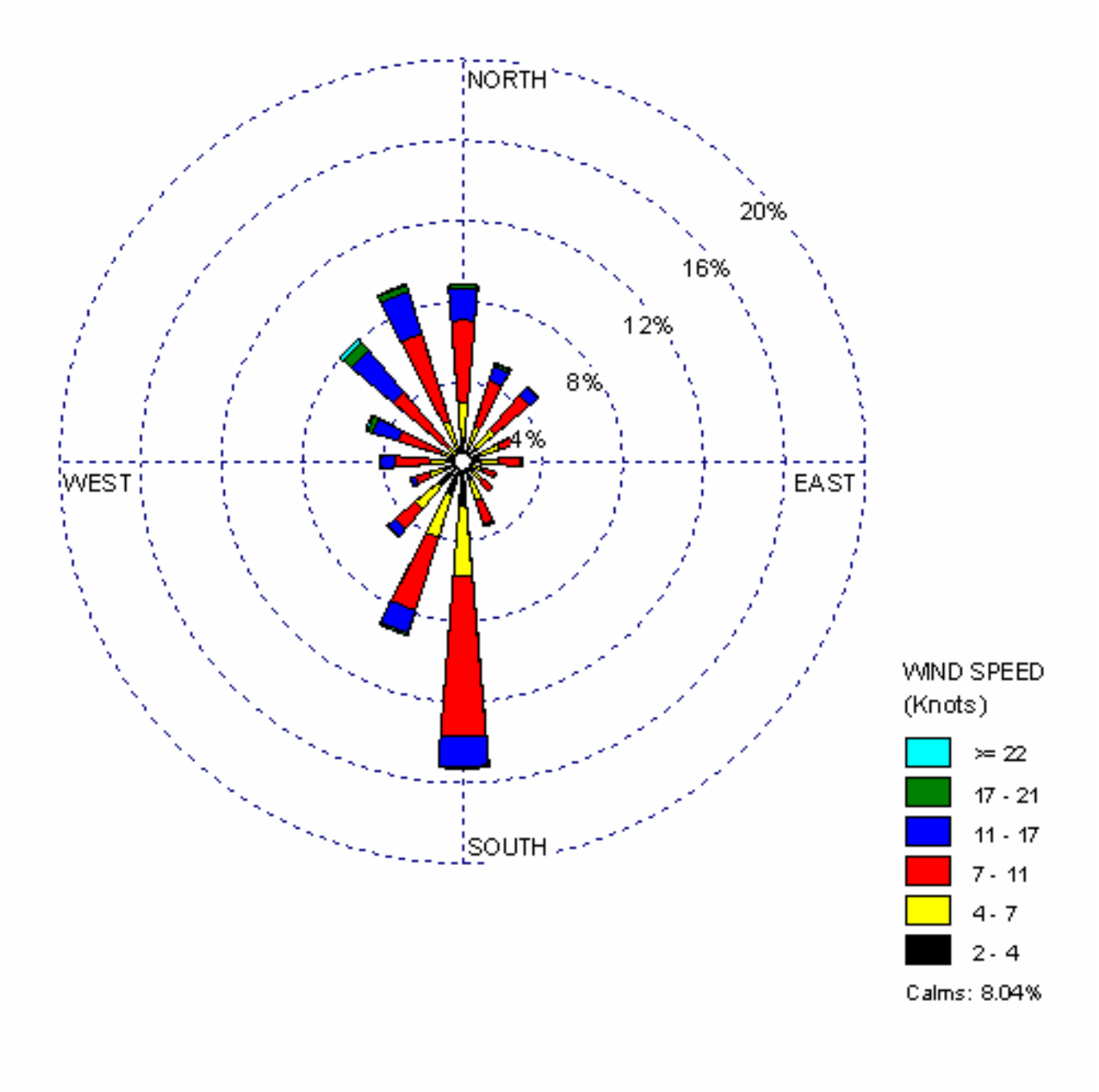


**Figure 2. 2005/2006 Annual Wind Rose for Reagan National Airport**

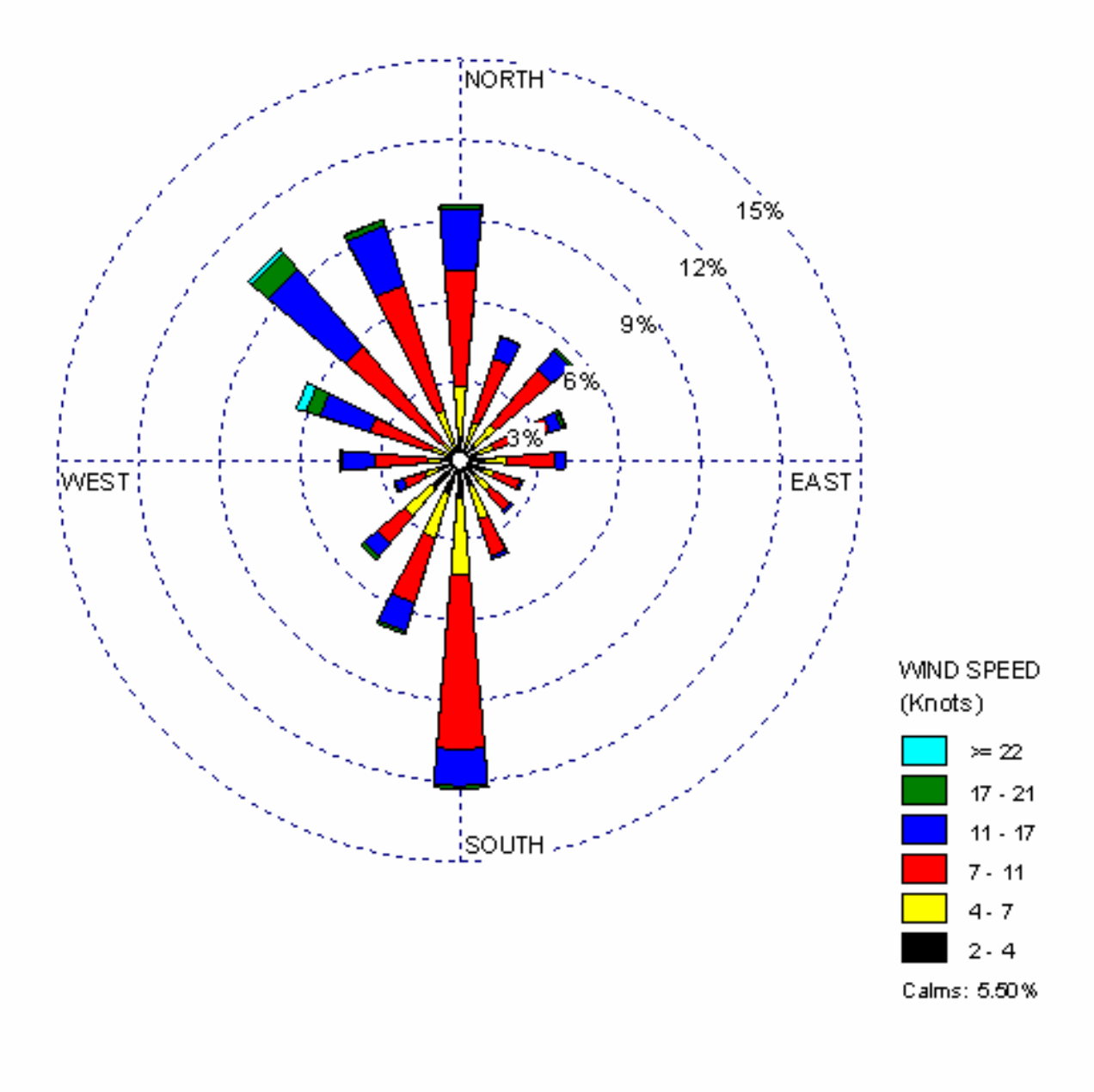


**Figure 3. 2005/2006 Springtime Average (Mar-May)**
**Wind Rose for Reagan National Airport**

establish the level of $SO_2$ present in the anticipated EI monitoring area prior to the actual start of the four-six week monitoring program. The data obtained will be used to ensure that the instruments are properly configured (i.e., have the correct range key and collection tape material) for the $SO_2$ concentration level expected during the EI.

ATSDR and ERG will set up and operate ATSDR $SO_2$ single-point monitors (SPMs) at two sites in the investigation area during the pre-monitoring $SO_2$ survey. One site will be located within the 0.00 - 0.25 mile grid ring (see Figure 1), and the other site will be located within the 0.25 - 0.50 mile grid ring. The systems will measure $SO_2$ concentrations in the outside ambient air for 3-5 days. If possible, two additional systems will be set-up to simultaneously measure the concentration of $SO_2$ indoors at the same locations over the same duration.

### 3.4 Staging

Continuous measurement systems for this project will be provided by ATSDR. These systems for the four-six week monitoring program will include 13 SPMs for $SO_2$, three beta attenuation monitors (EBAM) for respirable particulate matter ≤2.5 micron ($PM^{2.5}$), one EBAM for particulate matter ≤10.0 micron ($PM^{10}$), two meteorological monitoring systems, and 10 data acquisition systems (DAS). All of the systems/equipment supplied by ATSDR are resident at, or will be shipped to, ERG's laboratory facility in Research Triangle Park, North Carolina. The systems/equipment will be set up and rigorously checked to insure that all equipment is functioning correctly prior to field deployment. For the SPMs ERG will perform pre-deployment calibration and mid-point QC checks to qualify precision and accuracy before the systems are deployed. Each site specific DAS will be set up, configured, and tested.

ERG will provide all equipment required to collect time-integrated 24-hour Total Suspended Particulate (TSP) samples for gravimetric determination of mass and analysis for metals. All of the high volume collection systems used to collect TSP samples will be calibrated prior to deployment.

ERG will obtain all required ancillary equipment/hardware/parts that will be utilized for this EI. ERG will obtain all required compressed gas standards as required. ERG will design and

fabricate any specialty hardware needed to support effective deployment and/or operation of the systems in the field. When all design, fabrication, and checkout activities are completed, ERG will pack the equipment for transport to the investigation area.

### 3.5 Deployment

ERG will transport the equipment and the ERG mobile laboratory to the investigation area and site locations. ERG will place the mobile laboratory at the appointed location and facilitate connection to electrical power. ERG will set up each of the chemical and mass measurement systems, mass/metals sample collection systems, and meteorological measurement systems in accordance with the site specific approaches developed during the pre-site survey. Once the equipment is set up ERG will test each system to ensure that no damage occurred during transport. When the continuous chemical and mass measurement systems are determined to be operating correctly, they will be brought on-line. ERG will test the meteorological monitoring system and perform a QC check of the wind speed sensor (using a constant speed motor), and the temperature sensor (using a traceable temperature measurement device) in the laboratory prior to transport to the field. ERG will position each wind direction sensor in the field using a digital compass. When the meteorological monitoring systems are considered to be operating correctly, they will be brought on-line. ATSDR will approve the field set-ups.

### 3.6 Monitoring

From the point that the continuous measurements and sample collection systems are brought on-line, monitoring will be conducted continuously for duration of not less than 4-weeks, but not more than 6-weeks. The actual final duration will be determined on-going based on the weekly measurement data obtained.

ATSDR and ERG will have at least one staff member (Field Scientist) resident in the investigation area throughout the monitoring program. The Field Scientist will visit the sites daily to assess the functional status of the chemical, mass, and meteorological measurement equipment and correct any problems identified. For the $SO_2$ monitors, the Field Scientist will check the status of the chemcassetes daily and reload them as required. The Field Scientist will

perform 2-point internal optical calibration checks and download data from the DASs weekly. For the continuous particulate monitors, the Field Scientist will check the status of the filter tapes daily and reload them as required, and download data from the DASs weekly. ERG will perform a weekly sample flow rate check on the SPMs using a primary flow measurement standard (i.e., Buck Calibrator); this will occur at the time of data download. For the meteorological monitoring systems, The Field Scientist will perform a visual check of the meteorological sensors daily, and download data from the DASs weekly. For the TSP high volume samplers, the Field Scientist will check the motor brushes weekly, and replace them as necessary. TSP samples will be collected on an every-other-day schedule at four sites across the duration of the investigation.

There presently is one redundant or backup $SO_2$ SPM planned for this investigation. In the event that there is a failure of one of the primary $SO_2$ SPMs, the back up SPM will be substituted. The failed system will be repaired as quickly as possible and then returned to the network as needed. There presently are no redundant or backup meteorological parameters monitoring sensors for this investigation. If there is a failure of one of the meteorological parameters monitoring sensors, it will be repaired as quickly as possible and returned to the network. There presently is one redundant or backup TSP high volume sampler planned for this investigation. If there is a failure of one of the primary systems used to collect TSP/metals samples, the back up unit will be substituted. The failed sampler will be repaired as quickly as possible and returned to the network as needed. Any sample collection that is missed will be re-scheduled and completed.

### 3.7 Recovery

When the monitoring effort has been completed, ATSDR and ERG will visit each site to perform the internal optical 2-point calibration checks for the SPMs and download all data for the last time. After these activities have been completed, ERG will breakdown and pack all equipment, and return that equipment to the ERG Laboratory in Research Triangle Park, North Carolina. To the greatest extent possible, the monitoring sites will be returned to the condition they were in prior to installing the equipment. ERG will set up the $SO_2$ monitors at the ERG Laboratory and perform post-deployment calibration and QC checks to qualify precision and accuracy. Equipment belonging to ATSDR and/or ERG will be serviced, packed, and properly

stored for use in future ATSDR monitoring programs.

### 3.8 Reporting

After all data collection activities have been completed, ATSDR and ERG will prepare a Draft and Final EI Field Monitoring Report. The report will include the following:

- Introduction
- Methods (siting and monitoring approach)
- QA/QC
- Results
- Data Characterization
- Conclusions/Discussion

A Health Consultation reflecting data collected during this EI will be prepared separately from the Final EI Monitoring Report.

### 3.9 Proposed Project Schedule

The proposed schedule of major program events (tentative) is presented in Table 1. If the schedule has to be revised, the schedule will be revised in 1-week increments.

**Table 1. Proposed Schedule of Major Program Events**
**(based on information available at the time of preparation of this document)**

| Event | Activity | Date |
|---|---|---|
| Pre-Site Survey | Meet with the Mirant/City of Alexandria staff, identify potential site locations. Initial visit to determine potential locations, site specific requirements. | March 12 - March 13 |
| Siting | Site selection and agreements obtained with host residents (ATSDR responsibility). | March 10 - April 15 |
| Management | Preparation, review, revision (as needed) and acceptance of the Monitoring Plan. | March 19 - April 30 |
| Management | Preparation, review, revision (as needed) and acceptance of the cost estimate. | March 30 - April 30 |
| Pre-Monitoring Survey | Collect $SO_2$ data at two sites to gauge the level of $SO_2$ present prior to start of the actual monitoring effort. | April 16 - April 20 |
| Staging | Acquire/obtain instrumentation and related ancillary equipment and materials. Fabricate all support systems and equipment. Mount data acquisition systems in protective chassis boxes, and configure associated software for data collection and retrieval for each site. | March 1 - May 17 |
| Staging | Set up and perform a functional checkout on all instrumentation at the ERG laboratory. Perform instrument calibrations and pre-deployment QC checks. | March 1 - May 21 |
| Staging | Breakdown and pack all instrumentation, equipment, materials, and supplies, and prepare them for transport to the sites. | May 22 - May 24 |
| Deployment | Transport equipment to sites. Position mobile laboratory and connect it to electrical power. | May 26 - May 27 |
| Deployment | Install/set up all equipment associated with the ERG mobile laboratory site. Check out and QC equipment. Bring systems on line. Repeat for all other sites. | May 28 - May 31 |
| Monitoring | Week 1 – Check and service equipment daily. Perform sample collections as scheduled. Ship TSP samples to ERG laboratory weekly. | June 2 - June 8 |
| Monitoring | Week 1 – Download data, electronically transfer data to ERG Reporting Task Manager, and perform $SO_2$ optical QC checks. | June 8 |
| Monitoring | Week 2 – Check and service equipment daily. Perform sample collections as scheduled. Ship TSP samples to ERG laboratory weekly. | June 9 - June 15 |

**Table 1. Proposed Schedule of Major Program Events**
**(based on information available at the time of preparation of this document)**
**(Continued)**

| Event | Activity | Date |
|---|---|---|
| Monitoring | Week 2 – Download data, electronically transfer data to ERG Reporting Task Manager, and perform $SO_2$ optical QC checks. | June 15 |
| Monitoring | Week 3 – Check and service equipment daily. Perform sample collections as scheduled. Ship TSP samples to ERG laboratory weekly. | June 16 - June 22 |
| Monitoring | Week 3 – Download data, electronically transfer data to ERG Reporting Task Manager, and perform $SO_2$ optical QC checks. | June 22 |
| Monitoring | Week 4 – Check and service equipment daily. Perform sample collections as scheduled. Ship samples to ERG laboratory the same day they are collected. | June 23 - June 29 |
| Monitoring | Week 4 – Download data, electronically transfer data to ERG Reporting Task Manager, and perform $SO_2$ optical QC checks. | June 29 |
| Monitoring | Note: If week 5 and/or 6 is determined to be necessary, they would encompass the dates of June 30- July 6 and July 7 – July 13. Recovery and reporting effort dates would then be adjusted by 1 or 2 weeks as applicable. | June 30 - July 13 (tentative) |
| Recovery | Breakdown and pack equipment for transport, return site locations to their pre-deployment status. | June 30 - July 2 |
| Recovery | Transport equipment to Research Triangle Park. | July 2 |
| Recovery | Set up $SO_2$ instruments at the ERG laboratory, perform instrument calibrations and post-deployment QC checks. | July 9- July 13 |
| Recovery | Perform any required service on ATSDR owned equipment and store for future application. Return any borrowed or rented equipment. Return or dispose of any unconsumed materials/supplies (as appropriate). | June 14 - August 20 |
| Reporting | Prepare the Draft EI Monitoring Report. | August 1 - September 1 |
| Reporting | Submit Draft EI Monitoring Report for review and comment. | September 3 |
| Reporting | Receive review comments. | September 30 |
| Reporting | Submit Final EI Monitoring Report. | October 19 |

## SECTION 4
## QUALITY ASSURANCE AND CONTROL

### 4.1 Data Quality Objectives

The project Data Quality Objectives (DQOs) provide the answer to the critical question of how good data must be in order to achieve the project goals. DQOs are used to develop the criteria that a data collection design should satisfy including where to conduct monitoring, when to conduct monitoring, measurement frequency, and acceptable measurement precision and accuracy. Considering the targeted compounds, information obtained during the site selection survey, and specifications associated with the monitoring and sample collection systems that will be utilized, DQOs for this EI are presented in Table 2.

**Table 2. Data Quality Objectives**

| Element | Objective |
|---|---|
| Where to Conduct Monitoring | All sites must be located in close proximity to the potentially impacted populous, in accordance with the grid ring approach presented in Section 3.1. |
| When to Conduct Monitoring | Daily – from 0000 to 2359 hours |
| Frequency of Monitoring | Continuous for $SO_2$, $PM^{10}$, $PM^{2.5}$, and meteorological parameters so that short duration excursions can be assessed, and hourly and daily average concentration can be calculated. TSP and metals samples will be collected on an every-other-day schedule. |
| Overall Completeness | 80 % data capture |
| Acceptable Measurement Precision for SPMs | +/- 20 % relative standard deviation (RSD) |
| Acceptable Measurement Accuracy for SPMs | +/- 15 % RSD |
| Acceptable Measurement Precision for metals | +/- 20 % RSD |
| Acceptable Measurement Accuracy for metals | +/- 25 % RSD |

### 4.2 Measurement Accuracy

Measurement accuracy for this project is defined as the ability to acquire the correct concentration measurement from an instrument or analysis with an acceptable level of uncertainty.

To determine the measurement accuracy associated with the $SO_2$ SPM instruments used on this EI, a QC sample will be measured. The difference between the concentrations obtained from each instrument compared to the known concentration of the corresponding QC check standard will be calculated and expressed as the Relative Standard Deviation (RSD). Measurement accuracy checks will be performed initially (i.e., while the systems are being checked out during the staging efforts) and again after the equipment has been recovered and returned to the ERG Laboratory.

Accuracy for the metals analyses will be established through audits prepared by U.S. EPA and submitted to ERG as a regular function of the National Monitoring Programs (which ERG operates under contract to U.S. EPA).

### 4.3 Measurement Precision

Measurement precision is defined as the ability to acquire the same concentration from different instruments with an acceptable level of uncertainty, while they are sampling the same gas stream. For this EI, measurement precision will be assessed as follows:

- *$SO_2$ between two instruments*—Collocated $SO_2$ SPM instruments will be located at the site where the ERG mobile laboratory will be positioned. The difference between simultaneous concentration determinations from each instrument while sampling a common ambient air parcel will be calculated and expressed as RSD.

- *$SO_2$ across instruments by type*—As part of the pre- and post-deployment QC checks, the $SO_2$ SPM instruments will simultaneously perform 10 concentration determinations each. The average concentration from the 10 determinations will be calculated on an instrument specific basis. The 10 averages will then be compared to each other and expressed as RSD.

- *Metals*—Precision will be determined by analyzing 4 sets of field samples (1 from each TSP site) in replicate. The average concentration for each compound measured from each set of 4 determinations will be calculated on a compound specific basis. Each set of 4 averages will then be compared to each other and expressed as RSD.

## SECTION 5
## SPECIAL TRAINING REQUIREMENTS

ERG field personnel involved in this project have been trained in their tasks and have from four to 33 years of experience in the duties they will be performing. ERG staff will be subject to surveillance from the ERG QA Officer (Dr. Raymond Merrill) with appropriate corrective action enforced, if necessary. No additional special personnel will be required to augment the ERG personnel. ERG provides employee training through both specialized, in-house training classes, and by on-the-job training by their supervisors and co-workers. There are no unusual hazards and no special safety training or equipment other than standard personal protective equipment (PPE) will be required. Safety and hazard communication training have been completed by ERG laboratory staff. The ATSDR EI Manager and ERG Project Co-Directors are 40-hour Hazardous Waste Operations (HAZWOPER) certified.

## SECTION 6
## DOCUMENTS AND RECORDS

A field project notebook will be used to record the monitoring systems' operational parameters. Analysis documentation will include the use of bound laboratory notebooks to record experimental conditions, data, and pertinent observations. Hard copies of instrumentation records including calibration, QC checks, and any raw data will be archived in a Project Masterfile.

The project final summary report (see Section 3.8) will include all applicable raw data and records. A summary of any outliers or findings will be presented in the report. The report will undergo a technical review before submission. After submission, the report will be filed at ERG for a period of no less than three years. The file will also include electronic copies of all data used in the development of the report.

## B – MEASUREMENTS / DATA ACQUISITION

## SECTION 7
## MONITORING APPROACHES

### 7.1 Continuous Sulfur Dioxide

Measurements of $SO_2$ will be made using Honeywell SPMs owned by ATSDR. Primary calibration of these instruments is performed at the factory. Two-point internal optical calibration performance checks will be conducted (i.e., initially before deployment, weekly onsite, and again after equipment recovery). Two range setting ChemKeys® will be used as necessary during the program, based on concentrations measured during pre-monitoring and program monitoring activities. The linear detection range for the low range ChemKey® is 5-200 parts per billion by volume (ppbV). However, the instruments will be calibrated from 0-200 ppbV. The linear detection range for the high range ChemKey® is 0.2-6.0 parts per million by volume (ppmV). Ambient air is drawn into the instrument through a length of Teflon tubing (i.e., 0.250 inch outside diameter), outfitted with an inverted glass funnel connected at the inlet end. Electronic signals from the $SO_2$ systems will be collected and stored using HOBO Micro Station® DASs with 4-20 mA adapters and BoxCar® Pro 4.3 software. Each DAS is capable of collecting four channels of amperage input simultaneously, and offers internal storage for 1 million data points per system.

### 7.2 Continuous Particulate

Measurements of continuous $PM^{10}$ and $PM^{2.5}$ particulate will be made using Met One Instruments EBAM real-time beta attenuation monitors. The EBAMs are portable self-contained units that meet or exceed all EPA requirements for automated particulate measurement. The measurement range for these units is 0-10mg/$m^3$. These units will provide measurement data on an hourly basis. Data is stored automatically to a unit specific internal DAS. The monitors used to measure $PM^{2.5}$ will incorporate a $PM^{10}$ pre-cutter inlet followed by a Sharp Cut $PM^{2.5}$ cyclone. The monitors used to measure $PM^{10}$ will incorporate a $PM^{10}$ pre-cutter inlet only.

## 7.3 Meteorological Parameters

Measurements of meteorological parameters will be made using two stand alone meteorological monitoring systems, attached to secured tripods or mast assemblies. Each system incorporates a cup anemometer to measure wind speed, a directional mast and vane to measure wind direction, a wound bobbin assembly to measure relative humidity, and a thermistor temperature probe to measure ambient temperature. Measurements will be made at a height of approximately 10-12 feet above grade or roof top level (site dependent). Electronic signals from the meteorological monitoring systems will be collected and stored using HOBO Micro Station DASs and BoxCar® Pro 4.3 software. Each DAS is capable of collecting four channels of input signal simultaneously, and offers internal storage for 1 million data points per system.

## 7.4 Total Suspended Particulate

Samples for determining mass gain of TSP by gravimetric analysis will be made in accordance with EPA Method IO-2.1[1]. Method IO-2.1 employs high volume samplers to volumetrically collect representative aliquots of suspended particulate matter with an aerodynamic particle size above 0.01µm. Five-point flow rate calibration curves will be compiled for each sampler at the ERG prior to deployment. Single-point flow rate checks will be made in the field , prior to and after each collection event. All TSP filters will present a unique filter identification number. Each filter will be equilibrated and weighed prior to transport to the field (i.e., pre-sampling), and then equilibrated and re-weighted when received at the ERG laboratory after each collection event (post-sampling). The mass gain is determined by subtracting the pre-sampling weight from the post-sampling weight.

## 7.5 Metals

Determination of the concentration of toxic metals will be performed on the TSP filter samples (as described in Section 7.4) after gravimetric analysis has been completed. Analyses for toxics metals will be made in accordance with EPA Method IO-3.5[2], as described in the *"Technical Assistance Document for the National Ambient Air Toxics Trends and Assessment*

*Program*"[3]. ERG is National Environmental Laboratory Accreditation (NELAC) Program accredited laboratory, and is NELAC certified to perform this analysis. Target metals for this EI, and their associated method detection limit (MDL), are presented in Table 3.

**Table 3. Target Metals and Associated MDLs**

| Target Metal | MDL (ng/filter) |
|---|---|
| Antimony | 20.0 |
| Arsenic | 17.9 |
| Beryllium | 40.0 |
| Cadmium | 16.9 |
| Chromium | 284 |
| Cobalt | 19.9 |
| Lead | 36.2 |
| Manganese | 31.2 |
| Mercury | 18.6 |
| Nickel | 176.0 |
| Selenium | 35.9 |

EPA Compendium Method IO-3.5[2] provides the procedures for the multi-element determination of trace elements by ICP/MS. Ambient air is pulled through filter media using a high volume sampler. Particulate phase sample is collected on the filter, and the filter is digested yielding the sample material in solution. Sample material in solution is introduced by pneumatic nebulization into radio frequency plasma where energy transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially pumped vacuum interface and separated on the basis of their mass-to-charge ratio by a

quadrupole mass spectrometer having a minimum resolution capability of 1 amu peak width at 5% peak height. The ions transmitted through the quadrupole are registered by a continuous dynode electron multiplier, and the ion information is processed by a data handling system.

# SECTION 8
# DATA VALIDATION AND USABILITY

## 8.1 Verification and Usability Processes

A two-step process of verification and validation for data review will be performed. This process will begin with an objective review of whether or not the data collection plans and protocols were followed and whether the basic operations, calculations, and statistical evaluations were performed correctly. Ongoing QA review that started with the development of this EI Monitoring Plan will be reviewed to verify that the sampling and analytical methodology planned for this project was accomplished or that changes were identified, documented and met project quality objectives. ERG will be concerned only with the review and validation of data collected by ERG.

The second step will be to validate the technical usability of the data by determining whether the procedures followed were appropriate for the actual situations encountered, and whether the results make sense in the context of the investigation objectives. This validation will be done by comparing the original investigation objectives and data quality objectives with the actual circumstances encountered by ATSDR and ERG.

## 8.2 Verification Methods

*Evaluation of the Experimental Design*—The first step in validating the data set is to assess if the project, as executed, meets the requirements of the sampling design.

*Sample Collection Procedures*—Actual sample collection procedures will be documented in the field notebook and on applicable data sheets, and checked against any applicable requirements contained in this EI Monitoring Plan. Deviations from the EI Monitoring Plan will be classified as acceptable or unacceptable, and critical, or non-critical.

*Sample Handling*—Internal sample handling and tracking procedures for samples generated in the laboratory will be checked. Holding times will be monitored to ensure timely analysis and reporting of analytical results. Labeling and sample identification will be checked for variation from the EI Plan; Good Laboratory Practices will be followed in the labeling of samples and standards. All deviations will be documented in the final summary report.

### 8.3 Validation Methods

*Calibration* — Documentation of equipment calibration (i.e., where applicable) will be assessed to ensure that the values obtained are appropriate for data collection. Errors and omissions will be discussed in the final summary report. The documentation will be checked to ensure that the calibrations: (1) were performed at the specified intervals, (2) included the proper number of calibration points, and (3) were performed using appropriate approaches/standards for the reported measurements. Results generated during periods when calibration requirements are met will be considered conditionally valid and ready for Quality Control Validation review.

*Data Reduction and Processing* — The data processing system will be checked by using example raw data for which calculated values are already known. The example data are input into the system and the calculated results are compared to the known. Hand calculations will be used to check the data processing system. Findings from these audits will be included in the final report. Data will be considered conditionally valid if manual calculations are reconciled with automated data processing results.

*QC Results and Procedures* — QC measurements and QC procedures performed during the experimental program will be checked against the monitoring program requirements. Omissions will be discussed in the final summary report. Quality control results will be reviewed. Results that meet the DQOs and all other validation are considered valid. All results outside specified parameters will be discussed with the ATSDR EI Manager for corrective action.

## C – HEALTH AND SAFETY

## SECTION 9
## HEALTH AND SAFETY

### 9.1 Purpose

The purpose of this Health and Safety Section is to inform personnel of known or potential health and safety hazards that may be encountered during ambient and indoor air monitoring activities planned for Alexandria, Virginia. Accordingly, this HASP describes the possible hazards and the procedures required to minimize the potential for exposure, accidents and/or injuries during the scheduled work activities. This information has been reviewed by the ERG Laboratory Health and Safety Coordinator.

### 9.2 Scope

In order to better assess potential human exposure to selected chemical species and particulates in ambient and/or indoor air in Alexandria, Virginia, ATSDR will conduct an EI. During this EI, an ambient air monitoring program will be operated to obtain representative concentration data for:

- $SO_2$ concentrations
- Toxic metals concentrations
- TSP mass
- $PM^{10}$ mass
- $PM^{2.5}$ mass
- Meteorological parameters

### 9.3 Physical Hazards Assessment

Possible dangers associated with project activities include physical hazards related to heat and cold stress; slips, trips, or falls; electrical hazards; excessive noise; lifting; and animals, poisonous plants, and poisonous insects. Brief descriptions of these potential physical hazards and measures for preventing, or mitigating the consequences of, the hazards follow:

- Heat Stress — Ambient temperatures may be high enough to induce heat stress if field staff does not take appropriate preventive measures. Low winds and high humidity also contribute to heat stress, and both of these conditions may persist in Alexandria, Virginia during the summer. ERG staff must be familiar with the signs and symptoms of heat stress as presented below, and be aware of measures necessary to prevent its occurrence. Field staff can prevent heat stress using good common sense and awareness. ERG sampling team members should wear appropriate clothing and drink ample quantities of water and electrolyte solutions (water and drinks such as Gatorade should be purchased ahead of time). Flexible working and resting schedules should be used as needed depending upon conditions. If ambient temperatures exceed 90°Fahrenheit (F), ERG personnel should make efforts to limit their time in hot sunny areas and rotate where possible into cooler areas. If such heat waves persist, ERG personnel should monitor their heart rates on a regular basis. The resting pulse rate should not exceed 110 beats per minute. If employees note than their one-minute pulses exceed 110, they should stop work and contact the field team leader immediately and reduce work loads accordingly.

    - *Heat Rash*. Heat rashes may result from continuous exposure to excessive heat and humidity. Field staff with heat rashes will be instructed to seek medical attention if symptoms persist.

    - *Heat Cramps*. Heat cramps are caused by heavy sweating with inadequate electrolyte replacement. Symptoms include muscle spasms and pain in the hands, feet, and abdomen. Field staff with heat cramps will be instructed to seek medical attention if any of the symptoms persist.

    - *Heat Exhaustion*. Heat exhaustion occurs when one's body loses the ability to maintain proper temperature. The signs of heat exhaustion include shallow breathing; pale, cool, and moist skin; profuse sweating; dizziness; nausea; and fatigue. Field staff will be trained in the recognition of these symptoms and will be provided electrolyte solutions to help prevent heat exhaustion. If symptoms of heat exhaustion persist, the employees will be instructed to immediately move to a cool location and contact emergency medical services.

    - *Heat Stroke*. Heat stroke, with an estimated mortality rate of 50 percent, is the most severe form of heat stress. The signs and symptoms of heat stroke include red, hot, and dry skin; body temperatures exceeding 105°F; lack of perspiration; strong, rapid pulse; nausea; dizziness; confusion; and unconsciousness. If signs of heat stroke occur, victims will be instructed to immediately retreat to a cool place and contact the nearest medical facility (see Emergency Response Procedures). The affected person may return

to work only after obtaining the approval of a doctor.

- Slips, Trips, and Falls — Testing at the site is expected to occur at both ground and roof top level. ERG personnel will use good safety sense in evaluating walking and working surfaces. It is expected that ATSDR will select monitoring sites such that neither testing personnel nor the general public will be injured by tripping or falling over test equipment. For work conducted above ground level (e.g., on rooftops, etc.), ERG personnel must take measures to ensure the safe access to these areas, including the use of safe equipment and remaining at a safe distance (at least 10 feet) from a building's edge. All ladders or stairways must meet Occupational Health and Safety Administration (OSHA) standards. Where possible, roofs should be accessed from windows or stairways. Field team leaders will review applicable OSHA rules with team members prior to assigning employees to work on roofs.

- Electrical — Prior to installing equipment in the field, ERG field staff will verify that all electrical equipment and cords are in good working condition. If additional extension cords are needed after arriving on site, the field team leader will purchase a high quality extension cord that works well under the testing conditions. Field staff will be instructed to immediately report to their team leaders any signs of malfunctioning electrical equipment.

- Lifting Hazards — When carrying and lifting equipment, ERG field staff should practice good lifting techniques and avoid carrying heavy loads.

- Animals, Poisonous Insects, and Poisonous Plants — ERG field staff should be alert for and stay clear of wild and unsupervised animals, poisonous insects and poisonous plants (e.g., poison ivy). Team members should also be aware of multiple poisonous spiders (e.g. brown recluse, black widow, etc.) that are indigenous to urban environments.

    - ERG field staff will wear thick leather gloves. When entering the room that houses the monitoring equipment turn on all lights, if lights not available use a flash light to look around the sampling area before opening sampling container. Be aware of your surroundings, do not just blindly wander in the monitoring locations. Observation is critical to avoidance. Learn to check around with a sweeping glance for anything that seems out of place, your subconscious may notice a camouflaged animal. All monitoring equipment will be kept in a large sealed container, the vents will be screened to reduce the chance of animals and insects from entering the container.

    - Tap the monitoring container before opening the container. Snakes and other animals have many sensing devices to warn them of your presence. Make plenty of noise and movements while entering the

monitoring room to announce your presence.

- If an ERG field staff is bitten by a snake, rodent, or spider, they should be taken to a medical facility immediately for treatment. Give the medical staff as much detailed information about the animal as possible. Describe the size, shape, and color of the animal.

## 9.4 Chemical Hazards Assessment

The only chemicals to be used by the field staff are the calibration and QC check chemicals for the $SO_2$ monitoring systems. The ERG Laboratory Health and Safety coordinator will obtain Material Safety Data Sheets for these materials and review the relevant safety information with the team members. There will be compressed gases in the trailer used to QC the $SO_2$ instruments. These gases will contain $SO_2$ in air, and zero air. Because these chemicals are inhalation hazards a thorough leak check of the monitoring system will be performed at the beginning of the project. Additional leak checks should be performed each month during the testing. Prior to entering the ERG sampling trailer, open both doors and ventilate for at least 5 minutes. Perform a leak check of the instruments if you suspect a leak from the calibration gases.

## 9.5 Contacts for Local Emergency Services

Prior to the first ERG field activity, ERG will provide each of its field staff with the pertinent emergency contact information for the investigation area. This information will include the phone number(s) and address for the following:

Alexandria Police Dept.
2003 Mill Rd
Alexandria, VA 22314
Emergency: 911
Non-emergency: (703)838-4444

Alexandria Fire Dept.
Station 208
175 N Paxton St.
Alexandria, VA 22304
Emergency: 911
Non-emergency: (703)838-4658

Inova Alexandria Hospital
4320 Seminary Road
Alexandria, Virginia 22304
Emergency: 911
Non-emergency: (703)504-3000

## 9.6 Staff Concurrences

Prior to working on this ambient air monitoring program, ERG will require all of its associated field staff to read and understand these health and safety provisions.

## ERG STAFF CONCURRENCE SHEET

I have read, understood, and agree to comply with this Project Health and Safety Plan.

| Signature | Printed Name | Date |
|---|---|---|
| Signature | Printed Name | Date |
| Signature | Printed Name | Date |
| Signature | Printed Name | Date |

## D– REFERENCES

## SECTION 10
## REFERENCES


1. U.S. EPA Compendium Method IO-2.1; *"Sampling of Ambient Air for Total Suspended Particulate or $PM^{10}$ Using High Volume Sampling"*, EPA/625/R-96/010a, June 1999.

2. U.S. EPA Compendium Method IO-3.5; *"Determination of Metals in Ambient Particulate Matter Using Inductively Coupled Plasma/Mass Spectrometry (ICP/MS)"*; EPA/625/R-96/01a; U.S. Environmental Protection Agency: Research Triangle Park, NC, July 1999.

3. *"Technical Assistance Document for the National Ambient Air Toxics Trends and Assessment Program"*; U.S. EPA, January 1, 2007, Compendium Method IO-3.5, Section 4.0, page 82.