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**Part II**

# Environmental Community Air Monitoring Plan During the Abatement and Demolition of 133-135 Greenwich Street and 21-23 Thames Street

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# Environmental Community Air Monitoring

## 1.0 General:

Environmental air monitoring and visual observation will be conducted during the abatement and demolition of the buildings located at the 133-135 Greenwich Street/21-23 Thames Street site (The Site). The proposed program consists of two primary forms of environmental monitoring: Work Area Monitoring required by law for environmental remediation projects and intended to monitor the efficacy of project engineering controls; and voluntary Community Monitoring intended to gauge and document the impact (or lack thereof) of the project to the surrounding area.

### 1.1 Operations to be Monitored

The project schedule for The Site includes four weeks of soft-strip contaminants of potential concern (COPCs) abatement and removal, asbestos abatement and removal under a variance from the NYCDEP, and four weeks of conventional demolition. All work will be monitored for visible emissions by the Environmental Consultant's Site Hygienist. The Abatement Phase regulated under NYC DEP will be monitored under both a Community Air Monitoring Program, and a Work Area Monitoring Program. The Demolition phase of the project will be monitored under the Community Air Monitoring Program. All air monitoring conducted under this plan will be conducted by the Environmental Consultant's New York State DOL certified air sample technicians under the supervision of the Environmental Consultant's Certified Industrial Hygienist (CIH).

### 1.2 Project Monitoring

Monitoring of this project will include all standard monitoring functions for environmental remediation projects including observations for visible emissions, air sampling and analyses, inspection and monitoring of the contractor's work practices, and reporting to the Owner and the Regulators. These general monitoring functions will be applied to both the Abatement Phase and Demolition Phase of this project.

### 1.3 Neighboring Properties

The Environmental Community Monitoring Plan described in this document is intended to address the impact of the project to the surrounding area. In addition to that effort, properties directly adjacent to the project site have been given particular attention by this plan.

#### 1.3.1 Trinity Place Schools



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Extensive effort and cost has been invested in working with the NYC Department of Education to provide engineering controls and testing support to protect the educational facilities at 100 and 90 Trinity Place. Detailed information on these efforts is included in Attachment II to Part I of this submittal – "Work Plan."

1.3.2 125 Greenwich Street

Specific measures are planned to monitor the impact of the project on the 125 Greenwich Street building. One of the Environmental Community Air Monitoring stations specified in this document (school auditorium roof station) is directly adjacent to this building (within 20'). In addition, the Environmental Consultant will conduct Abatement Phase work area monitoring continuously during abatement phase work shifts between the project site and the 125 Greenwich Street building.

1.3.3 Bldg. South of Thames Street

This building, across Thames Street from the Project Site, will be separated from the project site by two Environmental Community Air Monitoring stations. In addition, during the Abatement Phase, extensive work area monitoring will be conducted on Thames Street.

### 1.4 Environmental Sampling and Analytical Methodologies

Sampling and analytical methodologies utilized for this Project, will comply with published protocols from EPA and/or National Institute of Occupational Safety and Health ("NIOSH"). Where appropriate other published standards may be substituted and project-specific adjustments to protocols may be made. Generally, sampling will be conducted once every 24-hour work period, except for asbestos (TEM samples), which will be taken for the duration of every work shift and once a day during non-work days during the abatement phase. Real-time particulate monitoring will be on a continuous basis. Instantaneous mercury readings will be obtained to evaluate the air quality around the work site at multiple locations each work day.

## 2.0 Visible emissions

### 2.1 Abatement Phase

At the commencement of each work shift, the Environmental Site Hygienist will conduct a thorough inspection of all engineering control systems including containment barriers, and negative air control systems, and exterior. If any visible emission is noted on the exterior of the work area, all work will be stopped and not restarted until an evaluation of engineering controls has identified and corrected the cause of the emission. The evaluation may include, but is not limited



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to, work activities and smoke testing of the isolation barriers. Any damaged or malfunctioning engineering control will be repaired immediately. The work will not be restarted until engineering controls are repaired or determined to be functioning properly.

### 2.2 Demolition Phase

During each work shift, the Environmental Consultant will observe demolition operations to monitor visible dust in the air and suppression measures being applied by the demolition contractor. The Environmental Consultant may, depending on the severity and duration of dust condition, order a stoppage of the work or require modified work practices to reduce visible dust.

### 2.3 Notification

The EPA Region 2 office and NYCDEP will be notified as promptly as reasonably possible of any visible emission observed by the Environmental Consultant to cross the property line of the Buildings. The Environmental Consultant will promptly advise the EPA Region 2 office and the NYCDEP of the corrective actions taken. A report of inspection results and corrective actions taken will be provided to the EPA Region 2 office and NYCDEP within 2 business days of any incident showing any visible emissions.

## 3.0 Abatement Phase Air Monitoring

### 3.1 Visible Emissions

Monitoring for visible emissions will be conducted as described above in Section 2.0 of this specification.

### 3.2 Community Air Monitoring

Prior to the commencement of any site work, one week of background community air monitoring will be conducted as detailed in *Table 1 – Community Air Monitoring* in Attachment A (Community Monitoring) to this specification. Community Air Monitoring as detailed in Table 1 will continue through the Abatement Phase and until completion of the Demolition Phase.

Community Monitoring locations are identified on the drawing included in Attachment C (Community Monitoring Locations) to this specification. The locations include the roof of the school auditorium on Cedar Street, the sidewalk bridge on Thames Street, and at ground level at the intersection of Thames and Greenwich Streets.

If the environmental air monitoring locations need to be changed during the abatement phase due to site conditions, NYC DEP and USEPA Region 2 office



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will be notified promptly. The community air monitoring locations will not be moved until NYCDEP and the USEPA Region 2 office accept the change.

### 3.3 Abatement Phase Work Area Monitoring

Air monitoring per the requirements of NYC DEP Title 15 will be conducted with the exception that Transmission Electron Microscopy (TEM) will be utilized as the analytical method for asbestos. Sample locations will be selected by the Site Hygienist in accordance with Title 15 and based on the configuration of the abatement containment areas. Containment area monitoring of additional Contaminants of Potential Concern (COPCs) that are not regulated under Title 15 will be conducted voluntarily by the Owner. The COPCs to be monitored are: Asbestos (TEM), Metals (ICP-AES) and crystalline silica (XRD).

This monitoring is detailed in *Table 3 - Abatement Phase Work Area Monitoring* in Attachment B (Work Area Monitoring) to this specification.

## 4.0 Demolition Phase Air Monitoring

### 4.1 Visible Emissions

Monitoring for visible emissions will be conducted as described above in Section 2.0 of this specification.

### 4.2 Community Air Monitoring

Community Air Monitoring will be conducted as detailed in *Table 1 – Community Air Monitoring* in Attachment A (Community Monitoring) to this specification. Community Air Monitoring will continue through the completion of the Demolition Phase.

Initial Community Air Monitoring locations are identified on the drawing included in Attachment A (Community Monitoring) to this specification. If the environmental air monitoring locations need to be changed during the demolition phase due to site conditions, NYC DEP and USEPA Region 2 office will be notified promptly. The community air monitoring locations will not be moved until NYCDEP and the USEPA Region 2 office accept the change.

## 5.0 Interpretation of Sample Data

The Target Air Quality Levels and EPA Site Specific Trigger Levels for the Site are set forth in Attachment A, Table 2.

The following actions will be taken if there is an exceedance of Target Air Quality Level. If there is an exceedance of either the Target Air Quality Level or the EPA Site Specific



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Trigger Level, actions under the EPA Site Specific Trigger Level heading below will govern.

### 5.1 Target Air Quality Levels

Any 24-hour $PM_{2.5}$ and $PM_{10}$ value in excess of the Target Air Quality Level will be considered an "exceedance" and the actions described below will be taken.

During the first week of sampling any sample of an analyte other than $PM_{2.5}$ and $PM_{10}$ in excess of 3 times the Target Air Quality Level for that analyte, unless superceded by an EPA Site-Specific Trigger Level, will be considered an exceedance and the actions described below will be taken.

Following the first week of sampling, a "rolling average" will be established based initially on the first week's results, to which will be added daily values as results are received from the laboratory. A rolling average value for any analyte, other than $PM_{2.5}$ and $PM_{10}$, in excess of the relevant Target Air Quality Level will be considered an exceedance of Target Air Quality Level and the actions described below will be taken.

Exceedance of an established Target Air Quality Level for any analyte calculated as provided above will result in an evaluation of engineering controls and work techniques in the source area. This evaluation shall include but not be limited to the evaluation of work activities that may be causing the exceedance, smoke testing of the isolation barriers in question, and inspection and corrective action.

### 5.2 EPA Site Specific Trigger Levels

Any 24-hour value (work shift value on work days or four hour value on non-work days in the case of asbestos) in excess of the EPA Site Specific Trigger Level will be considered an "exceedance." Exceedances of EPA Site Specific Trigger Levels will result in a stoppage of work associated with the exceedance until an evaluation of emission controls is performed and corrective action is in place. The EPA Site Specific Trigger Levels are applicable to individual sample result. If any of the individual sample results exceed an EPA Site Specific Trigger Level, then notification must be made to the USEPA Region 2 office and the NYCDEP. Work will be reinitiated once the USEPA Region 2 office has agreed (and NYC DEP during the Abatement Phase in the case of asbestos exceedances) to the corrective action(s) proposed to prevent the potential for exceedances in future work and such corrective actions have been implemented.

### 5.3 Notification

The US EPA Region 2 office and the NYCDEP will be notified promptly of any exceedance of either a Target Air Quality Level or an EPA Site Specific Trigger Level and will be notified promptly of any corrective actions taken in connection



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with a Target Air Quality Level exceedance and the implementation of corrective actions in connection with an EPA Site Specific Trigger Level exceedance.

## 5.4 Monitoring Data

All sampling results collected pursuant to this specification, in suitable electronic form, will be promptly provided to the USEPA Region 2 office weekly and exceedances will be reported as provided above. The Environmental Consultant will provide 24 hour averages and graphical data for all continuous sampling data collected.

Work area monitoring data generated during the abatement phase will be provided promptly in electronic format to NYC DEP.



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## Attachment A

### Table 1 – Community Air Monitoring

| Location | Parameter(s) | Sample Frequency | Analysis Method | Comment |
|---|---|---|---|---|
| Site Area | Mercury | Each work day | Lumex, portable mercury analyzer | Lumex results are real-time data logged |
| Site Area | Particulate (Visible dust emissions) | Continuous during working shifts | Visual Observation | Visual Notations on site log |
| Site Perimeter-three fixed locations listed below | Particulate PM-2.5, PM-10 | Daily | Laser dispersion Real time analysis, E-BAM | The Met One E-BAM (with a heated inlet to address condensible emissions)will be utilized for continuous PM10 and $PM_{2.5}$ monitoring |
| Site perimeter-one of the fixed locations below. | Particulate PM-2.5, PM-10 | Each work day | Met One BAM 1020 | Comparison data for E-BAMs. |
| 1. Waste load-out area on the Southwest corner of the Buildings<br><br>2. Roof of HS Auditorium<br><br>3. East end of Thames Sidewalk Bridge | 1. Asbestos<br>2. Silica<br>3. Metals<br>4. Total Dust<br>5. Organics | ACM each work shift, and each off-day.<br>Daily<br>Daily<br>Daily<br>Organics – See footnote 2 below | 1. TEM<br>2. XRD<br>3. ICP/MS<br>4. Microbalance<br>5. PCB (EPA TO-7A) Dioxin (EPA T0-9A (mod)) and PAH (EPA TO-13A) | Sampling durations may be modified based on Site Conditions. See footnote 1 below |
| Field Blanks | All Analytes | | | In accordance with QAPP and Published Methodology |



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**Footnote 1:** Sampling duration and/or flow rates may be modified to provide optimum analyte loading for analysis based on results of ongoing analyses. Initial Sampling flow rates should be in accordance with rates prescribed in the sampling method.

**Footnote 2:** Organics will be sampled as provided below under "Notes on the Community Air Monitoring Table."

**Notes on Community Air Monitoring Table:**

**General:** Blanks will be processed in accordance with the analytical methodologies and standard industry practice.

**Asbestos:**

Asbestos sample collection will be performed in accordance with NIOSH 7402, "Asbestos by TEM". Asbestos analysis will be performed utilizing Transmission Electron Microscopy ("TEM") analysis specified in 40 CFR Part 763, Asbestos Hazard Emergency Response Act, ("AHERA"), with the following modifications:

1. The sensitivity on TEM air samples will be less than 0.002 s/cc.
2. Both the length and width of all asbestos fibers will be recorded.
3. Confirmation by EDS and/or SAED will be performed for each fiber analyzed.
4. The mineralogy of the fibers will be noted and recorded.

**Dust:**

Airborne dust and particles at the Site will be monitored using real-time air monitoring instrumentation. Real-time air monitoring for PM-2.5 and PM-10 will be accomplished with direct reading particulate in air monitors. Data from Met One E-BAM Particle Counters are to be data logged. At one location the Met One E-BAM Particle Counter data will be compared against PM-2.5 results from PM-2.5 direct read results obtained using a Met One BAM 1020 monitor. At another location, the Met One E-BAM Particle Counter data will be compared against PM-10 results from PM-10 direct read results obtained using a Met One BAM 1020 monitor. This equipment will be operated for at least one week before the Abatement Phase begins. Prior to the commencement of the Abatement Phase, the EPA Region 2 office will be provided with the results comparing the data from the Met One E-BAM with the alternative instrument and the proposal of a correction factor, if needed.

**Respirable Dust/Crystalline Silica – Metals – Total Dust:**

Respirable dust and crystalline silica sampling will be performed according to NIOSH Method 0600 protocol with analysis following NIOSH Method 7500 (XRD).



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Metals sampling and analysis will be performed following NIOSH 7300 "Elements by ICP," except that ICP-MS will be utilized. A hot block/acid digestion will be utilized. Metals to be analyzed by ICP-MS and reported are: Antimony, Barium, Beryllium, Cadmium, Chromium, Copper, Lead, Manganese, Mercury (particulate), Nickel and Zinc.

Total Dust sampling and analyses will be conducted by NIOSH 0500.

**Mercury:**

In addition to metals monitoring for mercury particulate using air filters, real-time monitoring will be performed. The readings will be entered into the PDA program for inclusion with the daily download of sample collection data.

Real-time monitoring will be performed daily throughout the project. Mercury monitoring will be performed utilizing a Lumex RA 915+ direct read instrument.

The Lumex RA915+ will be utilized to obtain detection levels below established Site air contaminant criteria. At a minimum, mercury readings will be taken twice a shift at the fixed air monitoring locations. At the discretion of the Environmental Consultant and as daily Site conditions may dictate, additional mercury readings may be taken.

**Organic Compounds (Dioxin/PCBs/PAHs):**

Organic compounds samples will be collected at specified points along the project schedule as follows:

1. On the first day of the Background Phase, one sample of each organic compound at each community monitoring location will be collected (three total samples per location). The samples from the location with the highest particulate readings will be analyzed.
2. Organic samples will be collected at each community monitoring location once a week on a different day of the work week during the Abatement Phase and Demolition Phase, until all days of the work week are used and then the same schedule will be repeated until project completion. Samples from the location with the highest particulate readings for that day will be submitted for analysis. This will result in the processing of the samples that have the best likelihood of representing the "worst case." A total of three samples per week, one Dioxin, one PCB, one PAH will be analyzed.
3. Samples for organic compound analyses will be analyzed within fourteen days under normal laboratory analysis turn-around time



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## Attachment A

### Table 2- Data Reference Levels for Community Monitoring

| Analyte | Target Air Quality Levels See Note 1 | EPA Site Specific Trigger Levels – See Note 2 |
|---|---|---|
| **Metals** | | |
| Antimony | 5 ug/m3 | 14 ug/m3 |
| Barium | 5 ug/m3 | 5 ug/m3 |
| Beryllium | 0.02ug/m3 | 0.2ug/m3 |
| Cadmium | 0.04 ug/m3 | 2 ug/m3 |
| Chromium – See Note 3 | 0.6 ug/m3 | 60 ug/m3 |
| Chromium VI | | 0.6 ug/m3 |
| Copper | 10 ug/m3 | 100 ug/m3 |
| Lead | 1.5 ug/m3 | 5 ug/m3 |
| Manganese | 0.5 ug/m3 | 0.5 ug/m3 |
| Mercury | 0.3 ug/m3 | 3 ug/m3 |
| Nickel | 0.2ug/m3 | 28 ug/m3 |
| Zinc | 16 ug/m3 | 160 ug/m3 |
| **Particles and Dusts** | | |
| Asbestos | 0.00028 f/cc (SEM PCMe fibers) | 70 S/mm2 (TEM AHERA structures) |
| Particulate PM-10 (24 hour average) | 150 ug/m3 | 150 ug/m3 |
| Particulate PM-2.5 (24 hour average) | 40 ug/m3 | 65 ug/m3 |
| Respirable Silica (crystalline) | 10 ug/m3 | 10 ug/m3 |
| **Organics (semi-volatiles)** | | |
| Dioxins/Furans (2,3,7,8 – TCDD equiv.) | 0.00025 ng/m3 | 0.025 ng/m3 |
| PCB (total Aroclors) | 0.12 ug/m3 | 12 ug/m3 |
| PAH (benzo-a-pyrene equivalent) | 0.034 ug/m3 | 3.4 ug/m3 |

Note 1: A rolling average after the first week of sampling, except for PM-10 and PM-2.5.
Note 2: A 24-hour value.
Note 3: If a chromium value is in excess of the Target Air Quality Level (0.6 ug/m3), this will result in a stoppage of work; and, that sample will be speciated for chromium VI to determine that its concentration does not exceed the USEPA Site Specific Trigger Level for chromium VI (0.6 ug/$m^3$), and the appropriate actions pertaining to an exceedance of the USEPA Site Specific Trigger Level *for chromium IV* will continue to be conducted.



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## Attachment B

### Table – 3: Abatement Phase Work Area Monitoring

| Location | Parameter(s) | Sample Frequency | Analysis Method | Comment |
|---|---|---|---|---|
| Site Area | Visible Dust emissions | Each Work Day | Visual Observation | |
| All sample points required by NYC DEP Regulations for ACM as determined by Site Hygienist | Asbestos | Work shifts and once a day on non-work days | 1. TEM | |
| Waste Decon Clean-room at Greenwich Street | 1. Asbestos<br>2. Silica<br>3. Metals | ACM each work day. Alternate Silica & Metals | 1. TEM<br>2. XRD<br>3. ICP/AES | |
| Personnel Decon Clean Room at Greenwich Street | 1. Asbestos<br>2. Silica<br>3. Metals | ACM each work day. Alternate Silica & Metals | 1. TEM<br>2. XRD<br>3. ICP/AES | |
| Rotating Basis at Negative Air Exhaust nearest interior abatement | 1. Asbestos<br>2. Silica<br>3. Metals | ACM each work day. Alternate Silica & Metals | 1. TEM<br>2. XRD<br>3. ICP/AES | |
| Blanks | 1. Asbestos<br>2. Silica<br>3. Metals | 2 blanks per day<br>1 blank per week<br>1 blank per week | 1. TEM<br>2. XRD<br>3. ICP/AES | |

Notes to Table 3:

Work Area Monitoring for Asbestos will be conducted under AHERA Rules and referenced to the 70 s/cc EPA Site Specific Trigger Level.

Work Area Monitoring for all COPCs will be referenced to the applicable OSHA Standard and the EPA Site-Specific Trigger Levels (Table 2).



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# Attachment C

## Community Monitoring Locations

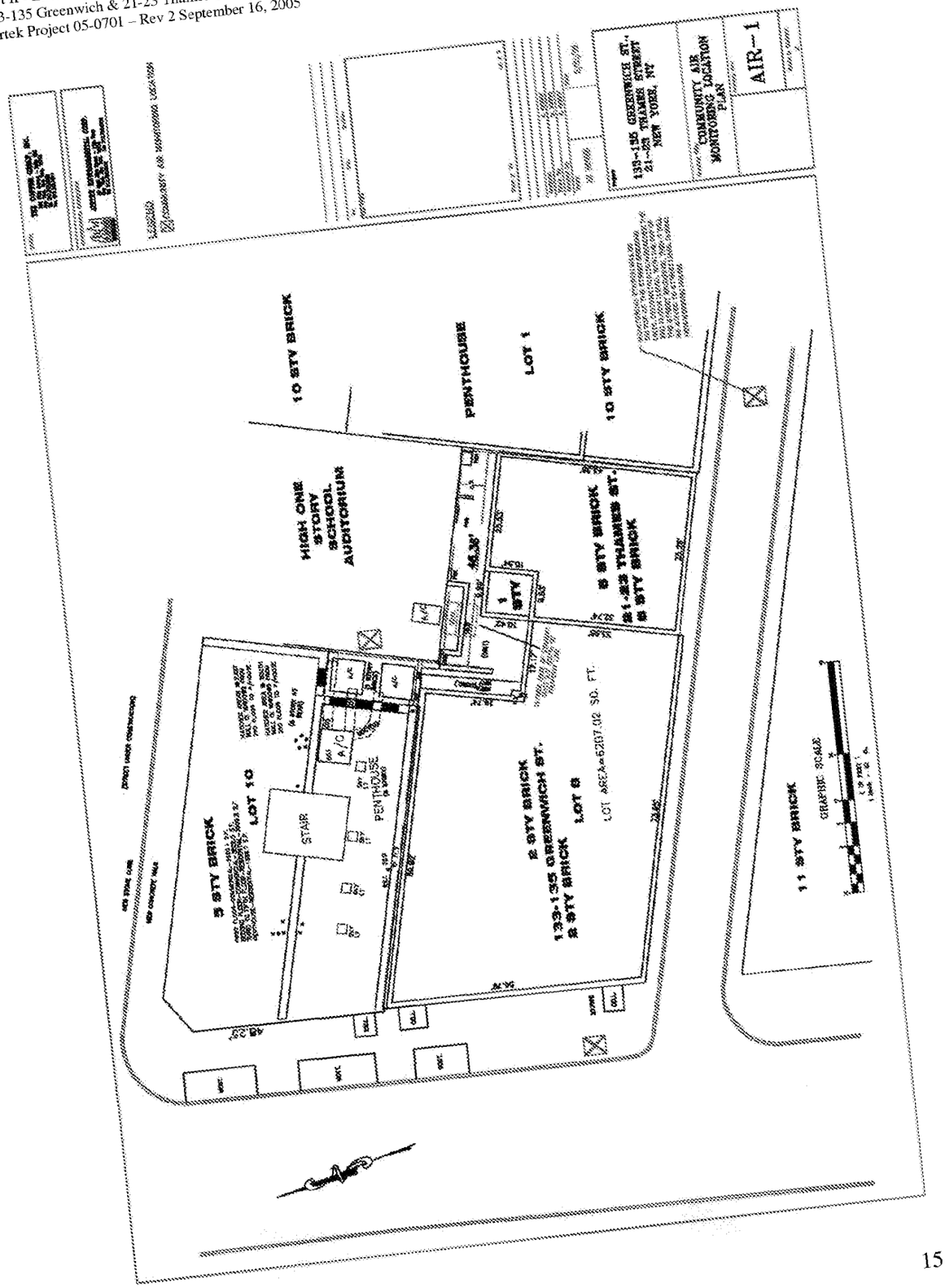


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# Attachment C

Quality Assurance Program Plan
133-135 Greenwich Street/21-23 Thames Street Deconstruction
Environmental Monitoring & Testing Program

Revision 1
Effective Date: August 11, 2005

Prepared By: _____ Date: _____

**Clifford A. Cooper, CIH - Quality Coordinator**

Reviewed By: _____ Date: _____

**Michael Porter, Senior Project Manager**

Approved By: _____ Date: _____

**Benn Lewis, Vice President**



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This QAPP has been distributed to the individuals listed below. Airtek IH Coorinator will be responsible for distributing the QAPP to each Airtek Field team member and contractors participating in the environmental data operations.

**Distribution List**

| Name | Address | Phone Number | Electronic Mail |
|---|---|---|---|



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## 1.0 OVERVIEW

The Quality Assurance Project Plan (QAPP) documents the methods and procedures for the Environmental Air Monitoring operations and waste characterization testing during the deconstruction and demolition activities at 133-135 Greenwich Street & 21-23 Thames Street (the Site) are implemented and assessed with respect to quality.

The Environmental Community Air Monitoring Plan (ECAMP), Health and Safety Plan (HASP), and Waste Management Plan which are used in conjunction with this QAPP, contain specifics about the numbers and types of samples to be collected, decontamination procedures, sampling procedures, and all field activities to be performed during this program.

The Airtek Industrial Hygiene Staff are assigned the responsibility of taking many environmental samples in support of our clients.

In order to use data gathered during sampling and analysis information about the samples must be tracked methodically. Sample tracking systems integrate all data and records that relate to one sample, from the field logs to the final analytical laboratory reports. Sample tracking provides a mechanism for Airtek personnel to determine the ongoing status of a given sample.

## *2.0 SAMPLE TRACKING DATA MANAGEMENT*

Information gathering and tracking begins before the sample is taken and is completed when the final laboratory analysis results are accepted by Airtek. When information concerning a sample is obtained, it is entered into an electronic database. This information is available for review, generation of reports, or trend analysis. This procedure addresses the following activities and applies to all environmental samples collected as part of Airtek sampling programs:

- Sample initiation
- Chain of custody
- Sample tracking
- Collection input
- Lab analysis/data input
- Data review
- Record keeping

### *2.1. Definitions*

***Chain-of- Custody Form (COC):*** A document that follows the sample from the point of assembly through sample shipment to final disposition. Custody of the sample is indicated on the document by signature and dates of possession.

***Composite Collection Form:*** The document used by the Sample Collection staff to record field notes regarding composites. This form contains information about the composite which may not be given to the analytical laboratories such as site location, total sample volume, and flow through the composite sampler. This form is used only when the



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collection contains composite samples. If the collection consists solely of grab samples all information is entered on the Sample Collection Form (see below).

***Composite Sampler:*** A sampling apparatus which is used to collect a sample over time. Information associated with the composite sampler, for example sampling start and stop times, or total flow through the sampler, is recorded on the Composite Collection Form.

***Data Manager:*** Individual responsible for the operation and maintenance of Airtek electronic data collection, storage, and reporting systems, including databases.

***IH Quality Coordinator/QA Officer:*** Individual responsible for ensuring that sample shipments are complete and that all documentation is correct prior to shipment of the samples; coordinating sample shipments to and results reception from analytical laboratories; and ensuring that results reports are complete and received on time.

***Sample Collection Form:*** The document used by the Sample Collection staff to record field notes regarding collected samples. This form contains information about the samples which may not be given to the analytical lab, such as sampling site location and sample collection notes. The Sample Collection Form is used in conjunction with the Composite Collection Form if the collection contains composited samples, or alone if the collection is composed solely of grab samples. In the former case information associated with the composite (such as flow data, total elapsed time, etc.) is recorded on the Composite Collection form, while information associated with the individual samples (such as any notes associated with the individual samples) would be recorded on the sample collection form.

***Sample Collection Staff:*** Individual or group of individuals responsible for the collection of environmental samples.

***Sample Team Lead:*** An individual within Airtek who is responsible for the routine sampling, analysis and reporting.

## *2.2 Responsibilities*

### *2.2.1 Project Manager*

- Manages the overall sample tracking and data management system.
- Assesses procedure implementation.
- Receives and checks all samples and chain-of-custody documents prior to shipment to analytical laboratories.
- Maintains hard copies of sample collection data.
- Monitors sampling activities.
- Establishes sample collection schedules and needed analyses.
- Resolves any questions regarding validity of samples.
- Coordinates sample submission to and results received from analytical laboratories
- Ensures all records identified by this procedure are retained and archived as specified in Section 7.3 of this procedure.
- Provides backup sample collection when required.

### *2.2.2 Sample Collection Staff*

- Collects routine samples according to applicable policies and procedures (e.g., NIOSH, EPA, ASTM, OSHA)
- Collects all required quality control samples.
- Collects special investigation samples, as needed.



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- Prepares chain-of-custody document.
- Enters all required sample collection information into field log and database.
- Maintains and calibrates sampling equipment.

### *2.2.3 IH Quality Coordinator / QA Officer*

- Ensures that this procedure is kept up to date.
- Assesses procedure implementation.
- Receives and checks all samples and chain-of-custody documents prior to shipment to analytical laboratories.
- Coordinates sample submission to and results received from analytical laboratories
- Ensures all records identified by this procedure are retained and archived as specified in Section 7.3 of this procedure.
- Provides backup sample collection when required.
- Maintains hard copies of sample collection data.

### *2.2.4 Data Manager*

- Administers the sample tracking database.
- Resolves collection data entry problems and assists the Sample Team Lead with collection creation or modifications.
- Loads electronic result files into database and checks data for correctness and completeness.
- Develops reports for review of sample tracking information.
- Maintains electronic files of all sample data.

## *2.3 Policy*

### *2.3.1 Basic Health and Safety Policy:*

All Airtek personnel must comply with applicable OSHA health and safety policies and other applicable federal, state, and local fire, health, safety, emergency preparedness, pollution prevention, and environmental protection regulations and policies.

### *2.3.2 Training Requirements and Documentation:*

All sampling personnel receive job-specific training by reviewing the appropriate procedures. At a minimum, this training consists of the following elements:

- ACM/LBP Certification, as required
- Personnel safety and use of personal protective equipment
- Location of equipment and monitoring stations
- Monitoring and sampling equipment operation
- Sample handling and preparation
- In addition, commercially available generic training is taken, when needed.
- All training must be documented in the Berkeley Lab training database. All required documentation must be kept up to date.

### *2.3.3 Analysis Requirements:*



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All samples must be analyzed by an analytical laboratory that is state-certified (NYS DOH ELAP and/or NIST NVLAP) in the analytical methods appropriate for the samples being collected.

***2.34 Equipment Maintenance and Inspection:***

All equipment used for sampling and analysis must be routinely inspected and maintained to ensure its accuracy. Procedures for calibration and maintenance of Airtek sampling equipment can be found in manufacturers procedures. Calibration frequency is tracked in the IH Instrumentation and Calibration tracking log.

## *2.4 Procedure*

Sample collections are documented using the Sample Collection Form and Composite Collection Form and each collection is divided into shipments, each of which has its own Chain of Custody Form. The shipments are sent to a commercial lab for analysis. Results are received via hard copy and/or electronic data deliverables, entered into the sample tracking database, and reviewed for completeness and accuracy. The following procedure describes the workflow for routine samples.

### *2.4.1 Sample Collection and Data Entry*

***Airtek Sample Team Lead***

Specifies collection sites, samples, and frequency of collection.

Specifies analyses to be performed, analytical laboratories to be used, and required turnaround time for receipt of results.

***Airtek Sample Collection Staff***

Initiates collection in database and prints out Sample and Composite Collection Forms and sample vial labels.

Records all of the required information on the appropriate Sample and Composite Collection Forms while taking samples.

Enters data from the Sample and Composite Collection Forms into the database. Consults with the Sample Team Lead regarding questionable samples and ensures all questions regarding samples are resolved before proceeding. Generates and prints chain of custody documents.

Transfers samples and all documentation to the Airtek Quality Coordinator. Signs and records date and time on Chain-of-Custody Form under "Relinquished by."

***Airtek Project Manager***

Accepts samples and documentation from Sample Collection Staff. Signs and records date and time on Chain-of-Custody Form under "Accepted by."

Verifies samples collected and entries on sample collection and Chain-of Custody Forms for correctness and completeness. Resolves any problems with Sample Collection Staff, Sample Team Lead, and Data Manager as necessary.

### *2.4.2 Sending Samples to Analytical Laboratories*

***Airtek Project Manager***



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Generates and prints shipping documents for samples being sent to commercial analytical laboratories.

Transports samples to Contract Laboratory; arranges with offsite laboratories for courier pickup; or arranges with Airtek Clerical Personnel for offsite shipment of samples.

Signs and records date and time on Chain-of-Custody Form under "Relinquished by." Relinquishes samples and Chain-of-Custody Form to the analytical laboratory representative or Shipping Department for common carrier .

***Commercial lab representative***

Accepts samples and Chain-of-Custody Form; signs and records date and time on form under "Received by."

Completes analysis of samples.

Delivers sample results to Airtek Staff via electronic transfer or diskette to Data Manager and hard copy to Quality Coordinator.

### *2.4.3 Receipt of analytical results*

***Airtek Data Manager***

Receives electronic data deliverables from analytical laboratories.

Loads data into database (electronically or manually).

Performs validation checks for timeliness, completeness and correctness on electronic results, after resolving or documenting all validation problems, passes electronic results to Sample Team Leads by advancing the data state to "Wait Authenticate."

***Airtek Quality Coordinator***

Receives hard copy results reports from analytical laboratories.

Reviews hard copy results for timeliness and completeness.

Passes results to appropriate Sample Team Leads, if requested.

## *2.5. Quality Control*

### *2.5.1 Airtek Data Manager*

Performs validation checks for timeliness, completeness and correctness for all electronic data.

Reviews Quality Assurance Quality Control (QA/QC) measures such as percent recoveries, duplicate analyses and laboratory blanks reported in the data entered into the database.

### *2.5.2 Airtek Quality Coordinator/QA Manager*

Performs validation checks for timeliness, completeness and correctness for all hard copy data reports.



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Reviews Quality Assurance Quality Control (QA/QC) measures such as percent recoveries, duplicate analyses and laboratory blanks reported in the hard copy data reports.

### *2.6 Records*

#### *2.6.1 Records Created*

The following records may be created by this procedure:

- Field Activity Logs
- Sample and Composite Collection forms and/or field logs
- Chain-of-Custody Forms
- Shipping documents
- Laboratory analysis results
- Electronic files.

#### *2.6.2 Records Retention*

The Airtek Quality Coordinator retains hard copies of all the records created by this procedure.

The Data Manager maintains electronic records and ensures that periodic backups and archiving of electronic files is done.

#### *2.6.3 Records Care and Maintenance*

The Airtek Quality Coordinator is responsible for the care, maintenance, and disposition of records according to Airtek record management policies and procedures.

Records must be retained in an organized system so that the records are protected and easily accessed when needed.

#### *2.6.4 When Records Transferred to Archives for Storage*

All records created by this procedure are reviewed after three years for transfer to the Airtek Archives.

## 3.0 QUALITY ASSURANCE PROCEDURES

All samples will be immediately placed in storage/transport containers or housings following completion of the sampling period and prior to being recorded on chain-of-custody forms and placed in chilled coolers. Samples will be preserved according to the specific method requirements and delivered to the laboratory within 24 hours of collection.

Daily field audits will be carried out by a designated QA Coordinator to ensure compliance during the performance of the sampling procedures. QA Coordinator will note and will bring to the attention of the Field Manager and the Project Manager any deviations from the approved plans. All deviations will be recorded in the QA Coordinator's log and in the field notebook of the sampling team being audited.

Examples of non-compliance include not wearing appropriate PPE; Improper documentation; Failure to collect field blanks or duplicates; Improper sampling equipment; Unauthorized changes



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in sampling locations or sampling procedures; Improper field equipment decontamination; not properly calibrating equipment; and improper handling of samples or equipment.

The following QA/QC documentation must be met for all samples:

- Sample documentation (location, date and time of collection, etc.);
- Chain of Custody;
- Initial and continuing calibration;
- Sampling design approach;
- Determination and documentation of detection limits;
- Analyte(s) identification;
- Analyte(s) quantification;
- QC and Performance Evaluation samples.

### *3.1 Chain of Custody*

All samples must be transferred without exception to the appropriate analysis station under chain of custody. Standard Chain of Custody must be used for this purpose.

### *3.2 Sample Shipment*

Samples are to be treated in an appropriate and suitable manner for delivery to the analytical laboratory. All packaging and labels shall comply with Federal Department of Transportation regulations as provided in 49 CFR 171-178. Specific requirements for sample shipment are outlined in the QAPP.

### *3.3 Quality Assurance Manual Methods for $PM_{10}$*

Measures of accuracy, precision, and additional measurement quality objectives for PM10 measurements are summarized on Table A-1. The same procedures may be used for TSP and lead samplers when monitoring for these. Because of US EPA requirements, a different set of procedures is used for $PM_{2.5}$.

A manual PM monitoring system consists of a sampling system at the site, an analysis system at a central location and a transportation system to get the sample filters from one to the other. The system components will function within the limits of the applicable performance specifications given in 40 CFR parts 50 and 53. Monitoring program procedures will also be in general accordance with the guidance and recommendations of applicable sections of the ``Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I,(EPA/600/R94/038a) and ``Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Part 1,(EPA-454/R-98-004).

The sampling system consists of a sampler (one or more at each site) and a human sample collection staff who loads new (unexposed) filters into the sampler, sets it to sample the filter for 24 hours (normally midnight to midnight) on a specified day, and retrieves the exposed filter afterward.



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The gravimetric analysis system consists of a laboratory balance and a human analyst trained to operate it. The weighing should take place in controlled temperature and humidity. Before being weighed, both unexposed and exposed filters must be conditioned for at least 24 hours in this environment.

The unexposed and exposed sample filters are transported in their cartridges to reduce the chance of contamination.

- **Traceability of standards:**

  The following records of traceability, certification, etc. will be checked and maintained, along with criteria for the various calibrations, and audits:

  - flow: orifices certified against a NIST-traceable displacement meter
  - pressure drop: manometers certified NIST-traceable annually
  - masses and balances NIST-traceable
  - temperature and pressure NIST-traceable
- **Calibrations:** The sample collection staff performs a multi-point flow calibration of each particulate sampler using an orifice unit (quarterly, after maintenance or repairs and when indicated).
- **Precision checks** through collocation: A second sampler is placed the monitoring station.
- **Performance audits:**
  - Quarterly audits: An IH Quality Coordinator does a one-point flow audit quarterly on all samplers, using a different orifice unit than the one used to calibrate the sampler.
- **Data audit:** Data Manager reviews all the data for anomalies.

### *3.4 Quality Assurance for $PM_{2.5}$*

Measures of accuracy, precision, and additional measurement quality objectives for PM2.5 measurements are summarized on Table A-2. These are measures to ensure the quality of data gathered using manual samplers of $PM_{2.5}$. A manual $PM_{2.5}$ monitoring system consists of a sampling system at the site, an analysis system at a central location and a transportation system to get the sample filters from one to the other.

The sampling system consists of a sampler (one or more at each site) with attached temperature and pressure instruments and a human operator who loads new (unexposed) filters into the sampler, programs it to sample each filter for 24 hours (normally midnight to midnight) on a specified day, and retrieves the exposed filters afterward. "Sequential" samplers may be used, capable of automatically changing filters to sample for several days in a row. Sequential samplers can run continuously, except for maintenance and QA checks.

The gravimetric analysis system consists of a microbalance in a climate-controlled weighing room and a human analyst trained to operate it. The weighing must take place within a narrow range of temperature and humidity. Before being weighed, both unexposed and exposed filters must be conditioned for at least 24 hours in this environment.



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The exposed sample filters are transported in a cooler to limit the loss of volatile material, and are then kept in a refrigerator if they are cannot be weighed within 10 days of sampling (they still must be weighed within 30 days of sampling to be valid). Unexposed filters are taken out to the site under similar controlled conditions (usually in a cooler, although this is not necessary).

- **Data requirements:**
  - Backup instruments, field staff, and supplies will be maintained throughout the monitoring duration to ensure continuous operation of monitoring stations and high data recovery.
  - Data quality objective: 10% coefficient of variation. The coefficient of variation, CV, is the standard deviation as a fraction of the mean:

    $$CV = \frac{s}{\bar{x}}.$$
- **Measures of Accuracy and Bias:**
  - Check of flow rate
  - Audit by collocation with a portable FRM sampler.
- **Measures of Precision:**
  - Check of flow rate
  - Collocation (see below).
- **Collocation:**
  - Monitors have a second monitor collocated at the same site, rotated between sites.
  - The second ("duplicate") sampler runs every 6 days.
  - Collocated particulate samplers must be less than 4 m apart but more than 1 m apart.

The $PM_{2.5}$ sampler requires enhanced quality control measures because of its unique design and operational attributes. Examples of these QC measures include:

- Filter equilibration temperature control of +/-2 °C over 24 hours
- A pre-sampling filter weighing within 30 days of sampling period
- Retrieving the filter from the sampler within 96 hours of collection
- A post-sampling filter equilibration and re-weighing within 240 hours after the sampling period

The precision check for manual methods is based on a comparison of the concentrations measured by two samplers that collected data side-by-side during the same specific time period. To ensure that the two collocated samplers duplicate similar conditions during monitoring specific rules are enforced: The two collocated $PM_{2.5}$ samplers must be within 4 meters of each other and particulate matter samplers must be at least 1 meter apart to preclude airflow interference. This 1-meter separation is based on the low volume of sampling. Currently, the $PM_{2.5}$ FRM monitors have a sampling volume of 16.67 L/min. At low concentrations, agreement between the measurements of collocated samplers, since they are expressed as percent



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differences, may be relatively poor. For this reason, collocated measurements are selected for use in the precision calculations only when both measurements are above 60 $g/m^3$ for $PM_{2.5}$.

The accuracy check for manual methods involves checking the flow rate of the sampler each calendar quarter.

### *3.5 Quality Assurance for Gaseous Pollutants*

These are some of the measures Airtek staff take to ensure the quality of data from the continuous gas analysis systems. A "monitoring system" for a given pollutant at a given site usually consists of an inlet tube (called a "probe"), an automatic electronic analyzer and a data acquisition system (possibly connected to multiple instruments) and/or a strip chart recorder.

- **Traceability of standards:**
  - Gaseous pollutant concentration standards (in compressed-gas cylinders or in permeation tubes) traceable to a NIST-traceable reference material (NTRM) or to a NIST-certified gas manufacturer's internal standard (GMIS)
  - Ultraviolet photometers (for ozone) certified against a NIST-certified reference UV photometer at EPA
  - mass flow meters (inside multigas dilution/gas phase titration calibrators) certified traceable to NIST standards
  - flow calibrators (bubble meters and/or dry flow calibrators) certified NIST-traceable
  - temperature, pressure, etc. certified NIST-traceable
- **Multipoint calibrations:** The sample collection staff notes the monitoring system's response to multiple known concentrations, adjusting the system if necessary to read correctly. This is done quarterly, after maintenance or repair and when a zero/span check is out of range.
- **Zero/span checks:** The sample collection staff or an automated system records the monitoring system's response to pure air, then to a concentration near its upper range limit (at least once every 2 weeks).
- **Precision checks:** The sample collection staff or an automated system records the monitoring system's response to a known concentration of a roughly consistent value (every 2 weeks). (In practice, this is usually combined with the zero/span check.)
- **Performance audits:**
  - Quarterly audits: The IH Quality coordinator using a different calibrator and different gas standards (or a different photometer) notes the monitoring system's response to multiple concentrations. Normally, this is done quarterly for each monitor.
- **Data audit:** Airtek Data Manager (not the operator of the monitoring system in question) verifies the highest and one random hourly reading each day for each parameter, and reviews all the data for anomalies.



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## 4.0 DATA REPORTS

Instrumental data will be collected and stored in accordance with the instrument manufacturer's operations manual. Raw data (both chemical and meteorological) will be electronically stored and compiled in a manner that will facilitate computation of average concentrations. Accurate working files of all documentation, including logbooks, original data, calculations, deviations from approved procedures, and data review and validation, will be maintained by the Airtek data Manager.

The laboratories shall provide all deliverables in a format that will allow ready compilation and assessment of the data, as appropriate. The laboratory will report all quality control sample results for each batch of samples. The laboratory will not know which samples are duplicates and will report them as primary samples. Data for all samples will be provided with a copy of the Chain of Custody form. For each record sample, the laboratory report will include, at a minimum:

- Sample identification number assigned by the field sampling team;
- Date the sample was collected;
- Date the sample was extracted;
- Date the sample was analyzed;
- List of all target analytes for the method that lists the following data for each target analyte:
- quantity (concentration) found in sample,
- units of measure (e.g., micrograms per liter, milligrams per kilogram),
- detection limit and reporting limit with unit of measure,
- analytes reported below detection limit, etc.; and
- Non-conformance summary identifying any known failure to comply with the QAPP or Sampling and Analysis Plan such as the following:
    - exceeded holding times,
    - failure to achieve required detection limits,
    - poor surrogate recovery or poor duplicate precision,
    - unidentified samples or custody forms,
    - broken custody seals, and
    - uncalibrated or improperly calibrated instruments.

### *4.1 Laboratory Reports and Chain of Custody Forms*

The laboratory will send copies of reports, including data validation documentation to the Airtek QA Officer and a copy to the Airtek Project Manager for the project files. These reports will include a copy of the Chain of Custody form. The laboratory will retain a copy of all data reports and Chain of Custody forms.

## 5.0 DATA VALIDATION AND QUALITY ASSURANCE AUDIT

This section outlines the procedures necessary for the data validation and quality assurance audit, which ensures the accuracy of the results.

### *5.1 Data Validation*



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Data validation is a systematic procedure of reviewing a body of data against a set of established criteria so as to provide a specified level of assurance of its validity prior to its intended use. The review of the data will include an audit of the quality control samples—the laboratory's method blanks, field blanks, spikes, and surrogate recoveries. These quality control samples allow a direct check on the variability in the methods of analysis and sampling and in the sample matrix itself. The data will be reviewed by the laboratory's QA Officer for compliance to the technical specifications and completeness. The laboratory will provide a non-conformance summary as appropriate for the analytes determined. Included in the non-conformance summary will be notification of sample receipts. This will include information regarding problems with sample packaging, Chain of Custody and sample preservation. A preliminary review for deviations from method protocols including holding times, surrogate recoveries, and spike recoveries will be reviewed.

The QA Officer will evaluate a number of criteria including the following:

- Chain of Custody completeness;
- Analyses completed versus analyses planned;
- Time held versus holding times;
- Laboratory blanks (method and instrument);
- Laboratory Control Sample;
- Trip and field blank results; and
- Duplicate analyses precision.

Deficiencies discovered by the contracted laboratory QA Officer will be documented and communicated to the Airtek QA Officer, the Project Manager, and the Laboratory. The impact of deficiencies on use of the data will be evaluated by the Airtek QA Officer and the Project Manager.

### *5.2 Laboratory Audits*

During the laboratory analyses, Airtek QA Officer will be in direct contact with the laboratory to check on the project status. Any technical concern will be discussed during these updates, and formalized in writing by the contracted laboratory. A telefax may be used. Any significant problems impacting either the holding times, or the analytical methodologies, or the deliverable package will be determined.

### *5.3 Field Audits*

The purpose of QA field audits is to ensure compliance with the approved SAP and QAPP. During the performance of the sampling procedures, the QA Officer will make on site audits. Deviations from the approved plans will be brought to the attention of the Field Manager and the Project Manager. All deviations will be recorded in the QA Officer's log and field notebook of the sampling team being audited. Examples of non-compliance or deviations from the plans are given below:

- Not wearing appropriate PPE;
- Improper documentation;
- Failure to collect field blanks or duplicates;
- Improper sampling equipment;
- Unauthorized changes in sampling locations or sampling procedures; and
- Improper field equipment decontamination.



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## 6.0 CORRECTIVE ACTION

If the validity of the data should become suspect during performance of the QA/QC procedures identified in this plan, then corrective actions will be initiated. The actual trigger, as well as the form of the appropriate corrective action, is dependent on the specific method/procedures, time at which the error was detected and the type of the error that has occurred. For analytical instruments, the corrective action may include:

- Recalibration or standardization of the instrument;
- Preparation of new standards; Repair or replacement of equipment, including columns, detectors, etc.; and
- Reanalysis of samples.

The laboratory's internal Standard Operating Procedures define corrective action. These procedures will be requested by all laboratories providing analytical services to Airtek under this project and will be appended t the QAPP when received.

Upon determining that deviations from the prescribed protocols contained in the QAPP have occurred, the Laboratory Data Validation Officer will be notified. Within 48 hours, written confirmation of the occurrence and the corrective action taken will be provided to the client.

## 7.0 ASSESSMENT AND OVERSIGHT

The following subsections describe assessment and oversight measures to be taken during data collection. These actions are separate from the final data validation described in Section 5.1.

### 7.1 Assessments and Response Actions

The Data Manager will be responsible for routine assessment of data collection and for initiating necessary response actions. The routine assessment will include review of data to ensure that instruments are functioning and collecting information. Routine assessment actions will also include review of the QC measures described in Section 3.6. Response actions will be initiated immediately upon discovery of a problem. The Data Manager will perform these response actions as needed to collect data that meet the project requirements.

The Project QA Officer will conduct occasional field oversight of sampling and analysis activities. During at least one of these visits the Project QA Officer will submit performance audit samples to be analyzed. During field oversight, the Project QA Officer will visually observe sample collection and analysis to verify that the procedures outlined in this QAPP are being followed and that any corrective action initiated previously is being continued.

Field documentation of samples, calibration, QC measures, and corrective action will also be reviewed. In addition, the Project QA Officer will conduct at least one review of data and record management systems at Purdue during the field monitoring period. During this review, the Project QA Officer will verify that the data management procedures are being followed. Any issues identified during these reviews will be discussed with appropriate personnel and addressed immediately.



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### 7.2 Reports to Management

During project data collection, the Data Manager will be responsible for routine assessment and response actions as described above. If response actions are taken, the Data Manager will inform the Project QA Officer of the reason for these actions and the results. The Project QA Officer will then review this information to verify that the QAPP is being followed and to determine if changes to the QAPP are needed. If conditions requiring corrective action are identified during a review conducted by the Project QA Officer, a brief report will be issued to the Project Coordinator, EPA Region 2 and the Data Manager; however, corrective action will be initiated immediately based on verbal discussion during the review.

The draft and final project reports will contain all valid monitoring data expressed as hourly and daily values. The report will incorporate graphical representations of the location of all measurements taken. The report will also contain the numerical and qualitative results of all QC measures on all measurement systems and will compare them to the applicable acceptance criteria. In the event that data must be invalidated, the reason for data invalidation shall be identified with the resultant corrective action. In addition, the report will include a brief summary of corrective actions taken during field data collection. The report will discuss the impact of these corrective actions on data quality.

The Data Manager will provide copies of all data and reports to the Airtek Project Coordinator, the Airtek QA Officer, and to USEPA Region 2. Requests for copies of reports shall be directed to the Airtek Project Coordinator and the Owner for purposes of determining whether they contain Confidential Business Information. Reports and data shall otherwise be available for public distribution.

## 8.0 DATA VALIDATION AND USABILITY

All data generated under this QAPP will be reviewed and validated by the Data Manager. Original raw data review will be done within two business days after the data were recorded from measurement. Data will be validated and verified by comparison with instrumental performance parameters as identified in the applicable section of this QAPP or instrument operation manual.

Data will be evaluated for compliance with stated objectives for representativeness, precision, and accuracy. This will be done by comparing results of QC and calibration activities to the stated data quality criteria (Section 3). However, the evaluation process used to find and correct an error may not be defined in this QAPP because not all possible errors and corrections can be anticipated.

## 9.0 EXCEEDANCE NOTIFICATION

### Notification

The USEPA Region 2, NYCDEP, NYSDEC and the NYSDOL will be notified as promptly as reasonably possible via phone and electronic mail of any exceedance of either a Target Air Quality Level or a USEPA Site Specific Trigger Level and will be notified promptly of any corrective actions taken in connection with a Target Air Quality Level exceedance or an USEPA Site Specific Trigger Level exceedance.

### Monitoring Data



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All Sampling results collected pursuant to this specification, in suitable electronic form, will be promptly provided to the USEPA Region 2, NYCDEP, NYSDEC and NYSDOL offices weekly and exceedances will be reported as provided above.



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# Appendix A

Measurement Quality Objectives for PM10 and PM2.5 – [Ref. Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II: Part 1, Appendix No: 3,]

| Table A-1 - Measurement Quality Objectives - Parameter PM2.5 | | | |
|---|---|---|---|
| **Requirement** | **Frequency** | **Acceptance Criteria** | **40 CFR Reference** |
| ***Filter Holding Times*** | all filters | < 30 days before sampling | Part 50, App.L |
| Pre-sampling | " | < 10 days at 25 oC | |
| Post-sampling weighing | | < 30 days at 4oC | |
| **Sampling Period** | All data | 1380-1500 minutes<br>or<br>value if < 1380 and exceedance of NAAQS | Part 50, App.L Sec 3.3 |
| ***Reporting Units*** | All data | g/m3 | Part 50.3 |
| ***Detection Limit*** | | 2 g/m3 | Part 50, App.L Sec 3.1 |
| Lower DL | All data | 200 g/m3 | Part 50, App.L Sec 3.2 |
| Upper Conc. Limit | All data | | |
| ***Filter*** | | | |
| Visual defect check | All Filters | | Part 50, App.L Sec 6.0 |
| Filter Conditioning | | | |
| Environment | All Filters | 4 hours minimum | |
| Equilibration | " | 20-23 C | |
| Temp. Range | " | +/-2° C over 24 hr " " | Part 50, App.L Sec 8.2 |
| Temp. Control | " | 30% - 40% RH | " |
| Humidity Range | " | +/- 5% RH over 24 hr. | " |
| Humidity Control | " | | " |
| Lot Blanks | 3 filters per lot | less than 15 g | " |
| ***Lab QC Checks*** | | | |
| Field Filter Blank | | ±30 g change between weighings | Part 50, App.L Sec 8.2 |
| Lab Filter Blank | 3 per weighing session | | |
| Balance Check | beginning, every 10th samples, Sec. 7.9 | ±15 g change between weighings | |
| | end | < 3 g | |
| Duplicate Filter Weighing | 1 per sample batch | ±15 g change between weighings | |
| ***Calibration/Verification*** | | | |
| Flow Rate (FR) Calibration | If multi-point failure | ± 2% of transfer standard ± | Part 50, App.L, Sec 9.2 |
| FR multi-point verification | 1/yr | 2% of transfer standard ± | Part 50, App.L, Sec 9.2.5 |
| One point FR verification | 1/4 weeks | 4% of transfer standard 80 | |
| External Leak Check | every 5 sampling events | mL/min | Part 50, App.L, Sec 7.4 |
| Internal Leak Check | every 5 sampling events | 80 mL/min | Part 50, App.L, Sec 7.4 |
| Temperature Calibration | If multi-point failure | ± 2% of standard | Part 50, App.L, Sec 9.3 |
| Temp multi-point verification | on installation, then 1/yr | ± 2 of standard | Part 50, App.L, Sec 9.3 |
| One- point temp Verification | 1/4 weeks | ± 4E of standard | Part 50, App.L, Sec 9.3 |
| Pressure Calibration | on installation, then 1/yr 1/4 | ±10 mm Hg | Part 50, App.L, Sec 9.3 |
| Pressure Verification | weeks | ±10 mm Hg | Part 50, App.L, Sec 9.3 |
| Clock/timer Verification | 1/ 4 weeks | 1 min/mo | Part 50, App.L, Sec 7.4 |
| ***Accuracy*** | | | |
| FRM performance evaluation | 1 | ± 10% | Part 58, App A, Sec 3.5 |
| Flow Rate Audit | 1/2wk (automated) | ± 4% of audit standard | |



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|---|---|---|---|
| | 4/yr (manual) | | |
| External Leak Check | 4/yr | < 80 mL/min | not described |
| Internal Leak Check | 4/yr | < 80 mL/min | not described |
| Temperature Audit | 4/yr | + 2C not described | not described |
| Pressure Audit | 4/yr (?) | ±10 mm | not described |
| Balance Audit | 1/yr | Manufacturers specs | not described |
| ***Precision*** | | | |
| Collocated samples | every 6 days for 25% of sites | CV < 10% | Part 58, App.A, Sec 3.5/5.5 |
| Single analyzer | 1/3 mo. | CV < 10% | not described |
| Single Analyzer | 1/ yr | CV < 10% | not described |
| Reporting Org. | 1/ 3 mo. | CV < 10% | not described |
| ***Calibration & Check Standards*** | | | |
| Flow Rate Transfer Std. | 1/yr | ±2% of NIST-traceable Std. | Part 50, App.L Sec 9.1 and 9.2 |
| Field Thermometer | 1/yr | ± 0.1 C resolution | not described |
| | | ± 0.5 C accuracy | not described |
| Field Barometer | 1/yr | ± 1 mm Hg resolution | not described |
| | | ± 5 mm Hg accuracy | not described |
| Working Mass Stds. | 3-6 mo. | 0.025 mg | not described |
| Primary Mass Stds. | 1/yr | 0.025 mg | not described |

**Table A-1 - Measurement Quality Objectives - Parameter PM10 (Dichotomous Sampler)**

| Requirement | Frequency | Acceptance Criteria | Reference | Information/Action |
|---|---|---|---|---|
| **Reporting Units** | All data | µg/m3 | 40 CFR, Pt 50.7 | |
| **Filter Checks** | | | | |
| Visual defect check Filter Integrity | All filters | See reference | Vol II, MS 2.10.4 | Discard any defective filters |
| Collection efficiency | Purchase | 99 % | 40 CFR, Pt 50, | |
| Integrity | Specification | ± 5 µg/m3 | App M, S 7.2 | As measure by DOP test (ASTM-2988). Reject shipment. |
| Alkalinity | | < 25.0 microequivalents/gram | | |
| Filter Conditioning | All filters | | 40 CFR, Pt 50, | Following 2 months storage |
| Equilibration time | " | at least 24 hours | App M, S 9.3 | at ambient temp and |
| Temperature range | " | 15 to 30° C 4 | CFR, Pt 50, App | relative humidity. |
| Temperature control | " | ± 3 C | M, S 7.4 | Repeat equilibration |
| Humidity range | " | 20 to 45 % relative humidity | | Keep thermometer in |
| Humidity control | | ± 5 % relative humidity | | balance room and record temperature daily. |
| | | | | Keep hygrometer in the balance room and record humidity daily. |
| **Equipment** | | | | |
| Sampler | Purchase specification | 40 CFR, Pt 53.9 | | |
| **Detection Limit** | Purchase | | | The lower limit of the mass concentration is determined by the repeatability of filter tare weights, assuming the nominal air sample volume for the sampler. |
| Flow rate transfer standard | Purchase specification | 40 CFR, Pt 50, App M, S 7.3 | 40 CFR, Pt 50, App M, S 3.1 | |
| Analytical balance | Purchase specification | 40 CFR, Pt 50, App M, S 7.5 Vol II, MS 2.10.4 | | |
| Mass reference standards | Purchase specification | Vol II, MS 2.10.4 | | |



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| **Sampler Calibration**<br>Flow control device<br><br><br><br>Elapsed time meter<br><br><br>Flow-rate transfer Standard | <br><br>On installation, after repairs, after out-of-limits flow check<br><br>On receipt and 1/6 months<br><br>Periodically | <br><br><4% difference from manufacturers spec and actual<br><br>± 15 min<br><br>±2% over the expected range of ambient conditions | 40 CFR, Pt 50, App M, S 7.1<br>Vol II, MS 2.10.2<br><br>40 CFR, Pt 50, App M, S 7.1<br><br>40 CFR, Pt 50, App M, S 8.2<br><br>Vol II, MS 2.10.1<br>Vol II, MS 2.10.1 | Adopt new calibration curve if no evidence of damage, otherwise replace.<br><br><br>Adjust or replace.<br><br><br>Checked against NIST-traceable primary standard. |
| **Balance Calibration** | 1/year | | Vol II, MS 2.10.4 | Calibrate and maintain according to the manufacturer's recommendations. |



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| **Precision**<br>Single analyzer<br><br>Reporting organization | <br>1/6 days<br><br>1/ 3 months | # 5 Fg/m for conc. 80 µg/m3<br><br>7% for conc. >80 µg/m<br>95% CI < ± 15% | 40 CFR, Pt 50, App M, S 4.1<br><br>40 CFR, Pt 58, App A, S 5.3 EPA-600/4-83-023 | Both PM10 values must be > 20 µg/m . |
| **Accuracy**<br>Single analyzer<br>Annual accuracy | Quarterly<br>(all sites yearly) | None<br>95% CI # ± 20% | 40 CFR, Pt 58, App A EPA-600/4-83-023 Vol II, App 15, S 6 | Transfer standards different then those used in calibration. Recalibrate quarterly (all sites before any additional sampling. Invalidate data to last acceptable flow yearly) check if difference > 10%. |
| **QC Checks**<br>Field calibration flow check<br><br>"Standard" filter weighing<br><br>Reweighing filters<br><br>1/month<br><br><br>Balance zero and Calibration check | <br>1/month<br><br><br>at beginning of weighing day<br><br>5 exposed and 5 unexposed/day<br><br><br>every fifth filter | <br>Percentage difference # ±7 from sampler's indicated flow rate or # ± 10 % from design condition flow rate<br><br>± 20 g of original weight<br><br>± 20 g of original weight<br><br>± 2 g at 10 mg<br><br>± 4 g at zero<br>± 2 g at 10 mg | <br>40 CFR, Pt 50, App M, S 8.2 Vol II, MS 2.10.3<br><br>Vol II, S 2.10.4<br><br><br>Vol II, S 2.10.4<br><br><br>Vol II, S 2.10.4 | <br>Trouble shoot and recalibrate sampler.<br><br>Trouble shoot and reweigh.<br><br>Trouble shoot and reweigh.<br><br>Trouble shoot and reweigh. |



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