Area 1, Phase 2 Construction Air Monitoring Project Plan Parcel 3 Development

Honeywell Baltimore Works Site

Baltimore, Maryland

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Prepared for:
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U.S. Environmental Protection Agency, Region III
Maryland Department of the Environment

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List of Drawings

ATTACHMENT 1 QUALITY ASSURANCE PROJECT PLAN

Acronyms and Abbreviations

Name	Description
AST	Aboveground Storage Tank
bgs	Below ground surface
BMPs	Best Management Practices
° C	Degrees Celsius
CAMP	Construction Air Monitoring Plan
CDP	Conceptual Development Plan
CFR	Code of Federal Regulations
CHASP	Contractor Health and Safety Plan
COC	Contaminant of Concern
COMAR	Code of Maryland Regulations
COPR	Chromium Ore Process Residue
CR	Crusher Run
CrVI	Hexavalent Chromium
CSSA	Cover Soil Stockpile Area
DDP	Detail Development Plan
DOT	U.S. Department of Transportation
DW	Deep Well
EC	Emergency Coordinator
EE	Engineering Evaluation
EMMP	Environmental Media Monitoring Plan
EPS	Expanded Polystyrene
ERM	Environmental Resources Management, Inc.
ERP	Emergency Response Plan
ERS	Environmental Remediation System
ESC	Erosion and Sediment Control
EWMI	Environmental Waste Minimization, Inc.
F	Fahrenheit
GCL	Geosynthetic Clay Line
GGMP	Groundwater Gradient Monitoring Plan
H&S	Health and Safety
HASP	Health and Safety Plan
HAZMAT	Hazardous Materials
HAZWOPER	Hazardous Waste Operations and Emergency Response
HB	Hydraulic Barrier
HDPE	High Density Polyethylene

Name	Description
HMS	Head Maintenance System
Honeywell	Honeywell International Inc.
HPD	Harbor Point Development LLC
HSC	Health and Safety Coordinator
HSG	Health and Safety Guidance
HW	Hazardous Waste
IC	Ion Chromatography
LLDPE	Linear Low Density Polyethylene
LOD	Limits of Disturbance
m	Meter
m^3	Cubic Meters
MDE	Maryland Department of the Environment
MDOT	Maryland Department of Transportation
MD SWM	Maryland Stormwater Design Manual
mg	Milligram
MHMP	Material Handling and Management Plan
MLW	Mean Low Water
MMC	Multimedia Cap
MPs	Monitoring Plates
MSDSs	Material Safety Data Sheets
msl	Mean Sea Level
MSS	Master Supervisory Station
MPs	Monitoring Plates
NAAQS	National Ambient Air Quality Standard
NELAP	National Environmental Laboratory Accreditation Program
ng	Nanogram
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
OCP	Oil Control Program
OSHA	Occupational Safety and Health Administration
oz/sy	Ounce per square yard
PAHs	Polycyclic Aromatic Hydrocarbons
PAM	Perimeter Air Monitor
PE	Professional Engineer
PELs	Permissible Exposure Limits

Name	Description
PM	Project Manager
PM_{10}	Particulate Matter with aerodynamic diameter < 10 micrometer
PPE	Personal Protection Equipment
psf	Pounds per square foot
PVC	Polyvinyl Chloride
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RAMs	Real-time Aerosol Monitors
RCRA	Resource Conservation and Recovery Act
RIC	Remote Intelligent Controllers
RQ	Reportable Quantity
S-B	Soil-bentonite
SWP	Solid Waste Program
SPCC	Spill Prevention, Control, and Countermeasure
SPRP	Spill Prevention and Response Plan
SSMP	Surface Soil Monitoring Plan
SSO	Site Safety Officer
SW	Shallow Well
SWM	Stormwater Management
SWPPP	Stormwater Pollution Prevention Plan
TSP	Total Suspended Particulate
µg	Microgram
$\mu g/m^3$	Micrograms per cubic meter
µm	Micrometer
USDOJ	U.S. Department of Justice
USEPA	U.S. Environmental Protection Agency
UST	Underground Storage Tank
VCP	Voluntary Clean-up Program

1. INTRODUCTION

Harbor Point Development LLC (HPD) and its consultants have prepared this Construction Air Monitoring Plan (CAMP) for the Area 1, Phase 2, Parcel 3 Development, Honeywell Baltimore Works Site Project (Project). The Project is planned for a portion of the former AlliedSignal Baltimore Works Site (Site), located in Baltimore, Maryland.

This CAMP has been prepared as part of the Detailed Development Plan (DDP) for the Project, and is to be used in conjunction with the Quality Assurance Project Plan (QAPP) (CAMP, Attachment 1) for construction air monitoring, Material Handling Management Plan (MHMP), Spill Prevention and Response Plan (SPRP), and Storm Water Pollution Prevention Plan (SWPPP). This CAMP is applicable to development support activities as described in the DDP, and terminates post-construction, following completion of the intrusive activities identified in the DDP.

This CAMP builds on the success of the previous Harbor Point development efforts in controlling dust generating activities during construction. Dust control Best Management Practices (BMPs) implemented as part of the previous Harbor Point projects will also be implemented as part of this Project.

1.1 Location and Existing Environmental Controls

Harbor Point Parcel 3 Development, LLC and its consultants have prepared this Construction Air Monitoring Plan (CAMP) for the second phase (Phase 2) of development on Area 1 at the former Honeywell Baltimore Works Site (or “Site”), located in Baltimore, Maryland. For prior environmental remediation purposes, the Site is divided into three Areas (Areas 1, 2, and 3); each Area is comprised of a different environmental remedy including different engineered caps. Area 1 has the most robust environmental remedy and is bounded by Will Street to the east, Dock Street to the north and the Patapsco River to the northwest, west and south. Area 1 has a multimedia cap (MMC) and is referred to as the “on cap” Area. Areas 2 and 3 have soil caps, and are located east of Wills Street.

Area 1 is approximately 14 acres, and is divided into five separate lots/parcels. The first phase of development on Area 1 (i.e., Area 1, Phase 1) was comprised of the Exelon Tower and Central Plaza Garage. Area 1, Phase 1 occupied Parcels 2 and 5, and the project was completed in 2016. This second phase of development on Area 1 (i.e., Area 1, Phase 2 development) is within Parcel 3 (“Project” or “Project area”) of Area 1. Drawing CAMP-01 presents the combined wind rose at Baltimore/Washington International Airport during the period of 2010-2020. During this time, the wind was predominantly out of the west, which was observed 10.0% of the monitored hours.

1.2 Proposed Development

The development will consist of constructing two seven-story Office Buildings, an open space public area referred to as “Point Park”, a promenade along the bulkheaded shoreline, and general site development, such as sidewalks, landscaping, a parking garage, a drop-off area, and other ancillary features. The Site is located on a peninsula on the northeastern shore of the Patapsco River at the Inner Harbor in the Fells Point section of Baltimore City. This is the site of a former chrome ore processing facility (Baltimore Works) which consisted of production and numerous support buildings on an area that covered approximately 14 acres of original and made-land. The Site is surrounded by open water on the west and the south and the Living Classrooms facility to the north along a tidal inlet are referred to as the Back Basin. The Project area is adjacent to prior development projects at the Site, including Thames Street Wharf (completed in 2010) and Wills Wharf (completed in 2020) to the east, 1405 Point (completed in 2018) to the northeast, and the Exelon Tower and Central Plaza & Garage (completed in 2016) to the

north. A portion of the Project area currently contains asphalt-paved surfaces that are presently being used as active surface parking lots.

This Project is entirely located within Area 1. An environmental remediation system (ERS) was completed in 1999 by Honeywell pursuant to the 1989 Consent Decree between the U.S. Environmental Protection Agency (USEPA), U.S. Department of Justice (USDOJ), Maryland Department of Environment (MDE), and Allied Signal (Honeywell). The ERS is currently maintained and operated by Honeywell to contain chromium-contaminated groundwater and reduce human exposure to impacted soils within the limits of Areas 1, 2, and 3. Area 1 is the focus of this development project, and the principal contaminants of concern identified within Area 1 are hexavalent chromium and polycyclic aromatic hydrocarbons (PAHs).

The Area 1 ERS components consist of a Multimedia cap (MMC), a Hydraulic Barrier (HB), a Head Maintenance System (HMS) and an Outboard Embankment. The Consent Decree requires that the overall Site development must not interfere with the efficacy of the ERS corrective measures or with Honeywell's ability to comply with the performance standards defined in the Consent Decree, including the various media monitoring plans and performance requirements. Consequently, modifications to the Project features and/or restoration of the ERS corrective measures have been incorporated into this Project to maintain compliance with the requirements of the Consent Decree.

The Project will be the second major construction activity in Area 1, scheduled for commencement of construction in January 2022. The first construction (Phase 1) in Area 1 included the Exelon Tower and Central Plaza that was completed in 2016 in accordance with the USEPA and the MDE approved plans, including the CDP, DDP and subsequent minor modifications of the DDP. Phase 2 incorporates many similar components as implemented in Phase 1, including pile foundations with cap penetrations, MMC repairs, HMS modifications, material management, and air monitoring—the subject of this CAMP.

The CAMP is part of the Project's Detailed Development Plan (DDP). It describes the air monitoring program that will be carried out to inform construction operations of dust control needs and to document air quality impacts to the surrounding community. Drawing CAMP-02 illustrates features of the project vicinity and air monitoring program.

1.3 Applicability

This CAMP pertains to the real-time monitoring for PM_{10} and the collection of air samples for laboratory analyses of hexavalent chromium (CrVI). Since field-capable real-time CrVI monitoring instruments are not available, PM_{10} will also serve as a real-time surrogate for CrVI impacts. Detailed air monitoring quality assurance and quality control measures are found in the QAPP. The CAMP also describes how air monitoring data will be communicated to stakeholders and how the real-time PM_{10} data will be used to manage dust control measures.

For the purpose of this Plan, "intrusive activities" occur any time there is disturbance or exposure of the surface immediately below the MMC synthetic layers inside the HB in Area 1. Air monitoring will be implemented upon commencement of intrusive activities and will continue until intrusive work below the MMC have been completed and all materials generated during intrusive work below the MMC have been transported off site for proper disposal or beneficially re-used as fill material below the MMC.

2. CONSTRUCTION AIR MONITORING

This section summarizes the key elements of construction air monitoring for the Project during intrusive activities. Additional details are provided in the QAPP and its appendices. These supporting documents to the CAMP are substantively the same as those prepared for and approved by the agencies for the Exelon Project and the Wills Wharf Office Project. However, they have been adjusted as appropriate to reflect lessons learned from these projects and the nuances of this current Project.

2.1 Fixed Air Monitoring Sites

Five fixed Perimeter Air Monitoring (PAM) locations will be established for construction air monitoring. Each PAM station will be instrumented with a DustTrak 8533 (*or equivalent*) monitor accompanied by a PM_{10} inlet head for real-time measurement of PM_{10} and collection of filter samples, for subsequent laboratory gravimetric and CrVI analysis. One of the PAM sites will have a collocated monitor to provide data for calculating method precision. The fixed perimeter monitors are designated PAM-1, PAM-2, PAM-3, PAM-4 and PAM-5.

The PAM target location areas are indicated as ovals in drawing CAMP-02. Each PAM location will be within 50 feet of the project's "Limits Of Disturbance" (LOD). The specific locations will be finalized following a field survey, considering availability of mains power, safe access, and security. During the course of the Project, these locations may be adjusted following approval by the agencies if warranted by work conditions, work areas, weather conditions, etc. The general siting strategy will be to place the monitoring stations between the intrusive construction activities and the nearest buildings:

- PAM-1 is planned for placement between the Project and the Exelon Office Building;
- PAM-2 is planned for placement between the Project and the Point Street Apartments (under construction at the time that this CAMP was being prepared); and
- PAM-3, PAM-4, and PAM 5 will cover the remainder of the site perimeter.

In addition to the perimeter monitoring sites, a fixed monitoring sites will be operated to the north of the clean soil stockpile and the contaminated soil container storage area. Note that any contaminated soil will be contained within closed containers. This monitor, in conjunction with the perimeter monitors will provide real-time information on the adequacy of dust control measures, or the need for supplemental dust control efforts.

The fixed monitoring locations (PAMs and soil stockpile monitors) will be sited, to the extent possible, away from trees, buildings, roadways, or other obstacles that may cause undue influence on the measured concentrations in general conformance to the US EPA monitor siting guidelines contained in 40 CFR Part 58, Appendix E. All sampler inlets will be placed not less than 2 meters above ground level and, to the extent practicable, have unrestricted air flow of 270 degrees around each sampler.

Data from the fixed monitoring sites will be telemetered to a database server in real-time, where they will be screened. If an alarm level is exceeded, an alert will be issued to field and project management staff via email and/or text message. Procedures will be established to initiate appropriate dust control action.

2.2 Work Zone Monitoring

Work zone monitoring for real-time PM_{10} will also utilize DustTrak 8533 (*or equivalent*) instruments, mounted on portable tripods. Work zone monitoring will occur during all intrusive work, including the following activities expected in Area 1:

1. Pile driving;

2. Pile cap installation; and
3. Contaminated material excavation and augering.

The number of portable monitoring locations deployed during each phase of construction will be dependent on the spatial extent of intrusive activities. Two work zone monitors will be installed such that neither monitor is further than 45 degrees of the average downwind bearing measured from the most downwind edge of the center of the work zone. Additional work zone monitors may be deployed to reduce the need for re-location, should the wind direction shift significantly.

If multiple and separate intrusive construction locations occur at the same time and are in relatively close proximity (i.e., within 100 feet of each other), an array of monitors will be installed downwind of construction zones, with at least two downwind monitor operated for each 75 feet of projected crosswind (i.e., orthogonal to wind direction) distance of intrusive operations. Drawing CAMP-03 illustrates the work zone monitoring network geometry.

The portable stations will be deployed approximately 50 feet downwind of the downwind edge of the intrusive work area unless field conditions necessitate an alternative location, as described in Section 2.2.2. The work zone monitoring data will be telemetered to a database server in real-time, where they will be screened. If an alarm level is exceeded, an alert will be issued to field and project management staff via email and/or text message. Procedures will be established to initiate appropriate dust control action.

2.2.1 Optimization of Work Zone Monitoring Due to Field Conditions

During the course of intrusive construction activities at the Exelon Project and Wills Wharf Project, certain field conditions were encountered that led to modification of the construction air monitoring program. On these occasions, ERM, in consultation with EPA and MDE, evaluated the conditions using the following criteria:

1. Protection of human health and the environment;
2. Worker safety;
3. Consistency with the intent of the CAMP; and
4. Practicability.

Building on this collaborative experience with the agencies from the Exelon Project and Wills Wharf Project, this CAMP includes the substantive aspects of those adjustments to work zone monitoring in the event that these conditions occur for this Project. It should be note that the contractor may install a temporary geomembrane cap over excavations to achieve a continuous watertight seal of the MMC geomembrane over the excavation. The temporary cap will be welded and quality control tested. No air monitoring will be required in areas with a temporary geomembrane cap.

2.2.1.1 Pile Driver Exhaust

Pile driver exhaust has the potential to contribute greatly to nearby PM_{10} concentrations detected by a work zone monitor, resulting in false alarms. To address this situation, work zone monitoring will not be required at pile driving locations as long as the check dams, where needed, are installed and the work area is covered with either eight inches of clean cover soil or six inches of crushed gravel. The agencies' requirement for eight inches of clean cover soil is found in EPA and MDE's emails dated 15 January 2015, copies of which are also in Appendix A. At the end of each work day, the interim cover will also be covered with plastic, secured in place with sand bags or other suitable means.

2.2.1.2 Adjustment to Placement of Work Zone Monitor Downwind of Work Zone

A work zone monitor may be offset up to 50 feet downwind of the work area if construction conditions or worker safety issues arise that make it difficult to station the monitor within 50 feet of the work area. If such an offset is necessary, an explanation including photographic documentation will be included in that day's work zone monitoring field sheet. In any case, the total distance of the monitor from the work zone will not exceed 100 feet without prior agency approval.

2.3 Construction Monitoring Duration and Frequency

The duration and frequency of air monitoring is as follows:

1. PM_{10} will be continuously monitored and 24-hour composite filter samples collected at the five fixed perimeter stations (i.e., PAM-1, PAM-2, PAM-3, PAM-4, and PAM-5) from the time of initiation of intrusive construction activities in Area 1 until their conclusion. Real-time measurements will be telemetered to the database server; filter samples will be submitted to the laboratory for CrVI and gravimetric analysis. The laboratory gravimetric analyses will be used to standardize the real-time PM measurements, in accordance with the manufacturer's guidance.
2. PM_{10} will be continuously monitored and monthly 24-hour composite filter samples collected at one stockpile monitoring site when stockpile material is present. Real-time measurements will be telemetered to the database server; filter samples will be submitted to the laboratory for gravimetric analysis, which will be used to standardize the real-time PM_{10} measurements, in accordance with the manufacturer's guidance.
3. Work zone air monitoring for real-time PM_{10} will be performed during intrusive activities in Area 1 under the conditions described above in Section 2. Monthly 24-hour integrated filter samples will be collected and submitted to the laboratory for gravimetric analysis in order to standardize the real-time PM_{10} measurements, in accordance with the manufacturer's guidance.

Fixed perimeter real-time air monitoring for PM_{10} will operate continuously for the duration of intrusive construction activities. Collection of 24-hour integrated air filter samples for CrVI and gravimetric analyses by laboratory will occur each day from initiation of intrusive activities until their conclusion.

2.4 Monitoring Equipment

2.4.1 Real-Time PM_{10}

PM_{10} will be monitored at the perimeter, soil stockpile, contaminated soil container storage area, and work zones stations using DustTrak 8533 real-time dust monitors (*or equivalent*). Should a monitor malfunction, the Field Manager or designee will deploy a spare monitor as soon as practicable during construction hours and will contact the equipment provider to deliver a replacement spare monitor.

The DustTrak Model 8533 (*or equivalent*) will monitor PM_{10} concentration and store 1-minute averages on the internal data logger. All monitors will be equipped with PM_{10} size selective inlets. At least once per month, a sample collected from a filter sampler (BGI Model PQ-100, or equivalent) co-located with each real-time monitor will be analyzed gravimetrically to establish the monitor's correlation with mass concentration. This factor will be used to adjust subsequent raw data, until the next filter sample analysis is reported, in accordance with the manufacturer's guidance. The DustTrak (*or equivalent*) volumetric flow rate will be verified daily and maintained/operated according to the requirements specified in the Standard Operating Procedures (SOP) found the QAPP.

The monitoring instruments will be protected inside a waterproof case with an omni-directional air intake port and will be mounted on tripods or attached to fixed poles. The real-time monitor data loggers will be remotely polled via cellular modem at least once every five minutes by the database server.

2.4.2 Air Filter Samples for CrVI Analysis

Daily integrated air filter samples (nominally, 24-hour) air samples will be collected at each of the five perimeter air monitor. This may be collected using the same DustTrak Model 8533 (or equivalent) monitors employed for real-time PM_{10} measurements, provided its sample flow rate is at least 3.0 liters per minute and the analytical laboratory maintains a minimum detection limit no greater than 0.2 nanogram per filter All PAM filter samples will be laboratory-analyzed for CrVI. Pre-numbered filter cassettes sent by the laboratory will be sealed in zip lock plastic bags along with the chain of custody form. Upon receipt in the field from the laboratory, the cassettes will be inventoried and stored in a secure location, with the chain of custody forms.

The laboratory will specifically prepare the PAM filters intended for CrVI analysis –shipping them to the field in coolers with ice packs during transit. In the field, they will be maintained at a temperature of less than 0 degree C, except during actual sampling. Subsequent to sampling, they will be maintained at less than 0 degree C until being prepared for shipping.

At the beginning of each sampling day, sample containers retrieved for that day's sampling will be recorded as logged-out on the chain of custody form and will be dispatched to the sampling locations. At the conclusion of each day's sampling, the sample media will be recovered and placed in the sealed sample containers. PAM filter samples (for which CrVI analysis will be performed) will be temporarily stored in coolers with ice packs during transit from the sampling stations to the on-site secure freezer for storage. All samples will be logged in to chain of custody form and, initially, shipped daily via overnight, next day delivery to the laboratory, except on Saturday and Sunday. Samples collected on Saturday and Sunday are to be maintained in the on-site, secure freezer until Monday for shipping to the laboratory. This shipping frequency will occur for the first two weeks of intrusive activities, and then will be reduced to semi-weekly shipping, targeting Monday and Thursday of each week.

For shipment of samples to the laboratory from the field, the sample containers will be logged out on the chain of custody form. Then, sample containers will be shipped back to the laboratory inside the sealed zip lock-sealed bag in which they were received from the laboratory, along with the executed COC, fastened by rubber band to the sample container. Samples collected at the fixed perimeter sites, for which CrVI analysis is required, will be placed in a sturdy cooler with frozen ice packs to maintain a nominal temperature of 0 C. Samples intended for gravimetric analysis, only, need not be refrigerated for shipment.

CrVI concentrations from submitted samples will be determined in the laboratory in accordance with the Standard Operating Procedure for the Preparation and Analysis of Hexavalent Chromium by Ion Chromatography prepared by Eastern Research Group, Inc. (ERG), dated February 2014, as provided in the SOP found in the QAPP. ERG's document references ASTM Standard Test Method D7614-12 Determination of Total Suspended Particulate (TSP) Hexavalent Chromium in Ambient Air Analyzed by Ion Chromatography (IC) and Spectrophotometric Measurements. Gravimetric analysis will be performed in accordance with the appropriate laboratory procedure.

2.5 Transmission of Real-Time PM_{10} Data

The real-time PM_{10} measurements will be telemetered from the fixed and portable stations will be polled at least once every five minutes by the remote database server. The database server will continuously execute a script that will send an alert, by email and text notifications, to the on-site Field Manager and/or Field Technician if any of the monitors indicate an exceedance of the PM_{10} Alert Level or if diagnostics indicate a potentially malfunctioning unit. In the event of an alert of an alert level exceedance, corrective actions will be initiated in accordance with Standard Operating Procedure for Responses and Notifications to Alert Level Exceedances, found in the QAPP.

2.6 Meteorological Monitoring Station

A meteorological monitoring station will be sited following EPA siting guidance in EPA-454/B-08-002 *Quality Assurance Handbook for Air Pollution Measurement Systems Volume IV: Meteorological Measurements Version 2.0 (Final),* March 2008. Wind speed and direction sensors for the meteorological monitoring system will be situated approximately 10 meters above ground, mounted to one of the temporary construction office trailers housing the either Developer's or Contractor's representatives. The meteorological sensors will be calibrated on-site during installation following the guidance of EPA-454/B-08-002.

2.7 Webcam and Telemetry

During the intrusive work, a video camera ("webcam") will be operated by the construction contractor, to stream images of the project operations to stakeholders inclusive of EPA and MDE. The webcam feed will be available to the air monitoring program team, for interpreting the monitoring data.

In addition to the webcam, a telemetry system will be used to provide real-time air monitoring data (PM_{10}) to the project team. At a minimum, the data will include PM_{10} at the fixed and portable monitoring stations, and relevant meteorological data. A secure web site will provide timely data access by the project team, as well as EPA and MDE staff, and the general public.

3. QUALITY ASSURANCE AND QUALITY CONTROL

Detailed quality assurance and quality control measures are presented in the Quality Assurance Project Plan (QAPP). The QAPP addresses all quality-related aspects of the construction monitoring program ranging from siting the sampling equipment, to sampling, and analytical procedures. The following sections summarize the data management, review, and validation processes detailed in the QAPP. ERM notes that reference herein to a "QA Manager" is solely with respect to the air monitoring program and not as QA Manager for all construction related activities.

3.1 Data Management

All collected data will be reviewed and their accuracy verified, by the air monitoring Field Manager or his/her designee. The Field Manager will ensure that the field and technical data obtained for the project will provide the end user with suitable data. All field and technical data will be reviewed under the direction of the Field Manager, to ensure that the final data are accurate prior to the inclusion in the project report. The field data sheets, log books, and sampler data will be reviewed by the Field Manager at least weekly.

Real-time data processing for the PM_{10} monitoring results is summarized as follows:

1. The field data sheets and real-time instrument data logs will be submitted electronically by field personnel to the air monitoring Project Manager, weekly.
2. Real-time PM_{10} concentration data will be automatically polled once per minute by the database server and 15-minute averages computed and uploaded to a secure web site. The database server will also generate summary graphs illustrating the most recent seven days of monitoring.
3. Laboratory results will be posted to the web site as reports are received and processed.
4. The secure web site will be accessible by the project team, as well as authorized representatives of USEPA and MDE

The air monitoring Project Manager will store the information electronically into the project. The laboratory gravimetric and CrVI analytical results will be processed as follows:

1. Samples will be sent to the laboratory under chain-of-custody controls.
2. The laboratory will enter the sample information into their tracking system and perform the requested analyses.
3. The laboratory will electronically submit raw data, sample results, and their QA information to the air monitoring Project Manager.

   The Project Manager will use the raw laboratory data, sample results and QA information to compute the measured air concentrations. The computational framework and calculated results will be reviewed by an independent quality assurance auditor as part of the program's system audit. The system audit serves the function of the third party validator employed by the previous Harbor Point construction air monitoring programs, but is more comprehensive—covering all aspects of the QAPP.
4. If the system audit identifies any data processing deficiencies, these will be shared with EPA and MDE and a Corrective Action Plan implemented, in accordance with the applicable SOP contained in the QAPP.

All raw and final, validated data will be retained on file for five year after the cessation of air monitoring, and will be readily available for audits and additional data verification activities. After one year, hardcopy records and computer backup electronic media may be discarded.

3.2 Data Review and Validation

All data will be verified by a completeness review. Field operations will be fully documented, reviewed, and subject to both performance and independent system audits. Field data review will consist of evaluating field records for consistency and completeness, assuring that each sample result is fully supported by accurate metadata, reviewing QC and calibration information, summarizing deviations and determining their impact on data quality, summarizing the samples collected, and summary of the review in the project report.

4. ALERT LEVELS

The Alert Level concentrations will be the same as have been previously established for the Exelon Project, and were approved by the EPA and MDE. As discussed above, when winds are persistent (i.e., greater than 5 miles/hour), an automated database server script will subtract the real-time PM_{10} concentration of an upwind monitor to compute the net construction activity impact, prior to comparing the measured values to the Alert Level. The data processing system will automatically consult a look-up table to identify the best available upwind monitor and compute the net concentration at the measurement site. If wind speed is less than 5 miles per hour, no upwind adjustment will be made. Due to its proximity to Parcel 4 construction impacts, monitors near that activity will not be considered for use as upwind monitors. The upwind monitoring site look-up table will be developed by the air monitoring consultant once the exact monitor locations have been set.

The Alert Levels for this Project are:

1. The work zone air monitor Alert Level for PM_{10} is 68 micrograms per cubic meter ($\mu g/m^3$), 15-minute average. This Alert Level is applicable to the work zone portable monitors; or
2. The work zone air monitor Alert Level for PM_{10} will be adjusted to 118 $\mu g/m^3$, 15-minute average, under certain ambient weather conditions per the process described in Section 6 of this CAMP;
3. The perimeter air monitor Alert Level for PM_{10} is 150 $\mu g/m^3$, 15-minute average;
4. The perimeter air monitor CrVI Alert Level is 0.178 nanogram per cubic meter (ng/m^3), 24-hour average.

Actions and notifications in response to an exceedance of an Alert Level are specified in the QAPP and associated SOPs.

5. REPORTING

This section describes the reports that will document the air monitoring program's results. These include daily data summary tables, event logs, data quality assessment reports, performance evaluation and system audit reports, and the construction summary report.

5.1 Daily Data Summary Tables

Daily data summary tables containing 15-minute average PM_{10} concentrations for each fixed and portable monitoring station, wind speed, wind direction, and rainfall will be generated by the database server script and available for review on a secure web site for access by the agencies and the public.

Following the receipt of the laboratory analytical results and once the data have been validated by the third party, those analytical results will be added to the daily electronic spreadsheet summary tables and uploaded to the project files and website, for access by the agencies and the public.

5.2 Event Logs

When applicable, event logs will be generated to identify nonconforming situations and corrective actions taken per the SOP for Response Actions and Notifications provided in the QAPP. Corrective actions to remedy a nonconforming situation will be developed and implemented by the Field Manager, QA Manager, or the air monitoring Project Manager. A description of the required corrective action will be documented in an event log. Corrective actions must be approved by the QA Manager and by both the EPA and MDE representatives prior to implementation.

Upon implementation of the corrective action, the QA Manager and air monitoring Project Manager will be provided with the completed event log, which becomes part of the project file. Copies of completed event logs will also be provided electronically to the agencies within 24 hours of the event.

5.3 Data Quality Assessment Points

The Field Manager will report to the air monitoring Project Manager on the progress of each phase of field work and any QA/QC issues associated with field activities.

The laboratory will maintain detailed procedures for record-keeping and reporting to support the validity of all analytical work. The Laboratory QA Manager will provide the QA Officer quality certification documentation, including audit reports, upon request.

Data quality assessment reports will be submitted to the agencies on a monthly basis throughout the intrusive construction activity duration. Field verification and data validation information will be included. The assessment reports will include the laboratory data packages for CrVI, gravimetric analysis, and related metadata.

5.4 Performance Evaluation and System Audit Reports

In accordance with the QAPP, laboratory and field performance evaluations and audits will be performed during the course of the project. Following an evaluation or audit, the QA Manager will prepare a report summarizing the results and submit it to the agencies. Details of this process are provided in the QAPP.

5.5 Summary Data Reports

The final monitoring report will be prepared and distributed to the stakeholders. It will incorporate and summarize all of the interim reports described above.

6. OTHER PROVISIONS

During the course of the previous Area 1 air monitoring efforts, certain site-specific field conditions occurred that required adjustments to the CAMP. A description of these conditions and adjustments to the air monitoring program approved previously by the agencies are included in this CAMP, as adapted for the Project. These provisions are included as proactive measures to minimize the potential for delays in the field if these same conditions arise.

6.1 Adjustment of the Work Zone PM_{10} Alert Level Due to Certain Ambient Weather Conditions

The PM_{10} work zone dust alert level for the portable monitors may be modified under certain ambient conditions, e.g., fog or high absolute humidity, when the perimeter, fixed station PM_{10} concentrations exceed the work zone dust alert level. Under these conditions, Specifically, if the average of the four PAM monitors is equal to or above the work zone dust alert level of 68 µg/m^3 for three consecutive 15-minute period averages, then the Work Zone dust Alert Level may be increased to 118 µg/m^3. Conversely, if the average of the four PAM monitors are below the work zone dust alert level of 68 µg/m^3 for two consecutive 15-minute period averages, then the work zone dust alert level will be restored to 68 µg/m^3. The upwind monitor "net-out" process described above should greatly reduce the need for such adjustment during conditions when wind speeds exceed the 5 mile/hour threshold.

The air monitoring Field Manager will notify the EPA and MDE, providing a description of the current ambient conditions and graphically displayed data demonstrating the PM_{10} concentration values prior to increasing to the modified work zone dust alert level, or reverting back to the previously established work zone dust alert level. The "PM_{10} Avg" value will be computed automatically by the database server script and saved in the data record.

6.2 Check on Potential for Constant Readings for PM_{10}

PM_{10} concentration readings provided from the fixed and portable stations will also be monitored to ensure that the instruments are not sending constant readings, i.e., values are not changing for a 15-minute duration as an indication of possible monitor malfunction. The database server script will include a concentration persistence algorithm that will check the real-time values for each 15-minute period and calculates the standard deviation. The QAPP specifies the response actions and notifications in the event that this condition occurs. The following text summarizes the activities and set-up for the script logic.

If the standard deviation is below 0.01, the database server will send an alert (text/email) to the field personnel. Field personnel will respond to such alerts by inspecting the potentially malfunctioning unit and will resolve the possible malfunction as soon as practicable in accordance with the SOP found in the QAPP.

This algorithm applies to all stations in use at the site (portable work zone stations, fixed stockpile stations, and fixed perimeter stations) and runs a check every 2 minutes. For example, the standard deviation will be calculated for minutes 1 through 15, 3 through 17, 5 through 19, etc. There will be no alerts issued during non-working or non-intrusive hours.

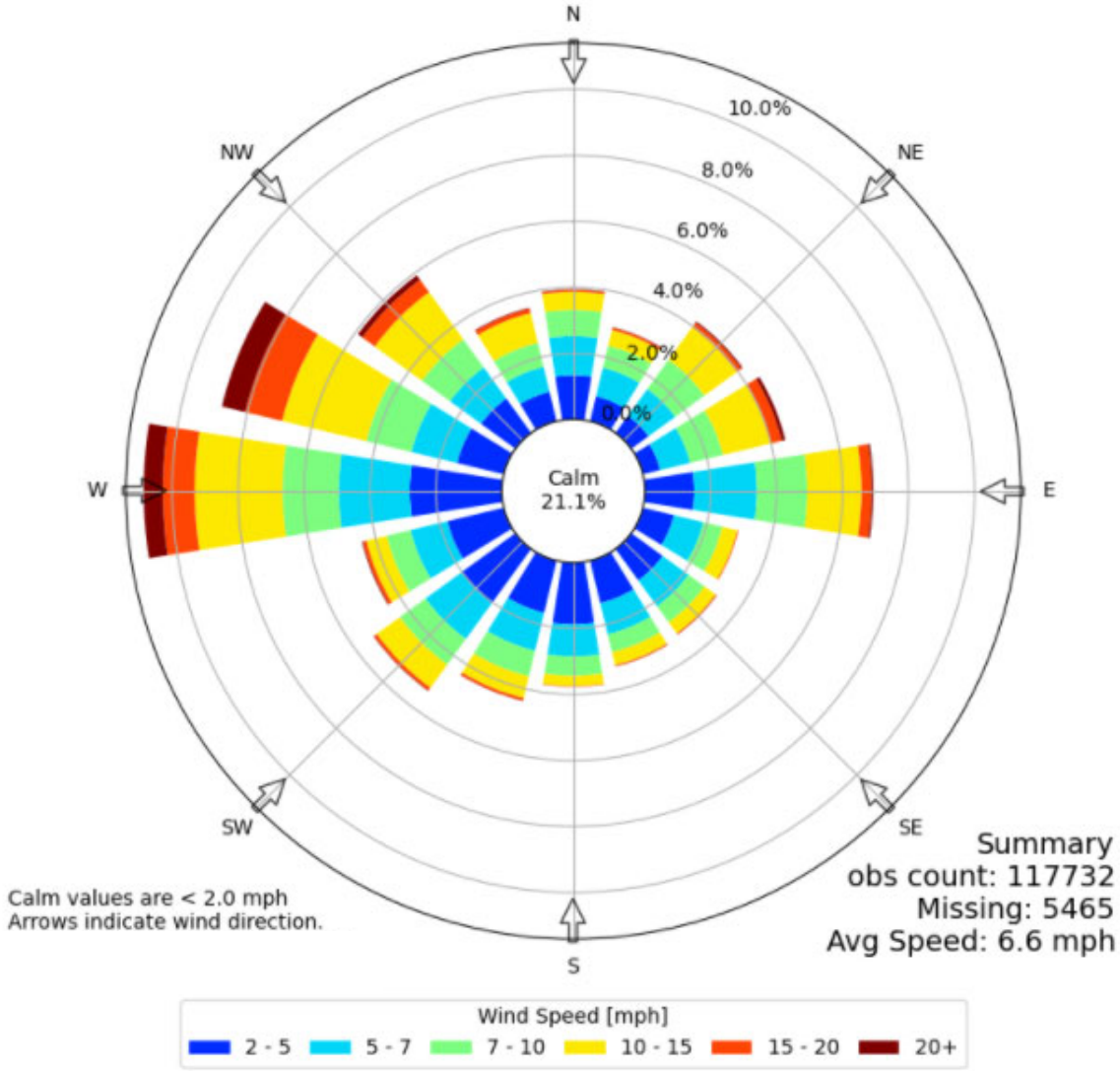
Additionally, the air monitoring Project Manager will each review the reported PM_{10} values using the 15-minute average graph generated by the database server for each of the fixed and portable stations at least twice per day when intrusive activities are in progress. The *Quality Control Live Data Check* table developed for tracking data will be used to document these reviews.

If, during these raw data checks, a station appears to be malfunctioning, the Project Manager will contact the field staff or, if the field staff makes this determination, the field personnel will respond to such alerts by inspecting the potentially malfunctioning unit and will resolve the possible malfunction as soon as practicable in accordance with the QAPP.

DRAWINGS

CAMP-01 – Wind Rose: Baltimore International Airport

Time Range: 2010-2020



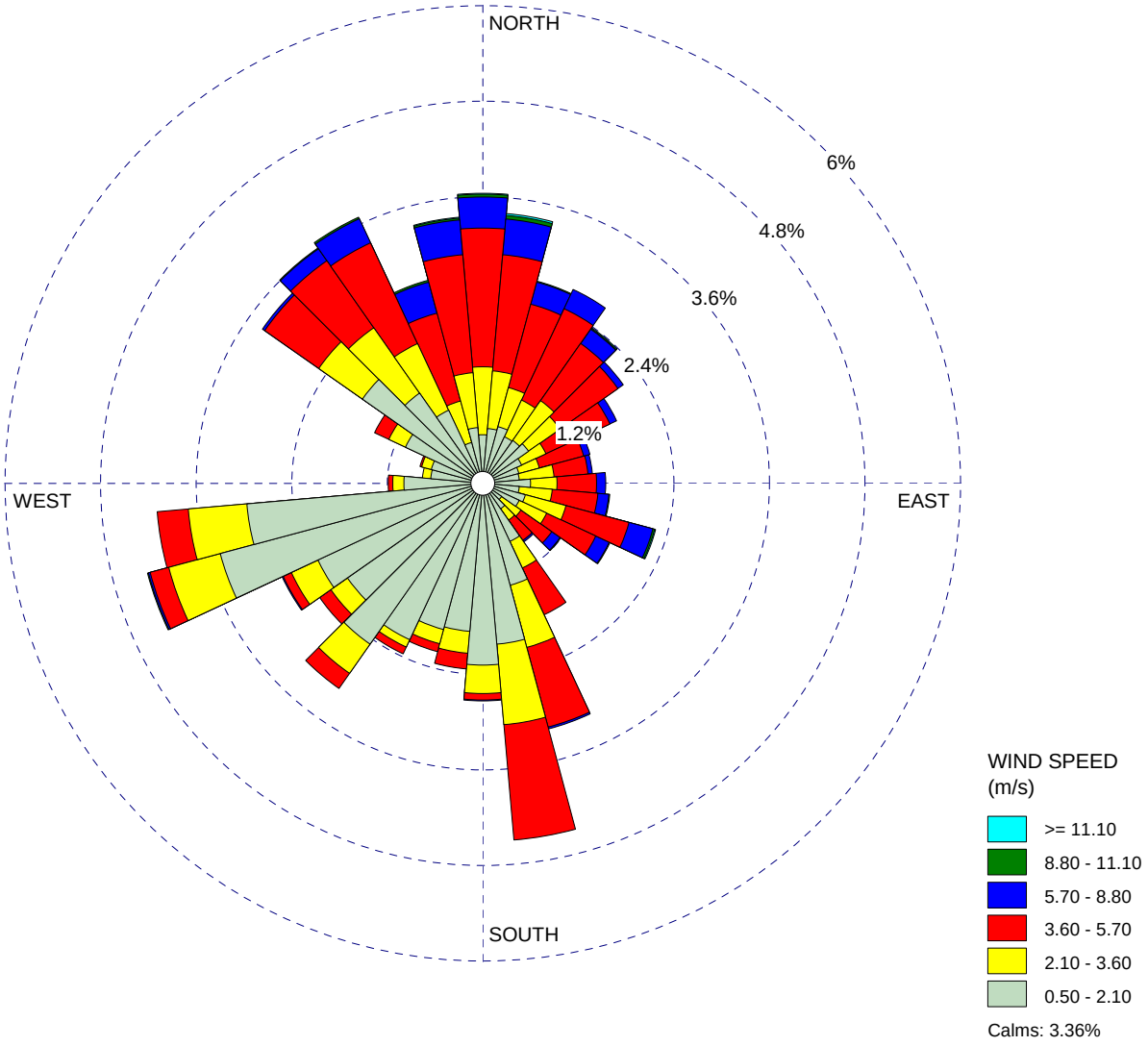
CAMP-01.1 – Wind Rose: Station BLTM2

WIND ROSE PLOT:

Station BLTM2 - 8574680 - Baltimore, MD

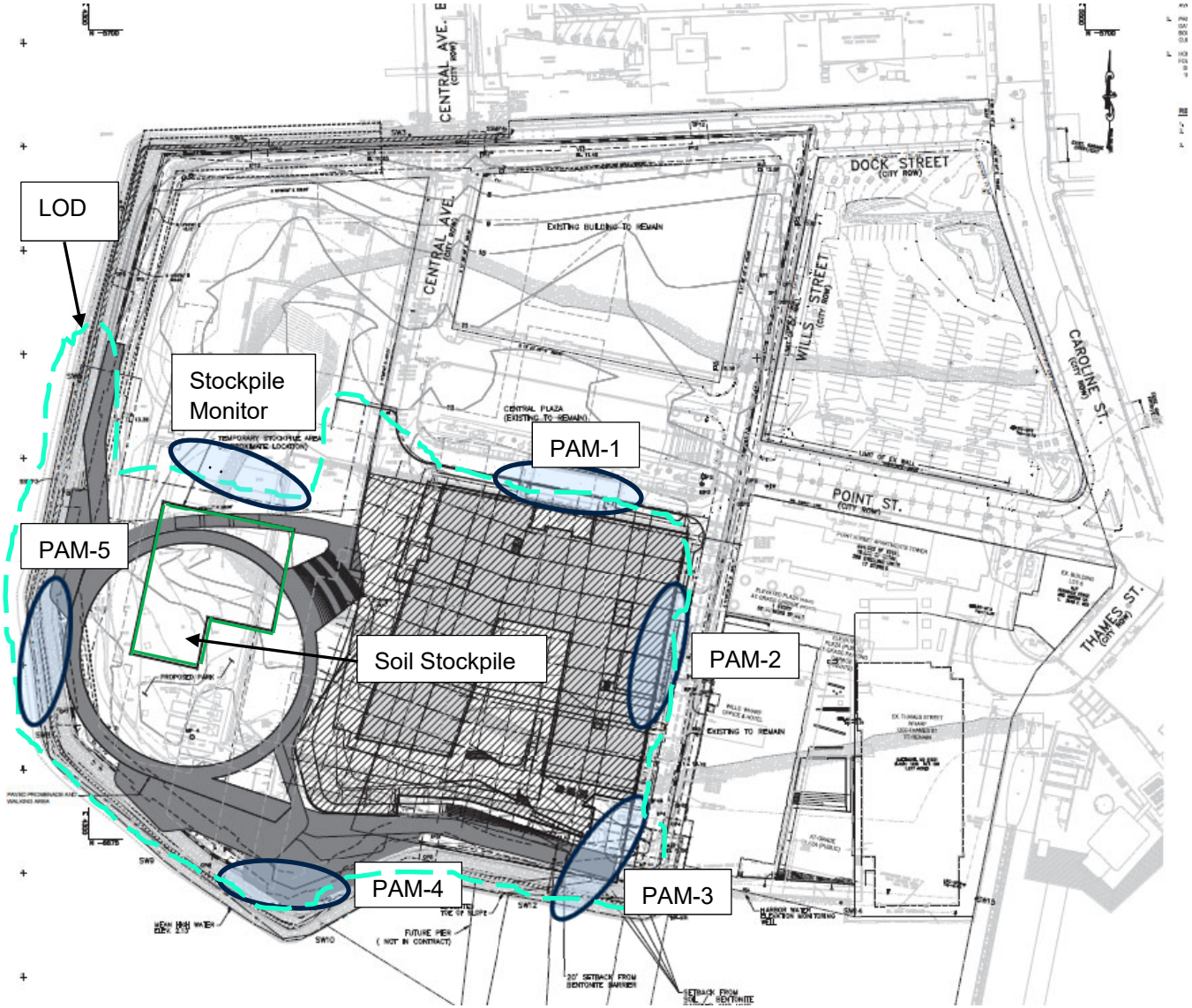
DISPLAY:

Wind Speed
Direction (blowing from)

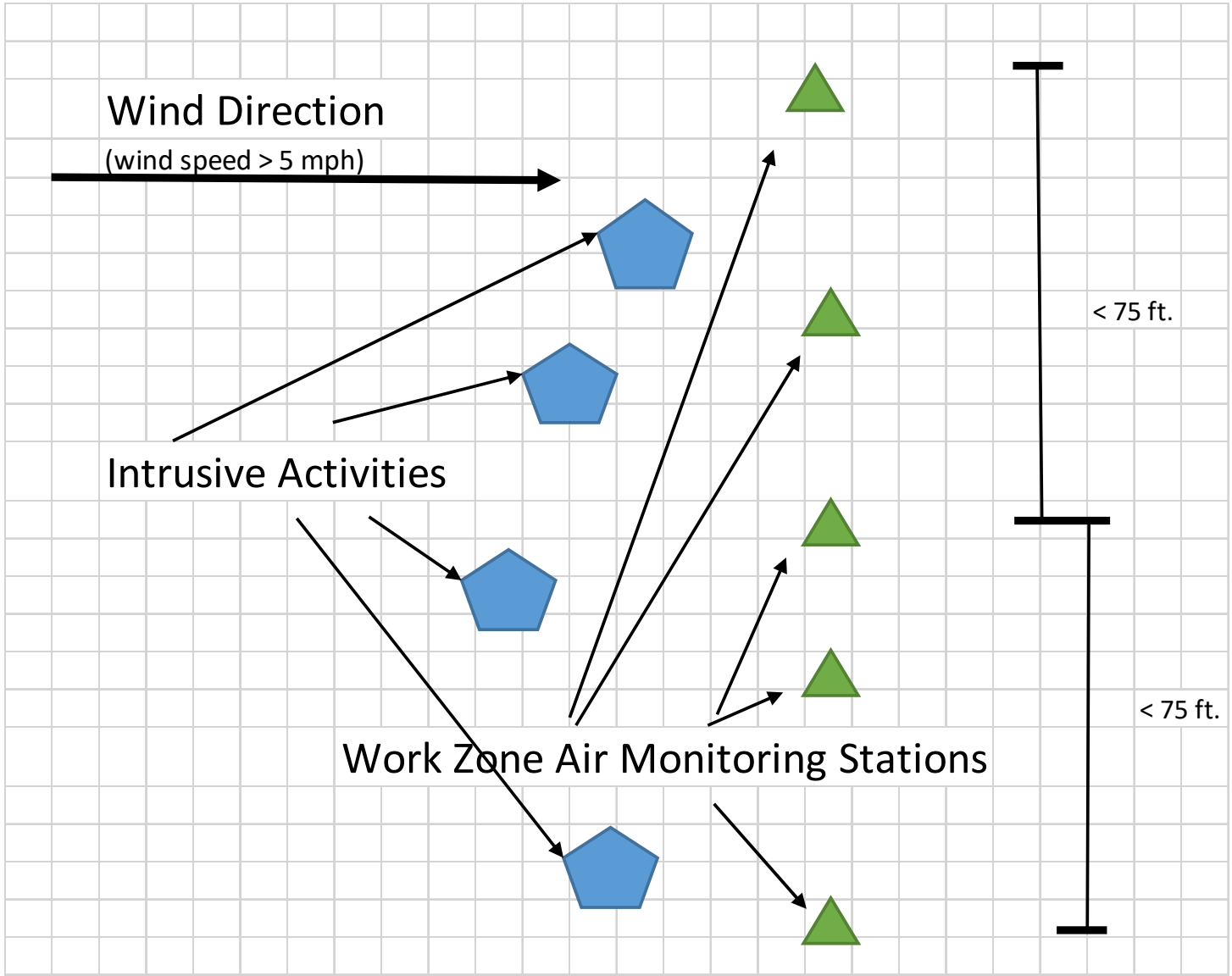


COMMENTS: 2020	DATA PERIOD: **Start Date: 1/1/2020 - 00:00** **End Date: 12/31/2020 - 23:00**	COMPANY NAME:	
		MODELER: **R. Jalbert**	ARCADIS
	CALM WINDS: **3.36%**	TOTAL COUNT: **7904 hrs.**	
	AVG. WIND SPEED: **2.64 m/s**	DATE: **8/16/2021**	PROJECT NO.: **30060991**

CAMP-02 – Plot Plan Project Vicinity and Air Monitoring Features



CAMP-03 – Work Zone Monitoring Network Geometry



ATTACHMENT 1 QUALITY ASSURANCE PROJECT PLAN

Area 1, Phase 2
Construction Air Monitoring Quality Assurance Project Plan
Parcel 3 Development

Honeywell Baltimore Works Site

Baltimore, Maryland

Revised November 19, 2021
August 10, 2021

Project No.: 0572981

Prepared for:
Honeywell International, Inc., U.S.
U.S. Environmental Protection Agency, Region III
Maryland Department of the Environment

Prepared by:
Harbor Point Parcel 3 Development, LLC
Environmental Resources Management, Inc.

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ATTACHMENT 1 FIELD DOCUMENTATION

Acronyms and Abbreviations

Name	Description
AST	Aboveground Storage Tank
bgs	Below ground surface
BMPs	Best Management Practices
° C	Degrees Celsius
CAMP	Construction Air Monitoring Plan
CDP	Conceptual Development Plan
CFR	Code of Federal Regulations
CHASP	Contractor Health and Safety Plan
COC	Contaminant of Concern
COMAR	Code of Maryland Regulations
COPR	Chromium Ore Process Residue
CR	Crusher Run
CrVI	Hexavalent Chromium
CSSA	Cover Soil Stockpile Area
DDP	Detail Development Plan
DOT	U.S. Department of Transportation
DW	Deep Well
EC	Emergency Coordinator
EE	Engineering Evaluation
EMMP	Environmental Media Monitoring Plan
EPS	Expanded Polystyrene
ERM	Environmental Resources Management, Inc.
ERP	Emergency Response Plan
ERS	Environmental Remediation System
ESC	Erosion and Sediment Control
EWMI	Environmental Waste Minimization, Inc.
F	Fahrenheit
GCL	Geosynthetic Clay Line
GGMP	Groundwater Gradient Monitoring Plan
H&S	Health and Safety
HASP	Health and Safety Plan
HAZMAT	Hazardous Materials
HAZWOPER	Hazardous Waste Operations and Emergency Response
HB	Hydraulic Barrier
HDPE	High Density Polyethylene

Name	Description
HMS	Head Maintenance System
Honeywell	Honeywell International Inc.
HPD	Harbor Point Development LLC
HSC	Health and Safety Coordinator
HSG	Health and Safety Guidance
HW	Hazardous Waste
IC	Ion Chromatography
LLDPE	Linear Low Density Polyethylene
LOD	Limits of Disturbance
m	Meter
m^3	Cubic Meters
MDE	Maryland Department of the Environment
MDOT	Maryland Department of Transportation
MD SWM	Maryland Stormwater Design Manual
mg	Milligram
MHMP	Material Handling and Management Plan
MLW	Mean Low Water
MMC	Multimedia Cap
MPs	Monitoring Plates
MSDSs	Material Safety Data Sheets
msl	Mean Sea Level
MSS	Master Supervisory Station
MPs	Monitoring Plates
NAAQS	National Ambient Air Quality Standard
NELAP	National Environmental Laboratory Accreditation Program
ng	Nanogram
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
OCP	Oil Control Program
OSHA	Occupational Safety and Health Administration
oz/sy	Ounce per square yard
PAHs	Polycyclic Aromatic Hydrocarbons
PAM	Perimeter Air Monitor
PE	Professional Engineer
PELs	Permissible Exposure Limits

Name	Description
PM	Project Manager
PM_{10}	Particulate Matter with aerodynamic diameter < 10 micrometer
PPE	Personal Protection Equipment
psf	Pounds per square foot
PVC	Polyvinyl Chloride
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RAMs	Real-time Aerosol Monitors
RCRA	Resource Conservation and Recovery Act
RIC	Remote Intelligent Controllers
RQ	Reportable Quantity
S-B	Soil-bentonite
SWP	Solid Waste Program
SPCC	Spill Prevention, Control, and Countermeasure
SPRP	Spill Prevention and Response Plan
SSMP	Surface Soil Monitoring Plan
SSO	Site Safety Officer
SW	Shallow Well
SWM	Stormwater Management
SWPPP	Stormwater Pollution Prevention Plan
TSP	Total Suspended Particulate
µg	Microgram
$\mu g/m^3$	Micrograms per cubic meter
µm	Micrometer
USDOJ	U.S. Department of Justice
USEPA	U.S. Environmental Protection Agency
UST	Underground Storage Tank
VCP	Voluntary Clean-up Program

1. PROJECT MANAGEMENT

Harbor Point Development LLC (HPD) and its consultants have prepared this Quality Assurance Project Plan (QAPP) for the Area 1, Phase 2, Parcel 3 Development, Honeywell Baltimore Works Site Project (Project). The Project is planned for a portion of the former AlliedSignal Baltimore Works Site (Site), located in Baltimore, Maryland.

A Construction Air Monitoring Plan (CAMP) has been prepared as part of the Detailed Development Plan (DDP) for the Project, and describes the overall approach to the air monitoring program. This QAPP provides guidance and minimum commitments to those activities that affect data quality. The air monitoring program supports and informs the project's Material Handling Management Plan, Spill Prevention and Response Plan, and Storm Water Pollution Prevention Plan.

This QAPP is applicable to the air monitoring aspects of development support activities described in the DDP. It terminates post-construction, following completion of the intrusive and dust-generating activities identified in the DDP.

The project consists of air monitoring during construction at the Harbor Point Development site. The QAPP outline and format generally conform to the policies and guidance specified in the USEPA Guidance on Quality Assurance Project Plans (CIO 2106-G-05 QAPP), USEPA, 2012. The QAPP presents the rationale and scope of work associated with quality-related field activities (e.g., sample types, sample locations), the project data quality objectives, protocols for collecting samples, field and laboratory analytical procedures, quality assurance/quality control (QA/QC) procedures, data quality evaluation criteria, and procedures for documenting field and laboratory methods so that data are technically and legally defensible.

1.1 Title and Approval Page

See page 1-2.

1.2 Table of Contents

See page 3-5.

1.3 Distribution List

QAPP Recipient	Project Role	Organization	Address / E-mail / Phone
TBD	Project Coordinator	USEPA Region 3	Office of Remediation 3LC20 1650 Arch Street Philadelphia, PA 19103-2029 <coordinator email> <coordinator phone number>
TBD	Technical Lead	USEPA Region 3	Office of Technical and Administrative Support 3LC10 1650 Arch Street Philadelphia, PA 19103-2029 <technical lead email> <technical lead phone number>

QAPP Recipient	Project Role	Organization	Address / E-mail / Phone
Ed Dexter	Project Coordinator	MDE	Solid Waste Program 1800 Washington Boulevard Suite 605 Baltimore, MD 21230-1719 Ed.dexter@maryland.gov (410) - 537- 3376
Brian Coblentz	Chief of the Solid Waste Program's Compliance Division	MDE	Solid Waste Program 1800 Washington Boulevard Suite 605 Baltimore, MD 21230-1719 Brian.coblentz@maryland.gov (410) - 537- 4175
Jonathan Flesher	Project Manager	Harbor Point Development LLC (HPD)	1300 Thames Street Suite 10 Baltimore, MD 21231 jflesher@beattydevelopment.com (410) 332-1100
George Pfeiffer	Project Manager	Honeywell International	101 Columbia Road Morristown, NJ 0796 george.pfeiffer@honeywell.com 908-791-0897
Brian Magee	Consultant to T. Rowe Price	Arcadis	Arcadis One Executive Drive Suite 303 Chelmsford, MA 01824 brian.magee@arcadis.com (978) 322-4519
Norman Forsberg	Consultant to T. Rowe Price	Arcadis	Arcadis U.S., Inc. 855 Route 146, Suite 210 Clifton Park, NY 12065 norman.forsberg@arcadis.com, (518) 250 7251
TBD	Laboratory Program Manager	TBD	<laboratory address> <program manager email> (<program manager phone number>
TBD	Air Monitoring Consultant Project Manager	TBD	<air monitoring consultant address <project manager email <project manager phone number>

1.4 Project Organization

Name	Title/Role	Organizational Affiliation	Responsibilities
Jonathan Flesher	Project Manager	HPD	■ Oversees all project activities. ■ Directs the scope of work to the air monitoring consultant's PM.
			■ Reviews and approves all documents and coordinate transmittal of documents to appropriate parties for review.
			■ Communicates with stakeholders regarding project activities.
TBD	Partner-in-Charge	Air monitoring consultant	■ Oversees entire program for the air monitoring consultant. ■ Reviews all final deliverables and invoices.
			■ Seeks HPD feedback on performance of project managers.
			■ Addresses program-level issues.
TBD	Project Manager	Air monitoring consultant	■ Reports to air monitoring consultant Partner-in-Charge ■ (TBD) and HPD ■ Jonathan Flesher
			■ Directs air monitoring consultant's Field Manager and subcontractors.
			■ Communicates questions or issues to Agency leads (MDE and USEPA)
			■ Ensures that assigned staff has been trained in SOP implementation.
			■ Ensures that all key decisions and project deliverables are subjected to independent technical review by qualified personnel within the time frame of the project schedule.

1.5 Problem Definition and Background

The Harbor Point Parcel 3 Development in the second phase (Phase 2) will occur on Area 1 at the former Honeywell Baltimore Works (the site), located in Baltimore, Maryland. For prior remediation purposes the Site is divided into three Areas (Areas 1, 2 and 3); each Area is comprised of different environmental remedy inducing different engineered caps. Area 1 has the most robust environmental remedy and is bounded by Wills Street to the east, Dock Street to the north and the Patapsco River to the northwest, west and south. Area 1 has a multimedia cap (MMC) and is referred to as the "on cap" Area. Areas 2 and 3 have soil caps, and are located east of Wills Street. Area 1 is approximately 14 acres, and is divided into five separate lots/parcels. The first phase of development on Area 1 (i.e., Area 1, Phase 1) was comprised of the Exelon Tower and Central Plaza Garage. Area 1, Phase 1 occupied Parcels 2 and 5,

and the project was completed in 2016. This second phase of development on Area 1 (i.e., Area 1, Phase 2 development) is within Parcel 3 ("Project" or "Project area") of Area 1. The development will consist of constructing two seven-story Office Buildings, an open space public area referred to as "Point Park", a promenade along the bulk-headed shoreline, and general site development, such as sidewalks, landscaping, a parking garage, a drop-off area, and other ancillary features.

The Site is located on a peninsula on the northeastern shore of the Patapsco River at the Inner Harbor in the Fells Point section of Baltimore City. This is the site of a former chrome ore processing facility (Baltimore Works) which consisted of production and numerous support buildings on an area that covered approximately 14 acres of original and made-land. The Site is surrounded by open water on the west and the south and the Living Classrooms facility to the north along a tidal inlet are referred to as the Back Basin. The Project area is adjacent to prior development projects at the Site, including Thames Street Wharf (completed in 2010) and Wills Wharf (completed in 2020) to the east, 1405 Point (completed in 2018) to the northeast, and the Exelon Tower and Central Plaza & Garage (completed in 2016) to the north. A portion of the Project area currently contains asphalt paved surfaces that are presently being used as active surface parking lots. The historical manufacturing processes at the site resulted in chromium impacts to soil and groundwater. The original buildings and associated infrastructure have been removed from the site, and a number of remedial actions are on-going.

This specific project is entirely located within Area 1. Area 1 was the principal site of Honeywell's Baltimore Works Facility where chromium ore was processed from 1845 to 1985. An environmental remediation system (ERS) was completed in 1999 by Honeywell pursuant to the 1989 Consent Decree between the U.S. Environmental Protection Agency (USEPA), U.S. Department of Justice (USDOJ), Maryland Department of Environment (MDE), and Allied Signal (Honeywell). The ERS is currently maintained and operated by Honeywell to contain chromium contaminated groundwater and reduce human exposure to impacted soils within the limits of Areas 1, 2, and 3. Area 1 is the focus of this development project, and the principal contaminants of concern identified within Area 1 are hexavalent chromium and polycyclic aromatic hydrocarbons (PAHs). The Area 1 ERS components consist of a Multimedia cap (MMC), a Hydraulic Barrier, a Head Maintenance System (HMS), a ground water storage and transfer system and an Outboard Embankment. The HMS maintains an inward ground water gradient to mitigate the migration of chromium-impacted ground water from the site.

The primary concern addressed by this Construction Air Monitoring Program QAPP is the potential for particulates containing CrVI to be distributed on-site and off-site during the period of construction that involves the disturbance of contaminated materials below the MMC. CrVI is considered by the USEPA to be a known human carcinogen by the inhalation route of exposure (USEPA 2013). Inhalation of CrVI dusts is also associated with non-cancer toxicity. Particulate matter (dust) is also a concern. The air monitoring program measures PM_{10}, to ensure compliance with ambient air quality standards. PM_{10} also serves as a surrogate for CrVI since it is not feasible to measure CrVI directly, in the field.

The Project will be the second major construction activity in Area 1, scheduled for commencement of construction in January 2022. The first construction (Phase 1) in Area 1 included the Exelon Tower and Central Plaza that was completed in 2016 in accordance with the USEPA and the MDE approved plans, including the CDP, DDP and subsequent minor modifications of the DDP. Phase 2 incorporates many similar components as implemented in Phase 1, including pile foundations with cap penetrations, MMC repairs, HMS modifications, material management, and air monitoring. Many of the previous USEPA and MDE-approved modifications to the ERS will therefore be reprised for Phase 2. However, several elements are unique to Phase 2, such as Point Park and development over low strength subsurface materials.

For the purposes of this Plan, "intrusive activities" refers to any time there is disturbance or exposure of the surface immediately below the MMC synthetic layers inside the HB in Area 1. Air monitoring will be implemented upon commencement of intrusive activities and will continue until the intrusive area is adequately covered with clean material or the geomembrane has been fully restored and materials from beneath the MMC have been removed from the site for offsite disposal.

1.6 Project/Task Description and Schedule

Due to the dynamic nature of dust-disturbing activities during construction, providing real time information on concentration levels of particulates to project personnel during construction is necessary in order that dust-generating activities on site can be appropriately controlled. Real-time instrumentation is available to measure ambient concentrations of particulate matter at 10 µm or smaller aerodynamic diameter (PM_{10}), but such instrumentation is not available for measuring CrVI concentrations in real-time, in the field. Air samples for measuring field CrVI concentrations require laboratory analysis.

A network of five PM_{10} monitors will be established at pre-determined locations along the Project perimeter. A 3-meter, tripod-mounted wind speed and wind direction system will provide local meteorological measurements at the Project site. Each monitoring system will be equipped with a data logger to collect, process, and record data, and a cellular modem to continuously telemeter the data to a central processing data server.

All instruments and data collection services will be configured and tested in a controlled setting by air quality technicians before deploying the site location. The air quality technicians will travel to the site to install, calibrate and perform flow checks on the fixed monitors to ensure proper field operations. Local staff will be responsible for identifying the need for and location of work zone monitor, setting them up, initiating monitoring Local staff will also be responsible for periodic checks to ensure the equipment is not vandalized, operating normally, and is receiving adequate power. Once the project is completed, the instruments will be subject to final calibration verification, demobilized from the site location, and returned to the vendor/owner.

To address the data objectives, perimeter real-time PM_{10} data will be collected from the time of initial surface disturbance, and then throughout the construction period. Perimeter CrVI sampling (24-hour integrated filter samples) will be performed whenever intrusive activities are being performed and will continue until the excavated area is covered and the MMC Is repaired and all materials from beneath the MMC have been removed from the site. Once soil stockpile(s) have been established, fixed real-time PM_{10} monitoring will be performed until the stockpile(s) is removed. Real-time PM_{10} monitoring will be performed downwind, in the vicinity of any intrusive activities. The locations of work zone monitors will be follow the intrusive activities as described in the Construction Air Monitoring Plan.

The intended use of the air monitoring data is to measure/monitor PM_{10} and CrVI during construction to ensure the efficiency of on-going dust-suppression activities such that dust control measures can be supplemented, as appropriate.

The continuous PM_{10} and meteorological data will be telemetered to a database server where they will be post-processed in real-time to compute the project-related impact. Based on embedded logic, the data system will gauge whether remediation activities may be causing off-site concentrations in excess of the established Alert Levels. The results of those computations will be used to automatically issue various levels of alarms to the onsite remediation Project team.

A final data report will be prepared that presents monitoring results, summary statistics, and QA/QC assessments, at the conclusion of the monitoring program.

1.7 Quality Objectives and Criteria for Measurement Data

Data quality objectives (DQOs) are an integrated set of qualitative and quantitative decision statements that define data quality requirements based on the end use of the data. The USEPA has developed a seven-step process (shown in bold italics below) to clarify study objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions. The DQO process is described in detail in the USEPA guidance document, Guidance on Systematic Planning Using the Data Quality Objectives Process USEPA QA/G-4 (February 2006).

1.7.1 Objectives and Project Decisions

The objective of the construction air monitoring program is to ensure that representative and accurate real-time PM_{10} and 24-hour integrated airborne CrVI data are collected to ensure that the site perimeter and work zones are accurately monitored during construction to control any potential release in a timely manner.

The sections below summarize the variables to be measured, the quality assurance/quality control mechanisms in place, measurement quality objectives, and data validation and audit results.

1.7.1.1 Variables to be Measured

- Continuous PM_{10} concentrations, reduced to 15-minute averages;
- Integrated PM_{10} concentrations (filter samples for correcting the real-time PM_{10} measurements);
- 24-hour integrated particulate CrVI concentrations (filter samples);
- Observations of field conditions and activities in the vicinity of each monitoring station; and
- Hourly Wind Speed and Wind Direction, for assessing the net impact of construction activities and validating air quality measurements.

1.7.1.2 QA/QC Mechanisms

Quality assurance/quality control (QA/QC) mechanisms are described in detail in Sections 2.5 through 2.7, but outlined here.

QA/QC mechanisms include:

- Accuracy, precision, and sensitivity of analysis;
- Representativeness and comparability of field data;
- Sample documentation (including field and laboratory records);
- Maintenance and calibration of field and laboratory equipment;
- Analytical procedures for CrVI that comply with ASTM Standard Test Method D7614-12 Determination of Total Suspended Particulate Hexavalent Chromium in Ambient Air Analyzed by Ion Chromatography and Spectrophotometric Measurements (or equivalent); and all of the associated QA/QC requirements of the selected method; and
- Review of field and laboratory data by qualified personnel.

1.7.1.3 Measurement Quality Objectives (MQOs)

MQOs are designed to evaluate and control various phases of the measurement process to ensure that total measurement uncertainty is with a range that will meet the DQO requirements. The MQOs (presented in Table 2) can be defined in terms of the following data quality indicators. A more detailed description of these MQOs and how they will be used to control and assess measurement uncertainty will be described in the following elements of the QAPP.

- Precision – a measure of mutual agreement among individual measurement of the same property usually under prescribed similar conditions. This is the random component of error.
- Bias – the systematic or persistent distortion of a measurement process which causes error in one direction. Bias is determined by estimating the positive and negative deviation from the true value as a percentage of the true value.
- Representativeness – a measure of the degree to which data accurately and precisely represent a characteristic of population, parameter variations at a sampling point, a process condition, or an environmental condition.
- Detectability – the determination of the low range critical value of a characteristic that a method-specific procedure can reliably discern.
- Completeness – a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct, normal conditions.
- Comparability – a measure of the level of confidence with which one data set can be compared to another.

1.7.1.4 Data Validation and Audits

Data validation is discussed in detail in Section 4.1 and audit processes are discussed in detail in Section 3.0, but both are outlined here.

Data validation will include the following:

- The laboratory will review and reduce the data internally, prior to submitting the data to the air monitoring consultant. Laboratory SOPs for internal data review procedures are included in the laboratory's QAPP.
- Laboratory data will be reviewed by the air monitoring consultant.
- The air monitoring consultant will review precision of the PM_{10} and CrVI measurements by assessing results of a duplicate monitoring system at PAM-1.

Auditing procedures will include the following:

- Field performance procedure audits will be conducted during construction air monitoring by the air monitoring consultant's QA/QC Manager. Specific attention will be given to field instrumentation QC, sampling methods, data collection, and sample preservation to demonstrate compliance with required procedures. Field instrumentation QC procedures will also be verified, including calculation of co-located precision of the monitoring system.
- Internal laboratory audits will be performed by the Laboratory QA Manager, Laboratory PM, or qualified designee, annually. Laboratory systems audits may also be conducted by the air monitoring consultant's QA/QC Officer or qualified designee. This auditor, in conjunction with the Laboratory QA Manager, may conduct a system startup audit to ensure that all instruments proposed or in use are

appropriate for the given methods and functioning properly. Audit procedures are described in detail in Section 3.0.

1.7.1.5 Statistical Analysis

Laboratory statistics will be performed to assure precision, accuracy, and sensitivity of the collected CrVI data. These measures and statistics are discussed in Section 3.4.

1.7.2 Alert Levels

I. Define the Site Boundaries

The target media is air at the site perimeter. The site physical boundary is the project property as bounded by the perimeter air monitoring (PAM) stations as shown on Figure 1-1. PM_{10} concentration measurements will be logged at 1-minute intervals. Integrated particulate CrVI filter samples will be collected over a 24-hour interval. The CrVI samples will be shipped to a laboratory for subsequent analysis.

The primary practical constraints include:

- Field methods to measure particulate CrVI are limited to sample collection, with subsequent analytical laboratory analysis. Particulate CrVI cannot be practicably determined in real-time in the field.
- Severe weather could create a safety concern and may also damage equipment and influence the monitoring results. Sample collection may be delayed if severe weather is encountered.
- Samples for particulate CrVI must be stored at 0°C or less.
- Monitoring locations will require electric power to operate instruments and sampling pumps.
- Monitoring locations must have safe access for personnel and security for instruments and sampling pumps.

The scale of decision for this site is air at the site property boundary.

II. Develop a Decision Rule

For this project, the decision is whether the data collected meet quality requirements and therefore can be accepted as valid representations of airborne PM_{10} and particulate CrVI concentrations during construction activities. The parameters of interest are the concentrations of PM_{10} and particulate CrVI in the air shed at the site perimeter, and local wind speed and direction. The decision making scale during construction is a rapid response (within 15 minutes) to elevated PM_{10} concentrations in the immediate, on-site work area at or above a dust Alert Level (150 and 68 $\mu g/m^3$, 15-minute average, for perimeter and work zone monitors, respectively) such that construction generated dust will not migrate off site at concentrations above the alert level. The CrVI Alert Level is set at 0.178 ng/m^3, 24-hour average.

The outcome of the construction monitoring is the collection of valid, representative data of construction conditions demonstrating that concentrations are at or below 150 $\mu g/m^3$ and are representative of pre-construction conditions. Specifically, the project will:

- Collect PM_{10} and particulate CrVI data using accurate methods, including data quality review. Ensure that the samples are collected using calibrated equipment. Analyze particulate CrVI filter sample concentrations in a NELAP-certified laboratory. Ensure that appropriate quality assurance/quality control measures are followed to confirm data accuracy and precision; and

- Collect real-time PM_{10} data from locations proximate to construction activities and from locations on the perimeter of the site to ensure any increases in PM_{10} above the alert level criteria are identified quickly and corrective measures are implemented.

III. Specify Limits on Decision Errors

The problem statement is to ensure that representative and accurate real-time particulate and airborne CrVI data are collected to define the impact of construction activities. For such estimation problems, performance metrics and acceptable levels of uncertainty are used in place of statistical hypothesis testing and decision errors.

For all data collection, data will be required to meet all the field and laboratory procedures and quality control requirements in order to be accepted.

The PM_{10} Alert Levels of 150 and 68 $\mu g/m^3$ (perimeter and work zone monitors, respectively) will be used to guide dust control activities to protect against excessive CrVI, as well as PM_{10}. These values were derived from background monitoring performed prior to the Exelon construction program and have been accepted by both USEPA and MDE.

The hypotheses and associated decision errors are:

- Ho: PM_{10} concentration is greater than the applicable alert level.
  - Type II error (false acceptance): PM_{10} concentration is identified as greater than the applicable alert level, but is actually less than or equal to the applicable alert level.
- Ha: PM_{10} concentration is less than or equal to the applicable alert level.
  - Type I error (false rejection): PM_{10} concentration is identified as less than or equal to the applicable alert level, but is actually greater than the applicable alert level.

Collected data must meet USEPA quality requirements and will be validated according to the relevant SOPs. Appropriate calibration of equipment during field activities and during laboratory analysis will be performed (see Sections 2.6 and 2.7 and Appendices B and C). Limits on decision errors based on use of the Alert Levels during construction (i.e., addressing false positives) will be established by the project team and documented in the Construction Air Monitoring Plan.

IV. Optimize the Sampling Design

Air quality data for assessing PM_{10} and particulate CrVI will be collected at five fixed locations along the project's perimeter. One location will include a duplicate sampler for PM_{10} and CrVI

During intrusive construction activities, additional real-time monitors will be placed in the Work Zone immediately downwind of intrusive construction activities.

The fixed perimeter monitoring and Work Zone monitoring data will be telemetered to a database server that will screen data and issue text and email alerts, in the event the PM_{10} Alert Level is exceeded. This will provide rapid feedback to workers as to when dust levels might require additional controls. Work Zone monitoring will occur on all intrusive work days.

V. Addressing Outlier Events

All air monitoring stations should be away from obstructions that could cause a high measured concentration due to some other process than construction-related activities. Each station should have a sign labeled "No Vehicle Idling" to avoid monitors reading vehicle exhaust. If it is found that a monitor is improperly placed, or alerts are being issued for outlier measurements then this should will be addressed with the project team and adjusted accordingly on a case-by-case basis.

All PM_{10} monitors will be operated continuously, regardless of outlier values being recorded. Any data that are determined to reflect outlier values will be retained in the database, but flagged as invalid when reported. The analytical parameters and target alert levels are summarized in Table 2.

1.7.3 Measurement Performance Criteria and Acceptance Criteria

Measurement Performance Criteria:

The quality of the air monitoring data must be evaluated and controlled to ensure that collected data are consistently within the established acceptance criteria. Measurement quality objectives for the data apply to both collection of the data (e.g., trip and field blanks) and the analysis procedures (e.g., lab blanks). The measurement objectives for this project are described in the best practice analytical method included as Table 1. The laboratory CrVI analytical method meets specific criteria for precision, bias, representativeness, minimum detection limits, comparability and completeness as shown on Table 1. USEPA's definitions for these terms are provided below (USEPA 2009).

Precision - a measure of the agreement among repeated measurements of the same constituent, usually under prescribed similar conditions (uncertainty is driven by random error).

Bias - the systematic or persistent distortion of a measurement process which causes error in one direction (uncertainty is driven by systematic error).

Representativeness - a measure of the degree to which an observation or a sample represents the population from which it was drawn.

Detectability - the determination of the low range critical value of a characteristic that a method-specific procedure can reliably discern.

Completeness - a measure of the amount of valid data obtained from a measurement system compared to the amount taken.

1.8 Special Training Requirements and Certification

Each laboratory technician analyzing samples under this project will have an Initial Demonstration of Capability on file for the analysis of CrVI in ambient air at the laboratory that is available for inspection upon request.

The personnel performing the field tasks will be able to demonstrate by training records and documented experience that they can operate, troubleshoot and maintain the equipment and perform QC checks.

1.9 Documents and Records

Documentation and records anticipated to be generated during the project are listed below, along with their storage location:

Record	Storage Location
Sample Collection and Handling Records	
Daily per-sample field data sheets (including sampler readings) (task-specific SOP for field sheet contents; info collected will include field equipment maintenance information, see Sections 2.2 & 2.3)	Field (hard copy); electronic copies stored weekly on air monitoring consultant's file server.

Record	Storage Location
Field Notebooks	Field (hard copy); Scanned and stored in air monitoring consultant's office project file at the conclusion of the fieldwork. .
Sample COC sheets	Field (hard copy); Faxed copies weekly scanned and stored in air monitoring consultant's office project file
Sample receipt acknowledgement from the laboratory	Electronic copies stored weekly in air monitoring consultant's office project file
Field Audit & Corrective Action Reports	Field (hard copy); air monitoring consultant's Office project file (electronic copy)
Field SOPs	Field (hard copy); air monitoring consultant's Office project file (electronic copy)
Analytical Records	
Laboratory Sample Management Records	Laboratory (hard copy & electronic)
Test method raw data & reported results	Laboratory (hard & electronic), air monitoring consultant's project file (electronic)
QA/QC reports (general QC records, MDL information, calibration, etc.)	Laboratory (hard & electronic), ERM project file (electronic)
Test Method SOP	Laboratory (hard & electronic), air monitoring consultant's project file (electronic)
DustTrak 8533 (or equivalent) data logs	Upload data logs to field computer once per day (electronic), Backup to air monitoring consultant's Office project within 36 hours of field upload (electronic) and upload to project website during construction within 36 hours of field upload.

All documentation will be retained for at least five years after project completion.

1.9.1 QA Project Plan Distribution

See distribution list in Sec. 1.3

1.9.2 Field Documentation and Records

All electronic versions/copies of data and reports will be initially stored on the air monitoring consultant's secure server. Sign-in sheets, Health and Safety Documentation will be stored on site as hard copies.

Data and reports will be transmitted to HPD, and HPD will supply records to Honeywell, USEPA, and MDE as required.

Real-time raw (non-QA'ed) PM_{10} data will be posted to the project's secure web site at least once every five minutes. The results of CrVI analyses will be posted to the project website following validation by the air monitoring consultant. Per agreement between HPD, USEPA, and MDE, the website will be accessible by all necessary personal by username and password that will be provided.

The URL for the project website is: [to be provided by air monitoring consultant].

Data will be retained by the air monitoring consultant for a minimum of five years after the cessation of air monitoring, and will be readily available for audits and data verification activities.

1.9.3 Laboratory Documentation and Records

All laboratory documentation will be initially stored on the air monitoring consultant's secure server. All data and reports will be transmitted as required.

1.9.4 Quarterly and/or Final Reports

All quarterly and/or final reports will be initially stored on the air monitoring consultant's secure server. All data and reports will be transmitted as required.

2. DATA GENERATION AND ACQUISITION

This section describes how the project data will be obtained, including the rationale for the sample design and all field quality controls procedures. The Field Documentation, including the Standard Operation Procedures (SOPs) for field sampling methods are provided in Attachment 1. The laboratory documentation, including analytical SOPs will be incorporated by reference, once a laboratory has been engaged.

2.1 Sampling Design (Experimental Design)

This section summarizes the key elements of construction air monitoring for the Project during intrusive activities. This document acts as support to the CAMP, with additional details regarding the air monitoring processes, but are substantively the same as those prepared for and approved by the agencies for the Exelon Project and the Wills Wharf Office Project. However, they have been adjusted as appropriate to reflect lessons learned from these projects and the nuances of this Project.

2.1.1 Fixed Air Monitoring

Five fixed Perimeter Air Monitoring (PAM) locations will be established for construction air monitoring. Each fixed air monitoring station will be instrumented with a DustTrak 8533 (or equivalent) monitor for real-time measurement of PM_{10}. At least once per month, a filter sample will be collected from a collocated sampler, for subsequent laboratory gravimetric. The filter sample results will be used to correct the real-time data in accordance with the instrument manufacturer's guidance.

Each PAM site will also be instrumented to collect daily, 24-hour integrated filter samples for subsequent laboratory analysis for CrVI.

The perimeter monitoring locations will be sited around the work site boundary so as to characterize potential air impacts to neighboring properties and areas, throughout the wind direction range. One of the fixed sites will have a collocated monitoring system to provide data for calculation of precision. The fixed station monitors are designated as PAM-1, PAM-2, PAM-3, PAM-4, and PAM-5.

The fixed perimeter monitor target location areas are shown in drawings in Figure 1. The specific locations will be finalized following a field survey, considering availability of mains power, safe access, and security. During the course of the Project, these locations may be adjusted following approval by the agencies if warranted by work conditions, work areas, weather conditions, etc. The general siting strategy will be to place the monitoring stations between the intrusive construction activities and the nearest buildings:

- PAM-1 is planned for placement between the Project and the Exelon Office Building;
- PAM-2 is planned for placement between the Project and the Point Street Apartments (under construction at the time that this CAMP was being prepared); and
- PAM-3, PAM-4, and PAM 5 will cover the remainder of the site perimeter.

In addition to the perimeter monitoring sites, one fixed monitoring site, instrumented with a real-time PM_{10} monitor, will be operated to the north of the clean soil stockpile and the contaminated soil container storage area in order to provide warning should south winds cause stockpile impacts in that area. The PAM sites will perform this function during other winds from other directions.

The fixed monitoring locations and equipment will be sited, to the extent possible, away from trees, buildings, roadways, or other obstacles that may cause undue influence on the measured concentrations in general conformance to the USEPA monitor siting guidelines contained in 40 CFR Part 58, Appendix E.

All sampler inlets will be placed not less than 2 meters above ground level and, to the extent practicable, have unrestricted air flow of 270 degrees around each sampler.

Table 3 summarizes the fixed monitoring network's design and siting rationale.

2.1.2 Work-Zone Monitoring

Work zone monitoring for real-time PM_{10} will also utilize DustTrak 8533 (or equivalent) instruments. Work zone monitoring will occur under the following conditions associated with the intrusive work expected in Area 1:

1. Pile driving;
2. Pile cap installation; and
3. Contaminated material excavation and augering.

The number of portable monitoring locations deployed during each phase of construction will be dependent on the spatial extent of intrusive activities. Two work zone monitors will be installed such that neither monitor is further than 45 degrees of the average downwind bearing measured from the most downwind edge of the center of the work zone. Additional work zone monitors may be deployed to reduce the need for re-location, should the wind direction shift significantly.

It is probable that multiple intrusive activities will be performed simultaneously. In such cases, work zone monitors will be sited to optimize their coverage. An array of monitors will be installed downwind of construction zones. At least two downwind monitors will be operated for each 75 feet of projected crosswind (i.e., orthogonal to wind direction) distance of intrusive operations. Figure 2 illustrates the sampling geometry. Additional work zone monitors will be utilized, as needed, to ensure adequate coverage.

The work zone real-time PM_{10} measurements will be telemetered to a database server in real-time, where they will be screened. If an alarm level is exceeded, an alert will be issued to field and project management staff via email and/or text message. One of the fixed perimeter monitors (described above) will serve as the "upwind" reference for computing the net impact of construction activities at each construction zone monitor for each 15-minute averaging period that wind speed exceeds five miles per hour.

Table 4 summarizes the field and QC samples scheduled for collection.

2.2 Sampling Methods

Details of sample collection procedures are provided in the Standard Operating Procedures contained in Attachment 1. Sample start time, end time, beginning and ending flow rate, and total sample volumes will be recorded on the field forms along with any other pertinent information regarding sample collection. Table 5 presents the applicable analytical methods, sampling media, sample preservation techniques, and holding time requirements for the CrVI and PM_{10} samples.

In addition to the field forms, field information will also be recorded in field notebooks that are sequentially pre-numbered; the field notebooks will be bound, have a water-resistant cover, and be assigned to individual field personnel for the duration of field activities. Entries will be as detailed and as descriptive as practical so that a particular situation can be recalled without relying solely on the sampler's memory. Field log entries will be dated and signed. Information entered in the field notebook will include, at a minimum, the following items:

- Project name and number;

- Dates and times of entries;
- Weather conditions;
- Names of personnel performing the activities;
- A description of sample locations, including sample name and type;
- Field instrument calibration information;
- Field instrument readings; and
- Health and safety information.

Information recorded in the field notebook should be neat, legible, completed in dark, permanent ink, and signed and dated by the person completing the entry.

Copies of the field notebook will be provided to the PM, and the data will be summarized for reporting purposes and retained in the appropriate project file.

Field notebooks will be stored in the air monitoring consultant's project file when not in use.

Corrections to field documentation will be made by striking out the incorrect entry, entering the corrected value or text, and dating and initialing the document; the original entry will remain visible.

2.3 Sample Handling and Custody

CrVI samples are collected on specific, laboratory-prepared filters that are loaded by the laboratory into cassettes. The cassettes are shipped in a cooler with ice packs, and must immediately be transferred to the freezer upon receipt. In the field, the cassettes are loaded into the sample pump for collection of primary samples. Filters will be considered invalid if any of the following occur:

- Filter has been dropped or contaminated with any foreign matter (such as dirt, finger marks, ink, liquids, etc.);
- Filter with tears or pinholes;
- The start and stop flow rates differ more than ±10%; or
- Filter sample operates less than 20 hours or more than 28 hours. Samples that ran less than 23 hours or greater than 25 hours will be flagged as valid, but outside standard the US EPA control range.

The sample date and time collected, project name and number, and unique sampling number associated with the filter will be recorded on the sample label. CrVI samples will be placed in a cooler with ice packs immediately after removing filter cassettes from the sample pump, as CrVI samples must arrive at the lab at 0ºC.

Although CrVI samples are stable for more than three weeks prior to extraction, providing they are kept frozen, it is planned that CrVI samples collected during intrusive construction work days, and field and trip blanks will be shipped daily via overnight, next day delivery to the laboratory during the first two weeks of intrusive activities. Thereafter, and following the approval of the agencies, CrVI samples collected during intrusive construction work days will be held and kept frozen in the on-site, secure freezer (following the freezer chain of custody log procedures described above) for subsequent shipment to the laboratory twice per week, targeting Monday and Thursday of each week. Sample coolers will be refreshed on site with ice packs as necessary to ensure a temperature of less than 0ºC is maintained through overnight shipment and until receipt by the laboratory.

The COC of the physical sample and its corresponding documentation will be maintained throughout the handling of the sample. All samples must be identified, labeled, logged in a COC form, and recorded in the field notebook as a part of the procedure to ensure the integrity of the resulting data. Information required on the COC form includes the following:

- Project name, location, and number;
- Name of ERM PM;
- Sampler name and signature;
- Location and time of sampling;
- Total volume of air that passed through the filter, including both the calculated total volume and the total volume reported by the filter sampler;
- Unique sampling number associated with the filter;
- Sample type and matrix;
- Requested analytical parameters or methods;
- Laboratory name and contact information;
- Signature of person relinquishing samples;
- Date and time of relinquishing;
- Special instructions, if any; and
- Signature of receiver and date and time samples received (completed by laboratory upon receipt).

The record of the physical sample (location and time of sampling, total volume of air that passed through each filter) will be related to the analytical results through accurate accounting of the sample custody. Sample custody applies to both field and laboratory operations. Analytical requests will be identified on the form. The information (for each sample) provided on the COC form will duplicate the information provided on the sample label of each sample container. A copy of the COC form completed by the field team will be submitted to the air monitoring consultant's QA Manager. The original and a copy of the COC form will be placed in protective plastic and will be taped to the inside lid of the cooler containing samples before transport to the laboratory. The COC forms will be retained in the air monitoring consultant's project job files by the QA Manager.

Sampling personnel will be responsible for the care and custody of the samples from the time they are collected until they are transferred to another individual. A sample is under an individual's custody if one of the following criteria is met:

- It is in the sampler's possession;
- It is in the sampler's view after being in possession;
- It is in the sampler's possession and secured to prevent tampering; and
- It is in a designated secure area.

Sampling personnel will complete the COC form for each sample shipment. When transferring custody, the individuals relinquishing and receiving samples will sign, date, and note the time of the exchange on the record. The COC record will be completed using waterproof ink. Corrections will be made by drawing a single line through the error and initialing and dating the correction. Information will not be erased or rendered unreadable.

When the samples arrive at the laboratory, the laboratory personnel receiving the sample cooler will evaluate the integrity of the samples and sign the COC form. The laboratory will assign work order numbers to the samples for use in its internal tracking system. Damaged sample containers, sample labeling discrepancies between sample container labels and the COC form, and analytical request discrepancies will be noted on the COC form. The laboratory will contact the air monitoring consultant's FM or Quality Manager by sending the COCs and the sample non-conformance report electronically within 24 hours of sample receipt. The laboratory will also provide a sample acknowledgment to the air monitoring consultant, indicating field sample identification, laboratory identification number, and analytical testing logged for each sample. The air monitoring consultant will review this information for correctness within 24 hours of receipt and provide feedback to the laboratory. The status of a sample can be checked at any time by referring to the laboratory numbers on the COC form and the laboratory work order numbers in the notebook. Both the laboratory and unique sampling numbers will be cited when the analytical results are reported. The laboratory will send the carbon copy of the COC form and the analytical data package to the PM.

Standard Operating Procedures (SOPs) and data collection forms have been developed for sample custody, sample labeling, analysis requests, and shipping and tracking procedures. Field SOPs are included in Attachment 1. Analytical laboratory sample custody procedures are included in the laboratory SOP (to be incorporated by reference once a laboratory has been engaged), which identify the roles of both the sample custodian and the laboratory coordinator.

2.4 Analytical Methods

Analytical methods and over-all analytical quality requirements for the laboratory are provided in Table 2. The laboratory-specific CrVI analytical method will be incorporated into this QAPP by reference, once a laboratory has been engaged. The required laboratory turn-around time (TAT) will be three business days for the first two weeks of the program, and five business days thereafter.

2.4.1 Field Measurements Methods

All field measurements related to this QAPP will be performed by multiple DustTrak 8533 (or equivalent) monitor for real-time measurement of PM_{10} and collection of filter sample, for subsequent laboratory gravimetric and CrVI analysis. The filter sampler will have a minimum sample rate of 3.0 liters per minute. Additionally, a continuous wind sensor will be installed on the work site to measure and record local wind conditions throughout the air monitoring program. Field obligations to these instruments include: general upkeep (cleaning, ensuring proper operation, etc.), weekly flow verifications, quarterly audit (verification) and quarterly calibration.

All of these measurements will monitored in real-time through a specified website with concentration and diagnostic graphics, along with data review by an air quality technician.

2.4.2 Field Analyses Methods

The DustTrak 8533 (or equivalent) will be used to collect PM_{10} 24-hour integrated samples at each perimeter monitoring site, onto specially-prepared filters that will be sent to a laboratory for gravimetric and CrVI analysis. No CrVI field analyses will occur.

2.4.3 Laboratory Analyses Methods (Off-Site)

Perimeter filter samples intended for CrVI analysis will be stored in a freezer and sent to the laboratory CrVI and gravimetric analysis. The laboratory will maintain a CrVI minimum detection limit of no higher than 0.2 ng/filter. At least once per month, a filter sampler will be collocated with each real-time PM_{10}

monitor, to collect a sample for gravimetric analysis to be used to derive adjustment factors for each real-time PM_{10} monitor, in accordance with the manufacturer's guidance. The data adjustments will be performed by the database server's post-processing routine.

2.4.4 Field Sampling Quality Control

Field blank filters in sample cassettes will be sent to the field, opened, and re-packaged as with the sample filter cassettes but not exposed to the air on a sampling device, and returned to the laboratories along with the primary samples according to the schedule shown in Tables 6 and 7. Blank filters will be provided by the laboratories from the same lot as the filters provided for sample collection. Additionally, a trip blank will be included in each sample set (2 per week, one in each shipment to the laboratory). A trip blank is shipped to the field and back to the laboratory, but never opened. All filters will be maintained at a temperature of less than 0º C from the time of shipment from the laboratory until the time of analysis, except during field sampling.

2.4.5 Field Measurement/Analysis Quality Control

All filter sample handling will be the responsibility of the field manager, where they will need to take care to properly store, handle and transfer filter cassettes for sampling. The field manager is responsible for ensuring instruments maintain consistent operation during any period of filter sampling. All analysis of filter samples will be performed by a separate laboratory.

2.4.5.1 Field Measurement QC

All instruments in the field are performing measurements automatically, which aside from handling of filter samples in the field, will not require any QC outside of proper handling and upkeep of instruments.

2.4.5.2 Field Analysis QC (Screening and Definitive)

This section is not applicable to this project. Data analysis will be performed remotely, and Filter Sample analysis will be performed by an external laboratory.

2.4.6 Laboratory Analysis Quality Control

All laboratory analysis QC is the direct responsibility of the laboratory and is not applicable to operations of this project outside of ensuring filter samples are used properly and received by the laboratory as requested.

2.5 Instrument/Equipment Testing, Inspection, and Maintenance

Field instruments are subject to periodic field verifications, preventative maintenance, and inspections. The schedule for these tasks is detailed in Table 8.

2.5.1 Field Measurement Instruments/Equipment

DustTrak DRX 8533 (*or equivalent real-time monitor*): The DustTrak Model 8533 monitors PM_{10} Concentrations and stores 1-minute averages on an internal data logger. This instrument can also collect a PM_{10} sample on an in-line 37 mm filter.

The manufacturer lists daily maintenance and calibration procedures that will be followed in the field. In addition, other maintenance and calibration procedures that will be used are as follows:

- Before each use: perform a zero check according to manual instructions;

- Cleaned the sample inlet at least once every two weeks; document the cleaning date and time recorded in the field notebook; and
- Replace the internal filters at least once every two weeks; document replacements in the field notebook.

The DustTrak Model 8533 instruction manual is referenced in the SOPs in Attachment 1. The results of periodic collocate filter sample gravimetric analyses will be used to compute adjustment factors for each real-time PM_{10} monitor, in accordance with manufacturer's guidance.

2.5.2 Field Instruments/Equipment (Screening and Definitive)

This section is not applicable to this project.

2.5.3 Laboratory Analysis Instruments/Equipment (Off-Site)

Laboratory records are defined as all written, recorded, and electronic documentation necessary to reconstruct all laboratory activities that produce data and include all information relating to the laboratory's equipment, analytical test methods, and related activities.

The laboratory will retain copies of all sample, sample QC and calibration runs, quantitation reports, injection logs, preparation summary sheets, corrective action reports, and summary information in a central file location for 5 years from the date of analysis. Electronic copies of raw data will also be retained by the laboratory for 5 years from the date of analysis.

Specific laboratory instrument calibration procedures for various instruments are described in detail in the method-specific procedures and laboratory SOPs and will be incorporated into this QAPP by reference, once a laboratory has been engaged.

2.6 Instrument/Equipment Calibration and Frequency

BGI TetraCal Standard (or equivalent flow standard): This instrument is annually certified by the vendor against a NIST traceable calibration system to ensure high-accuracy flow readings. Documentation of this certification will be stored on the air monitoring consultant's secure server and tracked for re-certification needs. The BGI TetraCal (or equivalent flow transfer standard) is used to test the flow rate, ambient temperature, filter temperature, and ambient pressure in a PM_{10} sampler. Flows will be checked at least weekly on all PM_{10} analyzers or samplers. Instrument flow calibrations will occur quarterly with the use of this standard.

DustTrak 8533 Sampler (or equivalent): Instrument verifications will be performed weekly. This will document the ambient temperature, multiple flow points and a zero-point leak check, as recommended by the manufacturer. These will be documented in a standard verification form. The forms will be reviewed by the field technician to diagnose for irregularities.

Field technicians will be responsible for performing calibrations quarterly on these instruments. Using a BGI TetraCal Standard (or equivalent), the technician will verify current performance and calibrate the following: temperature, pressure, and multiple flow points. Field maintenance also includes cleaning of inlet, downtube, and internal instrument components – as well as checking for parts that are in need of repair. Instrument pumps will be replaced or rebuild annually.

All calibration and maintenance must be documented and stored on the air monitoring consultant's secure server.

2.6.1 Field Measurement Instruments/Equipment

See Table 8 for a listing of the field equipment/instrument calibration, maintenance, testing, and inspection information.

2.6.2 Field Instruments/Equipment (Screening and Definitive)

This section is not applicable to this project.

2.6.3 Laboratory Analysis Instruments/Equipment (Off-Site)

Laboratory's instruments and calibration/maintenance program will be part of the laboratory's quality system and SOPs, which will be incorporated into this QAPP by reference once a laboratory has been engaged.

2.7 Inspection/Acceptance Requirements for Supplies and Consumables (USEPA QA/R-5 B8)

All supplies and consumables that are necessary to maintain instrument performance will be accepted/inspected by the air monitoring consultant's technicians in a laboratory setting. Any necessary supplies to maintain instruments in the field will be stored at a nearby location, or brought by a technician when visiting the site to perform maintenance.

New filters for sampling will be shipped to a field manager, kept in a controlled environment on site and shipped to the lab for analysis once exposed. Each batch of filters will include a field blank.

2.7.1 Field Sampling Supplies and Consumables

Provisions for field sampling supplies and consumables will be detailed in the applicable SOPs.

2.7.2 Field Measurement/Analyses (Screening and Definitive) Supplies and Consumables

This section is not applicable to this project.

2.7.3 Laboratory Analyses (Off-Site) Supplies and Consumables

For laboratory analyses, supplies and consumables will be the property of the laboratory for analysis purposes. The laboratory will provide sample filters to be used on site, and will receive them, once the filter has been exposed.

2.8 Data Acquisition Requirements (Non-Direct Measurements)

All non-direct measurements have been retained by ERM's previous involvement with this construction project. The air monitoring consultant will provide any required updated maps and photographs for specific project requirements.

2.9 Data Management

This section describes the data management process and methods to ensure data integrity from data production in the field to final use and retention. All data will be reviewed and verified for accuracy by the air monitoring consultant's QA/QC Officer and Field Manager (FM). The air monitoring consultant's FM will ensure that the field and technical data obtained for the project will provide the end user with acceptable data. All field and technical data shall be reviewed by the air monitoring consultant's QA/QC

Officer, to ensure that the final data is accurate prior to the inclusion in the project report. The field data sheets, log books, COC forms, and real-time PM_{10} data are reviewed and submitted (electronic, or hard copy) by the air monitoring consultant's FM to the QA/QC Officer, daily.

The laboratory analytical data processing procedure is summarized as follows:

1. Samples are sent to the laboratory under COC.
2. The laboratory enters the sample information into their tracking system and performs the analysis.
3. The laboratory electronically submits raw data, sample results, and their QA information to the air monitoring consultant, who computes the CrVI and PM_{10} concentrations corresponding to the field and laboratory results.
4. The air monitoring consultant's QA/QC Officer reviews the accuracy of the results and then stores the validated information electronically into the project files and uploads the summary tables to the project website.

The real-time PM_{10} field data sheets and real-time instrument data logs are submitted (electronic, or hard copy) by field personnel to the air monitoring consultant's PM weekly. The air monitoring consultant's PM, or their designee checks all metadata for accuracy, then stores the information electronically into the project files. Real-time PM_{10} concentration data will be provided as 15-minute averages based on one-minute frequency data collection.

3. ASSESSMENT AND OVERSIGHT

This section defines the responsibilities of the field project team, monitoring consultant and laboratory while the project is underway. The field team and monitoring consultants will be responsible for maintaining instruments and providing adequate air monitoring data to support agreed terms. The field team is responsible for responding to alarms as they are triggered and as supporting data is provided to them.

3.1 Assessments/Oversight and Response Actions

The PM_{10} Alert Level and CrVI concentration Alert Level to be used for construction air monitoring were previously established for the Exelon Project and were approved by the USEPA and MDE. As discussed above, when winds are persistent (i.e., greater than 5 miles/hour), an automated database server script will subtract the PM_{10} concentration of an upwind monitor from that measured by a work zone or perimeter monitor, to compute the net construction activity impact, prior to comparing the measured values to the alert level. The data processing system will automatically consult a look-up table to identify the best available upwind monitor and compute the net concentration at the measurement site. If wind speed is less than 5 miles per hour, no upwind adjustment will be made. Due to its proximity to Parcel 4 construction impacts, monitors near that activity will not be considered for use as upwind monitors. The upwind monitoring site look-up table will be developed by the air monitoring consultant once the exact monitor locations have been set.

The Alert Level criteria for this Project are:

1. The work zone air monitor Alert Level for PM_{10} is 68 micrograms per cubic meter ($\mu g/m^3$), 15-minute averaging time. This alert level is applicable to the work zone mobile monitors; or
2. The work zone air monitor Alert Level for PM_{10} may be adjusted to 118 $\mu g/m^3$ under certain ambient weather conditions per the process described in Section 6 of the CAMP;
3. The perimeter air monitor Alert Level for real-time PM_{10} is the 150 $\mu g/m^3$, 15-minute average; and
4. The perimeter air monitor CrVI alert level is 0.178 nanograms per cubic meter (ng/m^3), 24-hour average.

The monitoring program and its data processing system will be configured to issue email and/or text messages to the Field Manager and other designated contacts, should an Alert Level be exceeded Depending on the duration of the measured elevated concentrations, the Site Manager's required response ranges from simply confirming the proper operation of the monitoring system up to and including (in extreme conditions) temporary suspension of remediation operations. See SOP-002 for further detail on alert response and notifications.

3.2 Reports to Management

3.2.1 Daily Data Summary Tables

Daily data summary tables with 15-minute average PM_{10} concentrations for each PAM and work zone monitor, 15-minute average wind speed and wind direction, and daily rainfall will be prepared by the field staff.

Real-time raw (non-QA'ed) data reporting will also be available via the designated website to view current meteorology and PM_{10} concentrations.

3.2.2 Event Logs

When applicable, event logs will be generated to identify nonconforming situations and corrective actions taken. Corrective actions to remedy a nonconforming situation in the field can be defined by the air monitoring consultant's field personnel or the air monitoring consultant's QA/QC Officer or PM. A description of the required action will be documented in an event log. Corrective actions must be approved verbally by the QA/QC Officer prior to implementation. Upon implementation of the corrective action, the air monitoring consultant's QA/QC Officer or PM will be provided with the completed event log, which becomes part of the project file. Copies of completed event log will also be provided in the data summary reports.

3.2.3 Data Quality Assessment Reports

The field staff will report to the air monitoring consultant's PM, or a qualified designee on the progress of each phase of field work and any QA/QC issues associated with field activities. Additionally, the laboratory will maintain detailed procedures for record-keeping and reporting to support the validity of all analytical work. The Laboratory QA Manager will provide the air monitoring consultant's QA/QC Officer certification documentation, including audit reports, upon request.

3.2.4 Performance Evaluation and Audit Reports

As discussed in Section 3.1, laboratory PEs and audits may be performed during the course of the project. If performed, the air monitoring consultant's QA/QC Officer will prepare a report summarizing the results.

3.2.5 Summary Data Reports

The summary data report will be produced by the air monitoring consultant's and will include, electronically, the complete laboratory data packages, and all underlying metadata.

Quarterly reports will be issued with results of data quality and performance evaluations.

Annual reports will be issued to management to inform on the status of the project, results of performance evaluations, results of data quality evaluations, and any significant quality assurance problems and recommended solutions.

4. DATA REVIEW AND USABILITY

This section defines the use of data, as it is applicable to this project. The monitoring consultant is responsible for regularly reviewing, verifying, validating, and providing air monitoring data. The data provided will be a combination of real-time accessible data (by manual data polling or website script), as well as laboratory data that is used to support field instruments.

4.1 Data Review, Verification, and Validation Requirements

The process of reviewing field data will consist of evaluating field records for consistency and completeness assuring that each sample result is fully supported by accurate metadata, reviewing QC and calibration information, summarizing deviations and determining their impact on data quality, summarizing the samples collected, and summary of the review in the project report.

Field data (provided to the air monitoring consultant's FM electronically or by hard copy) will be scanned at least weekly and stored electronically as part of the project database maintained by air monitoring consultant.

4.1.1 Sampling Program Design Execution

Sample collection records (provided to the air monitoring consultant's PM by fax, electronically or hard copy) will be reviewed weekly by the air monitoring consultant's QA/QC Officer/PM or qualified designee to ensure that samples have been collected according to the sampling design. Items to be reviewed include the types and numbers of samples collected, sampling locations and frequencies, and measurement parameters of interest. Deviations must be reported to the air monitoring consultant's PM immediately. If a deviation is identified, the air monitoring consultant's PM will bring this result to the attention of USEPA and MDE and request their concurrence of air monitoring consultant's recommendation of whether or not the identified deviation requires any additional attention.

4.1.2 Sample Collection Procedures

Sample collection log forms will be reviewed by the air monitoring consultant's FM and the air monitoring consultant's QA/QC Officer to ensure that the appropriate procedures have been followed. Items to be reviewed include sampling methods and equipment, sample type, time, location and sample preservation requirements. Deviations must be reported to the air monitoring consultant's PM immediately. The PM will determine whether the samples meet the field quality control requirements. If a deviation is noted, the air monitoring consultant's PM will bring this result to the attention of USEPA and MDE and request their concurrence of the air monitoring consultant's recommendation of whether or not the identified deviation requires any additional attention.

4.1.3 Sample Handling

Sample handling procedures will be reviewed by the air monitoring consultant's FM and the air monitoring consultant's QA/QC Officer to ensure that the appropriate procedures have been followed. Items to be reviewed include sample labeling, COC documentation, sample preservation and holding times, sample packaging, and shipment. Deviations from established procedures must be reported to the PM immediately. If a deviation is identified, the air monitoring consultant's PM will bring this result to the attention of USEPA and MDE and request their concurrence of air monitoring consultant's recommendation of whether or not the identified deviation requires any additional attention.

4.1.4 Quantitative Field Data

The sample collection volume calculations performed in the field will be verified by the air monitoring consultant's FM and the air monitoring consultant's QA/QC Officer, along with the sample collection and handling procedures noted above.

4.1.5 Field, Technical and Laboratory Data Reduction

Field and laboratory analytical data will be summarized in tables as appropriate. The air monitoring consultant will check the data presented on the data summary tables.

The laboratory will review and reduce the data internally, in accordance with its SOPs prior to submitting the data to the air monitoring consultant's FM. The laboratory SOP contains all quality control requirements. Laboratory SOPs for internal data review procedures will be incorporated into this QAPP by reference, once a laboratory has been engaged.

Specifically, the laboratory will review the data package to ensure the following:

- Sample preparation information is correct and complete;
- Holding times have been met;
- Analytical information is complete and was generated within acceptable criteria;
- Any discrepancies/corrective actions identified during sample login, preparation or analysis have been addressed and documented;
- The appropriate SOPs have been followed;
- QC samples were within established control limits;
- Analytical requirements have been met (e.g., the correct analytical procedures were used as defined by the COC); and
- Documentation is complete and any QC issues are fully explained in a detailed case narrative.

An authorized laboratory employee must sign the data package to indicate the data have been reviewed.

Data will be reduced in the laboratory following method protocols and reported in standard formats. The data will be peer-reviewed by a qualified analyst before it is released to the air monitoring consultant. The review will be documented with a standard checklist that has been initialed and dated by the peer reviewer. Reporting requirements for analytical data pertain only to the final data report to be submitted to the air monitoring consultant.

4.1.6 Performance Audits

Performance audits consist of challenging measurement equipment with a known quantity and comparing the measured result against the standard value. The results provide enable quantifying the system's accuracy and bias.

4.1.6.1 Field Performance Audits

Performance audits of PM samplers consist of checking the sampler's indicated volumetric flow rate against that determined using an independent flow standard—i.e., a flow transfer standard other than the one used for calibrating the instrument.

The field auditor verbally reports the results of each flow rate challenge to the PM within one working day to transmit any significant problems with the field QA program. Any non-conformance identified during the audit will be reported immediately to the PM and remedied as soon as possible. A written report will be provided to key personnel and placed in the project file within 10 working days of each audit.

4.1.6.2 Laboratory Performance Audits

During the course of the project, laboratory performance audits will be performed as specified in the laboratory's quality system. Audit results will be documented by the auditor in a formal report. The air monitoring consultant will include a discussion of the audit findings in the next quarterly monitoring report. If corrective action was initiated, the status of those actions will also be reported.

4.1.6.3 System Audits

The air monitoring consultant's QA/QC Officer or qualified designee will conduct a program systems audit on at least an annual basis. The purpose of the audit is to assess the degree to which the quality assurance and quality control measures specified within this QAPP are being implemented.

During the system audits, the auditor will observe and review QC documentation and analytical results to ensure that they conform to the operating procedures and reporting requirements. Prior to the audit, the auditor will prepare a list of items and procedures to be audited. System audits will include a review of the following:

- Sample custody and tracking procedures;
- Calibration procedures and documentation;
- Completeness of data forms, notebooks, and other data reporting documents;
- Compliance with laboratory SOPs;
- Data storage, filing, and record-keeping procedures;
- QC procedures, criteria, and documentation;
- Operating conditions of equipment and facilities;
- Employee training records; and
- Laboratory information and management system procedures and security.

The auditor will interview key staff members to evaluate the program and determine if corrective actions are necessary to improve the data quality.

The auditor will submit a report in writing to the air monitoring consultant's PM within five (5) working days of the audit. The report will include the documentation of interviews, findings, and proposed findings and recommendations.

If the audit reveals any significant problems within the system, the air monitoring consultant's PM will develop and implement a corrective action plan within 10 working days from receipt of the audit report.

4.1.7 Surveillance of Operations

The raw (non-QA'ed) real-time monitoring values (PM_{10}, wind speed, and wind direction) will be posted to the project's secure web site approximately once every five minutes. The 24-hour integrated CrVI sample results will be posted to the website within approximately 24 hours, as practicable, of receipt of validated laboratory results. In this manner, authorized individuals will have ready access to monitoring results. The website will also present any response actions deemed necessary due to the air monitoring results.

The Developer's representative is responsible for all necessary notifications to both the MDE and USEPA representatives. The Developer's representative on site will ensure both USEPA and MDE's representatives are apprised of the air monitoring activities and results on an as-needed basis. In this manner, the agencies can assess the need to notify the public of the air monitoring results and related response actions, as appropriate.

4.1.8 Assessment of Data Quality

4.1.8.1 Field Data Quality

Data quality assessment criteria for field measurements include the following parameters:

Precision – Precision of field procedures will be assessed through the collection of field duplicate real-time data and co-located samples. Field duplicate data will be collected for PM_{10} and CrVI by use of a second monitoring system, which will be collocated at the PAM 1 monitoring site. If the relative percent differences (RPDs) for field duplicate data or co-located sample results are within acceptance criteria, the original result should be used. However, if the RPDs are not within acceptance criteria, the more conservative result will be used for reporting purposes.

Accuracy – Accuracy in the field is a measure of how close the value is to the true value and will be is assessed by performance audit of the instrument sample flow rates.

Completeness – Field completeness is a measure of the number of valid field measurements obtained relative to the total number of field measurements. The percent of completeness for field data can be expressed by the following formula:

Percent Completeness = (V/T) x 100

Where:

V = Number of valid data points

T = Total number of data points

Field completeness is based on the number of samples or field tests planned and the actual number collected or performed. The completeness objective for field measurements is 80 percent.

Representativeness – Representativeness in the field will be ensured considering recommended siting criteria when establishing monitoring sites and by following standard procedures during data collection. The air monitoring consultant's PM will monitor the sampling program to ensure that field activities are being conducted consistently according to the procedures outlined in the QAPP and applicable SOPs. Additionally, field blanks and duplicates will reflect representativeness by measuring sample homogeneity and precision.

Comparability – Measures to ensure comparability of field data include field personnel reviewing the QAPP and the SOPs. The air monitoring consultant's FM and/or QA Manager will routinely verify that proper field activity procedures are being followed. To facilitate comparability of field data, the air monitoring consultant's field staff will only utilize the approved SOPs.

Sensitivity – Sensitivity is the capability of a method or instrument to discriminate between measurement responses representing different levels of a variable of interest, or to detect or reliably measure low levels of a variable of interest. Field sensitivity basically refers to the smallest value or change in value a field instrument can reliably measure above background noise. The sensitivity objectives for the DustTrak include the following specifications:

- Concentration Range = 0.001 to 150 mg/m^3;
- Resolution = ±0.1% of reading or 1.0 µg/m^3, whichever is greater; and
- Flow Accuracy = ±5% of factory set point.

4.1.8.2 Laboratory Data Reduction

Field and analytical data will be summarized in tables as appropriate and discussed in the text of the data report.

The quality of laboratory data will be evaluated based on precision, accuracy, representativeness, completeness, and comparability of the data generated by each type of analysis. These data assessment parameters are described in the following sections. The specific analytical criteria including reporting limits and control limits for QC results are part of the laboratory's quality system, which will be incorporated into this QAPP by reference, once a laboratory has been engaged.

Blank samples are used to determine contamination arising from principally four sources: the environment from which the sample was collected/analyzed, the reagents used in the analysis, the apparatus used, and the operator/analyst performing the analysis. Three types of blanks will be implemented in the in this monitoring program:

- **Field blanks** - Field blank cassettes will be included for CrVI samples yielding one filter cassette blank per day that samples are collected. Blank filter cassettes will be sent to the field, opened, but not placed on the sampling devices, and then packaged like the actual samples. Field blank cassettes will be returned to the laboratory in the same shipment as the primary samples.
- **Trip blanks** - Trip blank cassettes will be included for CrVI samples yielding one filter cassette blank per sample shipment. The trip blank is an un-opened, un-handled filter cassette.
- **Lab blanks** - Laboratory SOP for the ASTM Standard Test Method D7614-12 (Determination of Total Suspended Particulate Hexavalent Chromium in Ambient Air Analyzed by Ion Chromatography and Spectrophotometric Measurements is included in the laboratory's quality system which will be incorporated into this QAPP by reference, once a laboratory has been engaged. The SOP will include procedures and criteria for lab blanks, spiked samples, and duplicate analyses.

4.1.9 Qualitative and Quantitative Comparisons to Acceptance Criteria

4.1.9.1 Precision

Precision is a measure of random error, and describes the degree to which repeated measurements are similar to one another. It measures the agreement or reproducibility among individual measurements. Precision will be measured through the use of field duplicate samples. Duplicate samples are ideally expected to contain similar chemical concentrations; therefore, it is generally assumed that any variability in results is introduced by inherent field heterogeneity, sampling, handling, or laboratory procedures.

Precision will be calculated as the RPD as follows:

$$\%\ RPD_i = \frac{|O_i - D_i|}{(O_i + D_i)/2}\ x\ 100\%$$

where:

$\%RPD_i$ = Relative percent difference for compound i

O_i = Value of compound i in original sample

D_i = Value of compound i in duplicate sample

The resultant RPD will be compared to acceptance criteria and deviations from specified limits reported. If the laboratory objective criteria are not met, the laboratory will supply a justification of why the acceptability limits were exceeded and implement the appropriate corrective actions.

4.1.9.2 Accuracy

Accuracy is the amount of agreement between a measured value and the true value. It will be measured as the percent recovery of blank spike samples and performance evaluation (PE) samples.

Accuracy shall be calculated as percent recovery of spiked analyses as follows:

$$\%R_i = (Y_i \div X_i) \times 100\%$$

where:

$\%R_i$ = percent recovery for compound i

Y_i = measured spike concentration in sample i (sample concentration with the spike - original sample concentration)

X_i = actual spike amount in sample i

The resultant percent recoveries will be compared to acceptance criteria and deviations from specified limits will be reported. If the objective criteria are not met, the laboratory will supply a justification of why the acceptability limits were exceeded and implement the appropriate corrective actions.

4.1.9.3 Representativeness

Representativeness is a qualitative parameter that expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness of the environmental conditions at the time of sampling is achieved by selecting sampling locations, methods, and times so that the data describe the site conditions that the project seeks to evaluate. Representative samples will also be ensured through following proper protocols for sample handling (storage, preservation, packaging, custody, and transportation), sample documentation, and laboratory sample handling and documentation procedures.

4.1.9.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. The comparability goal is achieved by maintaining consistency in sampling conditions, selection of sampling procedures, sample preservation methods, and analytical methods.

4.1.9.5 Completeness

Completeness for usable data is defined as the percentage of usable data out of the total amount of planned data. The closer the numbers are; the more complete the measurement system. The target goal for completeness is 80 percent for all data.

Non-valid data (i.e., data qualified as "R" rejected) will be identified during the data review and the reasons for rejection explained in the data review report.

4.1.9.6 Sensitivity (Method Detection Limit)

Sensitivity is the capability of a method or instrument to discriminate between measurement responses representing different levels of a variable of interest, or to detect or reliably measure low levels of a variable of interest. Sensitivity defines the method detection limit (MDL) as the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the concentration is greater than zero. The MDL for particulate CrVI is provided Section 4.0.

The MDL is determined by the laboratory on an annual basis, according to the procedure in 40 CFR, Part 136, Appendix B. A standard is spiked onto at least seven prepared filters at a concentration one to five times the estimated detection limit.

These filters are extracted and analyzed according to the method outlined. The MDL is calculated as follows:

MDL = (t) x (SD)

Where:

t = t-value for 99% confidence level and standard deviation estimate with n-1 degrees for freedom [t = 3.14 for seven replicates]

SD = Standard Deviation of the replicate analysis.

The laboratory will maintain current records of DL studies for each instrument, and will have established reasonable accuracy (lower control limits should be 10 percent or greater) and precision goals for the analytical method utilized. The laboratory should perform DL verification studies at least annually for each method, as stipulated by National Environmental Laboratory Accreditation Conference. The concentration of the standards used to determine the DLs should be no more than five times the expected DL value. Historical DL studies, accuracy, and precision limit control charts should be retained in the laboratory archives for five years.

4.1.10 Interim Assessments of Data Quality

Evaluation of field and laboratory QC data and/or audits conducted for field operations and/or laboratory operations may indicate the need for a corrective action. Problems with analytical QC data will be addressed by the laboratory QC officer. Problems arising during field operations, however, will be addressed by the Technical Lead through communication of the identified problem and proposed corrective action to the air monitoring consultant's Project Manager. The Project Manager and Technical Lead will discuss the appropriate actions with the MDE and USEPA representatives to obtain concurrence, and then relay this information to the field personnel for implementation. The field personnel

will then report back to the air monitoring consultant's Project Manager upon successful implementation of the corrective act.

4.2 Verification and Validation Methods

All data will be verified by a review of the completeness and accuracy of each result's metadata. Field operations will be fully documented, reviewed, and audited. All CrVI data will undergo Level II data validation. The precision of the DustTrak (or equivalent) particulate data will be determined by collocated duplicate results.

The quality of field and laboratory data will be evaluated based on precision, accuracy, representativeness, completeness, and comparability of the data generated by each type of analysis. These data assessment parameters are described in the following sections. The analytical criteria, including reporting limits and control limits for QC results, will be specified in the laboratory's quality system, which will be incorporated by reference once a laboratory has been engaged.

4.3 Reconciliation with User Requirements

The project management team, QA Coordinator, and sampling and analytical team members are responsible for ensuring that all measurement procedures are followed as specified and that measurement data meet the prescribed acceptance criteria. Prompt action must be taken to correct any problem that may arise.

4.3.1 Conduct Preliminary Data Review

A preliminary data review will be performed to uncover potential limitations to using the data, to reveal outliers, and generally to explore the basic structure of the data. The first step is to review the quality assurance reports. The second step is to generate graphical presentations of the data, and review these summary statistics and graphs.

4.3.2 Draw Conclusions from the Data

If the sampling design and statistical tests conducted during the final reporting process show results that meet acceptance criteria, it can be assumed that the network design and the uncertainty of the data are acceptable. This conclusion can then be reported to USEPA.

5. REFERENCES

USEPA QA/R-5 A1-A9, B1-B10, C1-C2, D1-D3, E1

40 CFR 30, Code of Federal Regulations, "Grants and Agreements with Institutions of Higher Education, Hospitals, and Other Non-Profit Organizations."

40 CFR 31, Code of Federal Regulations, "Uniform Administrative Requirements for Grants and Cooperative Agreement to State and Local Governments."

40 CFR 35, Code of Federal Regulations, "State and Local Assistance."

48 CFR 46, Code of Federal Regulations, "Federal Acquisition Regulations."

ANSI/ASQC E4-1994, *Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs*, American National Standard, January 1995.

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U.S. Environmental Protection Agency, 2000b. *Guidance for the Data Quality Objectives Process (QA/G-4)*, USEPA/600/R-96/055, Office of Environmental Information.

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U.S. Environmental Protection Agency, 2018. *Guide to Writing Quality Assurance Project Plans for Ambient Air Monitoring Networks,* USEPA-454/B-18-006, Office of Research and Development

U.S. Environmental Protection Agency, 2006. *Guidance on Systematic Planning Using the Data Quality Objectives Process*, USEPA QA/G-4, Office of Research and Development

ERG-MOR-063 (modified ASTM Method D7614-12)

ASTM International, 2012. *Standard Test Method for Determination of Total Suspended Particulate (TSP) Hexavalent Chromium in Ambient Air Analyzed by Ion Chromatography (IC) and Spectrophotometric Measurements*.

TABLES

Table 1. Measurement Quality Objectives

Compound	Reporting Units	Precision (RPD)*	Bias*	Representativeness	Comparability/ Method Selection	Completeness	Method Detection Limit
PM_{10}	$\mu g/m^3$	Duplicate instruments at one location Acceptance criteria: RPD < 40%	NA	Pre-construction – air shed surrounding site vicinity; Construction – air shed at perimeter & surrounding site vicinity	Direct Read Instrument DustTrak 8533 or equivalent; factory and field calibrated	Average daily PM_{10} concentration measurement for 24-hour sampling day at each location for the **duration of time that intrusive activities are taking place**	1.0 $\mu g/m^3$ 3.0 liter/min. minimum sample volumetric flow rate
Hexavalent Chromium (CrVI)	ng/ m^3	Co-located sample collection Acceptance criteria: RPD < 20%	25%	Pre-construction – air shed surrounding site vicinity; Construction – air shed at perimeter & surrounding site vicinity	ERG-specific method ERGMOR-063 based on ASTM Test Method D7614-12, with a minimum sample flow rate of 3.0 liter/min. and detection limit of no greater than 0.2 ng/filter	90% of proposed samples 6 samples per 24-hour sampling day	Detection limit not to exceed 0.2 ng/filter

** = These are estimates. The methods do not state the precision or bias.*
RPD = Relative percent difference
ASTM = American Society for Testing and Materials
$\mu g/M^3$ = Micrograms per cubic meter
ng/M^3 = Nanograms per cubic meter

Table 2: Analytical Parameters and Target Limits

Analytical Parameter[1]	Project Alert Level (applicable units)	Laboratory Limits[2] (applicable units)	
		Quantitation Limits	Detection Limits (if appropriate)
PM_{10}	**68 µg/m^3**	**1.0 µg/m^3**	**n/a**
PM_{10}	**118 µg/m^3**	**1.0 µg/m^3**	**n/a**
PM_{10}	**150 µg/m^3**	**1.0 µg/m^3**	**n/a**
CrVI	**0.178 ng/m^3**	**n/a**	**0.2 ng/filter**

[1] Analytical parameters include both field and laboratory analyses.
[2] Laboratory quantitation limits and detection limits are those that an individual laboratory or organization is able to achieve for a given analysis on a routine basis.

Table 3: Sampling Design and Rationale

Sampling Location/ID Number	Matrix/Media	Analytical Parameter[1]	Rationale for Sampling Design[2]
PAM-1	Treated filter	CrVI and Real-Time PM_{10}	Placed between the project and Exelon Office building to monitor impacts to neighboring tenants.
PAM-2	Treated filter	CrVI and Real-Time PM_{10}	Placed between the project and the Point Street Apartments (under construction as this QAPP is being prepared) to monitor impacts to neighboring tenants.
PAM-3	Treated filter	CrVI and Real-Time PM_{10}	Placed on the southeastern boundary of the project site, characterizing impacts in that direction and serve as upwind monitor as appropriate.
PAM-4	Treated filter	CrVI and Real-Time PM_{10}	Placed on the southern boundary of the project site, characterizing impacts in that direction and serve as upwind monitor as appropriate.
PAM-5	Treated filter	CrVI and Real-Time PM_{10}	Placed on the western boundary of the project site, characterizing impacts in that direction and serve as upwind monitor as appropriate.

[1] Analytical parameters include all planned field measurements (e.g., dissolved oxygen, turbidity, pH, etc.), field screening analysis (e.g., PCBs by immunoassay test kit, selected metals by XRF), and laboratory analyses.
[2] Rationale supports the selection of sampling locations and associated analytical parameters.
Source: EPA 2021 (Style is Table Source. All tables and figures must have sources [if appropriate].)

Table 4: Summary of Field and QC Samples (to be populated by air monitoring consultant)

Matrix/ Media	Analytical Parameter[1]	No. of Sampling Locations	Depth[2] (surface, mid, or deep)	No. of Field Duplicates	Organic Analyses[3] No. of:		Inorganic Analyses[3] No. of:		No. of Trip Blanks (for VOCs only)	No. of Equipment Blanks	No. of PE Samples[4]	Total No. of Samples
					MS	MSD	Dup	MS				
LABORATORY ANALYSES:												
FIELD ANALYSES:												
FIELD MEASUREMENTS:												

1 Analytical parameters include all laboratory analyses, field analyses (e.g., nutrients by various field test kits, PCBs by immunoassay test kit, select metals by XRF, etc.), and field measurements (e.g., dissolved oxygen, turbidity, pH, etc.).
2 When samples are collected at different depths at the same location, information for each depth category (e.g., surface, mid, or deep/bottom) is provided on a separate line.
3 Information includes the number of associated analytical QC samples, if collection of additional sample volume and/or bottles is necessary. If the QC samples listed are part of the analysis and don't require the collection of additional sample volume and/or bottles, "NA" (for "no additional sample") is included in the column. (Note: MS=matrix spike, MSD=matrix spike duplicate, Dup=laboratory duplicate/replicate.)
4 PE or Performance will be submitted for laboratory analysis along with the associated field sampled where noted.
Source: EPA 2015 (Style is Table Source. All tables and figures must have sources [if appropriate].)

Table 5: Analytical Method, Containers, Preservation, and Holding Times Requirements (to be populated by air monitoring consultant)

Matrix/Media:				
Analytical Parameter[1] and/or Field Measurements[2]	**Analytical Method Number**	**Containers (no., size/volume, type)**	**Preservation Requirements (chemical, temperature, light protection)**	**Maximum Holding Times[3]**
ANALYTICAL PARAMETER:				
FIELD MEASUREMENTS:				

[1] Analytical parameter includes both field and laboratory analyses.
[2] Field measurement parameters include those parameters measured directly in the field (e.g., dissolved oxygen, turbidity, pH, etc.).
[3] Maximum holding times include all pertinent holding times for each analytical parameter (e.g., from sample collection to sample preparation, from sample preparation to analysis, from sample collection to analysis, etc.) and field measurement (e.g., from sample collection to measurement).

Table 6: Quality Control Requirements for Analyses (to be populated by air monitoring consultant)

(<<Matrix>> for Analyses of <<Type of Analyses>>)					
ANALYTICAL METHOD/SOP:					
QC Sample:	**Data Quality Indicator (DQI)**	**Frequency Number**	**Method/SOP QC Acceptance Limits**	**Acceptance Criteria/ Measurement Performance Criteria[1]**	**Corrective Action**
LABORATORY ANALYSIS:					
FIELD ANALYSIS:					

[1] Information supports the acceptance criteria/measurement performance criteria introduced in Section 1.7.3.

Table 7: Quality Control Requirements for Field Measurements (to be populated by air monitoring consultant)

(<<Matrix>> for Field Measurements of <<Type of Parameters>>)					
FIELD PARAMETER:					
QC Sample:	**Data Quality Indicator (DQI)**	**Frequency Number**	**Method/SOP QC Acceptance Limits**	**Acceptance Criteria/ Measurement Performance Criteria[1]**	**Corrective Action**
<<PARAMETER 1 – Instrument Name (Manufacturer, Model)>>					
<<PARAMETER 2 – Instrument Name (Manufacturer, Model)>>					
<<PARAMETER 3 – Instrument Name (Manufacturer, Model)>>					

[1] *Information supports the acceptance criteria/measurement performance criteria introduced in Section 1.7.3.*

Table 8: Field Equipment/Instrument Calibration, Maintenance, Testing, and Inspection (to be populated by air monitoring consultant)

Analytical Parameter	Field Equipment/ Instrument	Calibration Activity	Maintenance Activity	Testing/Inspection Activity	Frequency	Acceptance Criteria	Corrective Action
CrVI	DustTrak DRX 8533 (or equivalent)	Instrument flow verification; temperature, pressure, and flow rate calibration (using BGI TetraCal flow standard).	1-Point check with zero filter. Clean inlet with internal filters. Factory cleaning and calibration.	Testing: Confirm that no error indicators/alarms are present on the instrument screen. Confirm with rental agency that factory Inspection: Check Zero Value. Initial daily flow check Start/Stop flow rates cleaning has occurred.	Testing: Once per day. Check instrument screen Inspection and Maintenance: Clean once every two weeks. Calibrate quarterly.	±0.001 milligrams per cubic meter 3 liters per minute, ±5% Confirm maintenance schedule in field notebook.	See user manual for instrument to determine flow rate re-calibration needs.
Total PM	DustTrak DRX 8533 (or equivalent)	Instrument flow verification; temperature, pressure, and flow rate calibration (using BGI TetraCal flow standard).	1-Point check with zero filter. Clean inlet with internal filters. Factory cleaning and calibration.	Testing: Confirm that no error indicators/alarms are present on the instrument screen. Confirm with rental agency that factory Inspection: Check Zero Value. Initial daily flow check Start/Stop flow rates cleaning has occurred.	Testing: Once per day. Check instrument screen Inspection and Maintenance: Clean once every two weeks. Calibrate quarterly.	±0.001 milligrams per cubic meter 3 liters per minute, ±5% Confirm maintenance schedule in field notebook.	See user manual for instrument to determine flow rate re-calibration needs.

Analytical Parameter	Field Equipment/ Instrument	Calibration Activity	Maintenance Activity	Testing/Inspection Activity	Frequency	Acceptance Criteria	Corrective Action
Wind Speed and Direction	Anemometer	Quarterly siting checks, linearity checks, and velocity.	Instrument should undergo repair or replacement if found to be out of tolerance in response to calibration checks.	Data is reviewed multiple times a week to verify normal performance. Quarterly checks on instruments that are present at the site.	Calibrate quarterly.	+/- 5% linearity and bearing +/- 2% on velocity.	See user manual for instrument to determine flow rate re-calibration needs.

FIGURES

Figure 1 – Plot Plan Project Vicinity and Air Monitoring Features

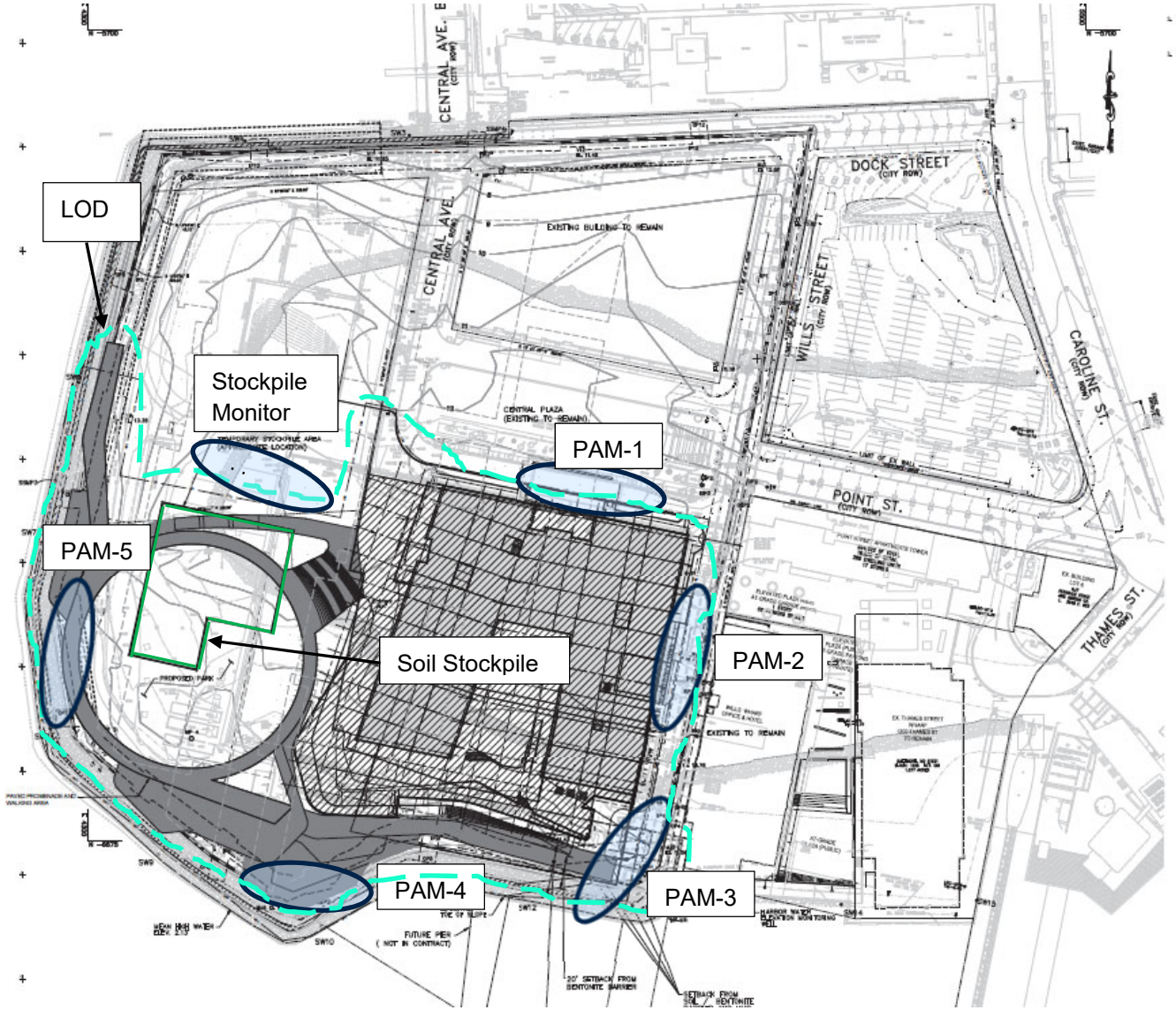
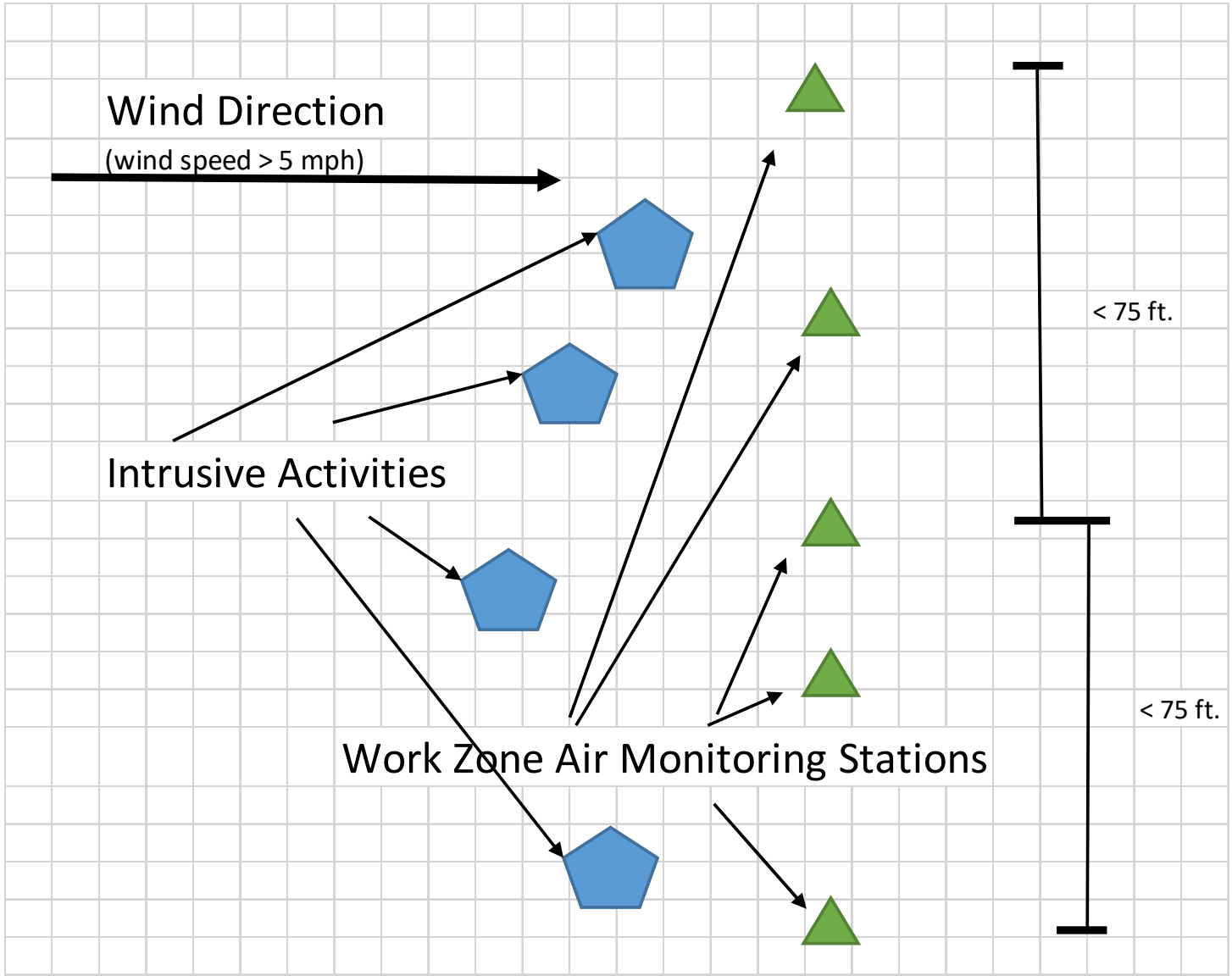


Figure 2 – Work Zone Monitoring Network Geometry



ATTACHMENT 1 FIELD DOCUMENTATION

Equipment/Instrument Manuals

EQUIPMENT/INSTRUMENT MANUALS

Instrument manuals are accessed electronically from the manufacturer's web site. Follow is the list of key equipment and the manuals' associated links

1. TSI Incorporated Model 8533 DustTrak Aerosol Monitor
   https://tsi.com/getmedia/3699890e-4adf-452f-9029-f3725612d5d1/8533-8534-DustTrak_DRX-6001898-Manual-US?ext=.pdf
2. Campbell Scientific Model CR1000X Datalogger
   https://s.campbellsci.com/documents/us/manuals/cr1000x-product-manual.pdf
3. Sierra Wireless Model RV50 Cellular Modem
   https://s.campbellsci.com/documents/ca/manuals/rv50_man.pdf
4. BGI/Mesa Labs Model TetraCal Volumetric Flow Standard
   https://bgi.mesalabs.com/wp-content/uploads/sites/35/2014/10/MK101-15-B-tetraCal-tetraCal-Ultra-Manual.pdf

Air Monitoring Standard Operating Procedures

SOP 001 -- Version 1.0

Procedure Name: Air Monitor Set-Up

1. APPLICABILITY

The Field Manager is responsible for implementing this procedure to set up air monitors along the project perimeter, near the soil stockpile, and near intrusive work zones. DustTrak Model 8533 Aerosol Monitors (or equivalent) will be employed to measure real-time inhalable particulate matter with aerodynamic diameter less than 10 micrometer (PM_{10}) at each monitoring location. Perimeter monitoring sites will also will also be equipped to collect daily 24-hour composite filter samples for subsequent laboratory CrVI analysis. The monitoring consultant's staff will perform instrument set-up and subsequent servicing.

2. PURPOSE

This Standard Operating Procedure (SOP) describes how to set up DustTrak Model 8533 Monitors (or equivalent) PM_{10} monitoring instruments. This document will provide instructions for instrument siting, installation, calibration, and operation of an instrument in the field. This is intended to guide the Field Manager on the necessary protocol to ensure accurate and proper operations of this instrument for its intended use.

The monitoring program is detailed in detail in the Construction Air Monitoring Program (CAMP) document. Specifics of quality-related tasks are contained in the associated Quality Assurance Project Plan (QAPP).

3. EQUIPMENT REQUIRED

- DustTrak Model 8533 Monitors (or equivalent) for PM_{10} monitoring
- Datalogger (Campbell Scientific CR1000x or equivalent)
- 12 volt power source
- Cellular modem (Sierra Wireless RV50 or equivalent), antenna, cables, and associated data plan of at least 250 MB for each modem
- Certified volumetric flow rate standard, such as a BGI TetraCal (or equivalent)

4. PROCEDURE

The air monitoring consultant is responsible for implementing this procedure, at the direction of the Field Manager. To yield representative measurements, monitors must be properly selected, configured, sited, installed, calibrated, and operated. This SOP provides direction on the first four of these tasks.

4.1 Acceptance Checking

1. Prior to deployment to the site, instruments will be selected that meet the project's monitoring quality objectives, as specified in the QAPP. The equipment will be received at the air monitoring laboratory and will undergo an acceptance check in the lab controlled environment. This consists of being configured, as it will be operated in the field: 1-minute averaging, PM_{10}, and, for perimeter air

monitors, daily 24 hour filter sample duration. It will then be allowed to run for multiple days to ensure continuous operation without issue or instrument alarms.

2. Once received at the site, all shipping containers should be inspected for transport damage, and to ensure that all equipment is present. If there are issues, contact the air monitoring Project Manager immediately to resolve.

4.2 Siting and Installation

Once all equipment is present and in good condition, the instruments should be installed in general conformance to the siting diagram within the CAMP and QAPP documents. Some adjustments may be necessary in order to accommodate site conditions such as the presence of interfering structures and poser availability. Any deviations must be documented and reviewed/approved by the monitoring Project Manager.

Micro-siting will follow US EPA guidance for separation of potential interfering structures, local interfering emission sources, etc., as discussed in the CAMP.

Fixed Monitors

Fixed monitors will be installed along the project perimeter (Perimeter Air Monitors, PAMs) and near the soil stockpile, in general conformance to the network design presented in the CAMP. Once installed, these monitors will remain in the same location for the duration of the program unless site changes necessitate relocation.

1. **PAMs.** For perimeter monitoring purposes, the instruments are expected to operate once ground breaking activities commence and will be sited to optimize their coverage around the perimeter of the site. A total of five PAMs DustTraks (or equivalent) will be deployed, situated to provide coverage of the project site. Instruments will be configured to continuously monitor PM_{10}, reporting 15-minute average values. During any intrusive construction activities, an instrument will be set up to collect daily 24-hour composite filter samples for subsequent CrVI laboratory analysis. At least once per month a collocated filter sample will be collected for gravimetric analysis. The gravimetric results will be used to develop mass calibration in accordance with the instrument manufacturer's guidance monthly for adjusting the real-time signals.
2. **Soil Stockpile.** One fixed monitoring site will be established to the north of the clean soil stockpile, near the work site perimeter. The instrument will continuously monitor PM_{10} from the time the stockpile is built, until it has been fully reclaimed. The instrument will be configured to continuously monitor PM10, reporting 15-minute average values. As with the other real-time monitors, at least once per month a collocated filter sample will be collected for gravimetric analysis. The gravimetric results will be used to develop mass calibration in accordance with the instrument manufacturer's guidance monthly for adjusting the real-time signals.

Work Zone Monitors

Whenever intrusive construction work is being performed or the liner is open, two or more work zone monitors will be installed and operated until the liner has been restored or the area sealed. These monitors will be moved or supplemented with additional monitors if necessary to accommodate wind directional shifts such that no monitor is within 45 degrees of the average downwind bearing. Intrusive activities may include, but not be limited to:

i. Pile Driving;

ii. Pile cap installation; and

iii. Contaminated material excavation and augering.

The air monitoring consultant's Field Manager will participate in the weekly "look-ahead" construction meetings to learn what work is anticipated so that the proper number of work zone air monitors can be assembled and readied for service, and support staff scheduled. He/she will also attend the daily tailgate meetings to confirm what intrusive activities will be carried out that day, their location, and expected duration. He/she will develop a daily monitoring plan after consulting the weather forecast for wind and precipitation. He/she will monitor weather and construction activities during the course of the work day to anticipate the need for any adjustments to the monitoring plan.

If multiple and separate intrusive construction locations occur at the same time, an array of work zone monitors will be installed downwind of construction zones, with at least two downwind monitor operated for each 75 feet of projected crosswind (i.e., orthogonal to wind direction) distance of intrusive operations. If the wind direction shifts in the course of activities, either additional monitors will be installed and operated or the initial monitor locations may be shifted.

The instrument(s) will be operated continuously from the time intrusive work commences until the liner is restored or the work area otherwise secured. The instruments will be configured to continuously monitor PM10, reporting 15-minute average values. At least once per month a collocated filter sample will be collected for gravimetric analysis. The gravimetric results will be used to develop mass calibration in accordance with the instrument manufacturer's guidance monthly for adjusting the real-time signals.

4.3 Calibration and Operation

1. Once instruments are powered on without alarms and installed at the given locations, they will be connected to a datalogger and modem, and the field technician will confirm connection with data server.
2. Prior to initial operation at the project site, each air monitor's volumetric flow rate, temperature, and pressure will be calibrated using certified standards (certified annually). If recommended by the monitor's vendor, a leak check will be performed. Each instrument will undergo an as-left temperature, pressure and multi-point flow verification.
3. All instrument adjustments should be documented and the log forms stored on the air monitoring consultant's server and stored at the site.
4. Following its initial deployment, the field technician will perform volumetric flow verifications, daily, with the results submitted to the air monitoring project manager, each day. .
5. Each air monitor will be re-calibrated on a quarterly basis, to ensure proper operations and correct for instrument drift.

4.4 Follow-up Documentation

1. All flow verifications and calibrations should be documented and tracked for potential changes over the course of the project.

4.5 Version History

Version	Sect.(s) Revised	Change(s)	Author	Approved By	Date
1	All	Original Draft	J. Maska/ERM	R. Osa	4/21/2021

SOP 002 -- Version 1.0

Procedure Name: Air Quality Alert Response

1. APPLICABILITY

The air monitoring consultant's Field Manager is responsible for implementing this procedure upon receiving a PM_{10} alert via email or text message. Other air monitoring consultant staff may be called on to confirm monitoring data validity. The project's construction contractor staff may be called upon to implement enhanced dust control or other corrective action.

2. PROJECT MANAGEMENT

Harbor Point Development, LLC (HPD) is the Developer. An air monitoring consultant has yet to be retained. EPA and MDE have equal regulatory authority for this project. Key project personnel, regulatory personnel and their contact information are summarized in Table 1.

Table 1. Key Project Personnel

Name	Title/Role	Organizational Affiliation	Responsibilities
Jonathan Flesher	Project Manager	HPD	■ Oversees all project activities. ■ Directs the scope of work to the air monitoring consultant's PM.
			■ Reviews and approves all documents and coordinate transmittal of documents to appropriate parties for review.
			■ Communicates with stakeholders regarding project activities.
TBD	Partner-in-Charge	Air monitoring consultant	■ Oversees entire program for the air monitoring consultant. ■ Reviews all final deliverables and invoices.
			■ Seeks HPD feedback on performance of project managers.
			■ Addresses program-level issues.
TBD	Project Manager	Air monitoring consultant	■ Reports to air monitoring consultant Partner-in-Charge ■ (TBD) and HPD ■ Jonathan Flesher
			■ Directs air monitoring consultant's Field Manager and subcontractors.
			■ Communicates questions or issues to Agency leads (MDE and USEPA)
			■ Ensures that assigned staff has been trained in SOP implementation.
			■ Ensures that all key decisions and project deliverables are subjected to independent technical review by qualified personnel within the time frame of the project schedule.

Name	Title/Role	Organizational Affiliation	Responsibilities
Norman Forsberg	Consultant to T. Rowe Price	Arcadis	■ Receive notification of Alert Level Exceedance ■ Participate in development of Corrective Action Plans, following and CrVI exceedance
Brian Magee	Consultant to T. Rowe Price	Arcadis	■ Receive notification of Alert Level Exceedance ■ Participate in development of Corrective Action Plans, following and CrVI exceedance
Maria Kaouris	Project Manager	Honeywell	■ Receive notification of Alert Level Exceedance ■ Participate in development of Corrective Action Plans, following and CrVI exceedance

3. PURPOSE

This SOP is intended to specify the response actions and notifications to be implemented in the event that real-time respirable particulate matter less than 10 micrometer in aerodynamic diameter (PM_{10}) monitoring during construction intrusive activities indicates an exceedance of the Alert Level specified in the Construction Air Monitoring Plan (CAMP). This procedure also addresses the appropriate response to measurement of a measured CrVI concentration in excess of its corresponding Alert Level.

For the purpose of this SOP, “intrusive activities” occur any time there is disturbance of the contaminated soil immediately below the synthetic layers of the existing MMC in Area 1.

The project-specific PM_{10} and CrVI Alert Levels have been approved by EPA and MDE, for previous development of the property.

Site remediation activities have the potential to adversely impact ambient air quality. Of particular concern at the Harbor Point property is the potential for intrusive construction activities to result in elevated Hexavalent Chromium (CrVI) impacts. As a proactive measure, the project incorporates a network of fixed perimeter and soil stockpile air monitors, and portable work zone monitors, with real-time PM_{10} measurement and telemetry capability. The perimeter monitoring sites are also equipped to collect daily 24-hour integrated filter samples for subsequent laboratory analysis of CrVI.

The air monitoring consultant is responsible for installing and operating the air monitors—and interacting with the construction contractor to implement corrective actions if air monitoring results exceed designated alert levels.

This SOP details the monitoring consultant Field Manager’s responsibilities upon receipt of a dust alert. It is intended to guide the investigation and corrective actions to be performed in the event of an alert.

4. OVERVIEW OF CONSTRUCTION AIR MONITORING

PM_{10} will be monitored using DustTrak Model 8533 (or equivalent) real-time monitors. Either the DustTrak or a separate instrument will be used to collect particulate filter samples for subsequent laboratory analyses of CrVI. Detailed descriptions of the air monitoring program are contained in the following documents:

- Area 1, Phase 2, Parcel 3 Development, Honeywell Baltimore Works Site, Construction Air Monitoring Plan, July 2021 (CAMP); and

- Area 1, Phase 2, Construction Air Monitoring Quality Assurance Project Plan, Parcel 3 Development, Honeywell Baltimore Works Site (QAPP), including;
  - Field Sampling Standard Operating Procedures (SOPs).

5. EQUIPMENT REQUIRED

- PM_{10} and CrVI monitoring instruments.
- Phone, computer or tablet access to internet:
  - Communication for receiving automated messages regarding PM_{10} concentration alerts;
  - Access to real-time air quality and meteorological data;
  - Access to weather forecast for anticipating near-term wind and precipitation changes.
- Dust control Best Management Practices supplies:
  - Water misting equipment;
  - Geotextile material; and
  - Polyethylene sheeting and sandbags.

6. ALERT LEVELS

The PM_{10} Alert Levels are established as follows:

Monitor Type	Parameter	Alert Level	Comments
Perimeter Air Monitor	PM_{10}	150 µg/m^3, 15-minute average	Under some conditions, upwind concentration may be subtracted out[1]
	CrVI	0.178 ng/m^3, 24-hour average	Analysis performed by laboratory
Soil Stockpile Monitor	PM_{10}	150 µg/m^3, 15-minute average	Under some conditions, upwind concentration may be subtracted out[1]
Work Zone Monitor	PM_{10}	68 µg/m^3, 15-minute average	Under some conditions, upwind concentration may be subtracted out[1]

[1] When wind speed exceeds five miles/hour, the data processing system will automatically consult a look-up table to identify the best available upwind monitor and compute the net concentration at the measurement site. If wind speed is less than 5 miles per hour, no upwind adjustment will be made. Due to its proximity to Parcel 4 construction impacts, monitors near that activity will not be considered for use as upwind monitors.

7. PROCEDURE

The air monitoring consultant is responsible for implementing this procedure to respond to monitoring system alerts. While the intent is to ensure efficient site construction without undue impact on the site's surroundings, if need be, construction activities must be suspended until conditions improve.

8. DUST CONTROL

Best Management Practices (BMPs) will be used to control dust to the extent practicable. In order of sequencing, the standard operating BMPs will include the following:

- BMP No. 1 - Limiting the size of the open area at any one time during construction. This will serve two purposes:
  - Reduce the area of exposed soil that could be a source of windblown dust; and
  - Assist with storm water management.
- BMP No. 2 – Apply aerosolized water mist downwind of the excavation zone or cover soil stockpile area using potable water as needed to precipitate-out potential fugitive airborne dust and to keep exposed soil surfaces moist during excavation and loading;
- BMP No. 3 - Direct load soil from below the synthetic layers of the MMC into lined, roll-off containers with sealable covers stationed as close to the excavation zone as practicable;
- BMP No. 4 - Cover excavation surfaces with geotextile as soon as practicable during the excavation sequence to reduce the area of exposed soil that could be a source of windblown dust. Other soil sealing materials such as polyethylene plastic sheeting and foam spray will be applied to excavation slopes. The bottom of the excavation zone will be further sealed by installing a clean, aggregate layer, thereby allowing workers to perform work in a clean zone; and
- BMP No. 5 - Cover the clean soil stockpile with polyethylene plastic sheeting, secured by sand bags, to reduce the potential for these areas to be a source of windblown dust.
- Additional corrective actions to control a dust release from a work zone will include establishing a wind curtain by attaching fabric to a temporary fence upwind of the work zone, and by increasing the aerosolized water misting downwind of the work zone.

9. RESPONSE ACTIONS AND NOTIFICATIONS

Response actions and notifications pertain to the project-specific PM_{10} Alert Level exceedances that could occur at the fixed, perimeter air monitoring and/or mobile Work Zone and clean soil stockpile area monitoring locations. PM_{10} data will be continuously monitored via telemetry from the fixed and work zone stations during intrusive construction activities. An automated system will screen the continuous data for Alert Level exceedances and issue email and text alerts. This system will interrogate the alarming instrument's diagnostics and will note any out-of-tolerance parameters in the alert notification.

In addition, since the continuous PM_{10} monitors only read particulates up to 10 microns in size, the field technician and/or field manager are responsible for a minimum of three visual inspections per day of the work zones for large particulate releases during pile driving or large scale MMC removal during moment slab construction. These inspections will be documented daily in the field logbooks and will coincide with the construction activities most likely to produce large particulate releases. If such a release is observed, it will be documented photographically, if possible, and work will be stopped temporarily in order to apply aerosolized water misting to control the release. If this corrective action is taken, it will be documented in the field logbook. If the alert notification noted any out-of-tolerance operating parameters, the field technician will perform field verification tests. If the monitor is malfunctioning, it will replaced with a spare unit.

9.1 SCENARIO NO. 1 – PM_{10} Alert LEVEL EXCEEDANCE AT WORK ZONE MONITOR LOCATION(S)

Scenario No. 1 addresses the situation when a work zone monitor 15 minute average PM_{10} measurement (adjusted for upwind concentration, if appropriate) exceeds the 68 µg/m^3 Alert Level.

9.1.1 Response Action for Scenario No. 1

The step by step response for Scenario No. 1 is as follows:

- **Step No. 1** – Best efforts will be made to conduct Step 1 within approximately ten (10) minutes of alarm notification to the Field Manager and Field Technician. Inspect the immediate Work Zone area where the continuous PM_{10} monitor(s) sounded the alarm to assess whether there is an identifiable source of dust or activity related to construction intrusive work that may be triggering the alarm by answering the following questions:
  a. Is visible dust releasing from the specific work zone intrusive activity?
  b. Is the construction equipment (e.g., pile drivers) releasing visible smoke within range of the monitor(s)?
  c. Are there other nearby visible sources of particulate release, e.g., the cover soil stockpile, idling vehicles, etc.?
     i. If the work zone appears to be or is suspected to be the dust source, corrective action will be taken immediately to eliminate, control or manage that source to reduce the potential for its recurrence. Additional corrective actions to control a dust release from a work zone will include establishing a wind curtain by attaching fabric to a temporary fence upwind of the work zone, and by increasing the aerosolized water misting downwind of the work zone. The alarming monitor will then be observed for another 15-minute average to document that the instrument is no longer indicating an Alert Level exceedance. Under this scenario, no further action is required after a 15-minute PM_{10} average that does not exceed the Alert Level. The event will be documented in the field logbook.
     ii. If an alternate nearby dust source is suspected based on the answers to the questions above, that source should be temporarily eliminated (e.g., stop pile driving, turn off idling vehicle, etc.), and the 15-minute averages continued until the 15-minute average PM_{10} concentration drops below the Alert Level. Under this scenario, no further action is required after a 15-minute PM_{10} average that does not exceed the Alert Level. The event will be documented in the field logbook.
- **Step No. 2** – If Step 1 does not resolve the Alert Level exceedance, troubleshoot the Work Zone instrument that alerted for possibility that the monitor may be malfunctioning.
  a. If the PM_{10} instrument that alerted appears to be malfunctioning as evidenced by telemetered diagnostic data, when negative readings are recorded, or loss of power occurs, after checking the other Work Zone instrument operation and concentration readings, run the Zero Cal and Flow Cal verifications and re-start the previously alerting monitor; and
  b. Observe the PM_{10} concentration readings for another 15- minute average to document that the instrument is now operating properly. Under this scenario, no further action is required after approximately 30 minutes from the alert. Document the event in the field logbook.

- **Step No. 3** - If Step 2 does not resolve the monitor alarm, the Field Manager, in consultation with the air monitoring consultant's Project Manager, MDE inspector or on-site EPA representative, or alternate Agency contacts, will check the PM_{10} readings of all on-site and off-site monitors for consistency of reported PM_{10} concentrations:

    a. Check the PM_{10} level(s) at each downwind Work Zone monitor(s) and the fixed, perimeter continuous PM_{10} monitoring stations, to assess the possibility that the source of the PM_{10} concentrations that triggered the alert are caused by or being contributed to by upwind, off-site conditions unrelated to construction. If the downwind Work Zone monitor(s) PM_{10} readings and the perimeter monitor PM_{10} readings upwind and downwind are similar, then all Work Zone and perimeter stations will be observed for another 15-minute average to document that there is no Alert Level exceedance or that upwind and downwind conditions are similar. Under this scenario, no further action is required after a 15-minute PM_{10} average that does not exceed the Alert Level. The event will be documented in the field logbook.

- **Step No. 4** - If after having followed Steps No. 1 through 3, the PM_{10} concentration is not improving and remains at or above the alarm level:

    a. The Field Manager, in consultation with the air monitoring consultant's Project Manager, MDE inspector or on-site EPA representative, or alternate Agency contacts, will STOP all potential dust generating work activities (which may include activities outside of the Work Zone) that may be potentially contributing PM10 concentrations above the Alert Level;

    b. The Field Manager, in consultation with the air monitoring consultant's Project Manager, MDE inspector or on-site EPA representative, or alternate Agency contacts, will visually observe the efficacy of the SOP BMPs and the additional corrective measures implemented;

    c. The Field Manager, in consultation with the air monitoring consultant's Project Manager, MDE inspector or on-site EPA representative, or alternate Agency contacts, will establish a CrVI sampler at the Work Zone monitoring location with the highest PM10 concentration. Collect a CrVI sample for 24 hours and submit the sample for three-business day turnaround analysis by the laboratory. Also initiate CrVI sampling at the fixed, perimeter stations, if not already in progress. Sampling and analyses will be in accordance with the QAPP;

    d. Resume construction activities once the downwind Work Zone real-time monitors indicate that PM_{10} concentrations are below the Alert Level for two consecutive 15-minute average periods and there are no exceedances of the Alert Level at any of the perimeter air monitoring locations;

    e. Document the additional corrective actions taken in the field logbook;

    f. Record the CrVI sample analytical results from the Work Zone and perimeter monitoring locations in the project's daily files.

9.1.2 Notifications under Scenario No. 1

All Work Zone Alert Level exceedance responses will be documented in the field logbook by the Field Manager. If the exceedance event is resolved at Step 3, the EPA and MDE Project Coordinators (or Alternates if the Coordinators are unavailable) will be contacted on the event day and the field log record will be transmitted to the EPA and MDE Project Coordinators on the event day. If the Work Zone Alert Level Alert event is resolved at Step 4 (Stop Work), the EPA and MDE Project Coordinators (or Alternates if the Coordinators are unavailable) will be contacted immediately.

As part of Step 4, a Stop Work event log entry will be made in the field logbook and the Field Manager, in consultation with the air monitoring consultant's Project Manager, MDE inspector or on-site EPA representative, or alternate Agency contacts, will notify the primary points of contact provided in Table 1 immediately following the issuance of the Stop Work order. It is expected that the Field Manager, in consultation with the air monitoring consultant's Project Manager, MDE inspector or on-site EPA representative, or alternate Agency contacts, will work together with AHCC's Sr. Project Manager to resolve the on-site conditions. The Field Manager, in consultation with the air monitoring consultant's Project Manager, MDE inspector or on-site EPA representative, or alternate Agency contacts, will also assess and document the potential for upwind and/or off-site, dust source contribution.

9.2 SCENARIO NO. 2 – PM_{10} ALERT LEVEL EXCEEDANCE AT PERIMETER MONITOR LOCATION

Scenario No. 2 addresses the situation when there is an exceedance of the PM_{10} Alert Level at a perimeter monitoring station, indicated by a 15-minute PM_{10} average exceeding the Alert Level or 150 $\mu g/m^3$. The steps below address conditions during the intrusive construction work day. If an alarm condition occurs during non- working hours when the construction site is inactive for the day or weekend, the alarm condition will be addressed following the steps below prior to commencing work the next work day.

9.2.1 Response Action for Scenario No. 2

The step by step response for Scenario No. 2 is as follows:

- **Step No. 1** – In the event a real-time perimeter PM_{10} monitor exceeds the Alert Level, intrusive construction activities will be temporarily suspended. The Field Manager, in consultation with the air monitoring consultant's Project Manager, MDE inspector or on-site EPA representative, or alternate Agency contacts, and the construction contractor's Sr. Project Manager will work together to ensure that the SOP BMP measures are in place. The Field Manager, in consultation with the air monitoring consultant's Project Manager, MDE inspector or on- site EPA representative, or alternate Agency contacts, will observe all perimeter monitor and Work Zone monitor PM_{10} readings two consecutive 15-minute averages;
- **Step No. 2** – If a perimeter air monitor is still reading above the PM_{10} Alert Level, inspect the fixed, perimeter monitor(s) that sounded the alert for the possibility of malfunction, as evidenced by alerts sent by telemetry when negative readings are recorded or loss of power occurs.
    a. If the real-time PM_{10} monitor that sounded the alert appears to be malfunctioning, after checking the other fixed, perimeter station(s) instrument operation and concentration readings for consistency of reported PM_{10}, run the Zero Cal and Flow Cal verifications and re-start the previously alarming monitor; and
    b. Observe the PM_{10} concentration readings for another 15-minute PM_{10} average to document that the instrument is no longer malfunctioning. Under this scenario, no further action is required after 45 minutes (three, 15-minute averages) from the initial alarm and work interruption. Resume construction activities and document the event in the field logbook.
- **Step No. 3** – If, after completing Steps No. 1 and 2, the PM_{10} concentration is not improving and remains at or above the alarm level:
    a. The Field Manager, in consultation with the air monitoring consultant's Project Manager, MDE inspector or on-site EPA representative, or alternate Agency contacts, will maintain the STOP

work action involving all potential dust generating work activities (which may include activities outside of the Work Zone) that may be potentially contributing PM_{10} concentrations above the Alert Level; and

b. The Field Manager, in consultation with the air monitoring consultant's Project Manager, MDE inspector or on-site EPA representative, or alternate Agency contacts, will compare all perimeter monitor results and Work Zone monitoring data; and

c. The Field Manager, in consultation with the air monitoring consultant's Project Manager, MDE inspector or on-site EPA representative, or alternate Agency contacts, will initiate CrVI sampling at the perimeter stations, if not already in progress, and establish CrVI samplers at the Work Zone monitoring locations; collect CrVI samples for 24 hours, and submit the samples for three business day turnaround analysis by the laboratory. Sampling and analyses will be in accordance with the QAPP;

d. After the perimeter station real-time PM_{10} monitors indicate that the 15-minute PM_{10} averages are below the Alert Level for 2 consecutive 15-minute average periods and there are no 15-minute exceedances of the Alert Level at any of the other perimeter air monitoring locations, resume construction activities;

e. Document the BMPs employed and additional corrective measures taken in the field logbook;

f. Record the CrVI sample analytical results from the mobile Work Zone and fixed, perimeter monitoring locations in the project's daily files.

9.2.2 Notifications under Scenario No. 2

Under Scenario No. 2, the Field Manager, or designee, in consultation with the air monitoring consultant's Project Manager, MDE inspector or on-site EPA representative, or alternate Agency contacts, will notify the primary points of contact provided in Table 1 immediately following the initial alarm and work stoppage. Following resolution of the PM_{10} exceedance, the Field Manager, or designee, in consultation with the air monitoring consultant's Project Manager, MDE inspector or on-site EPA representative, or alternate Agency contacts, will notify the primary points of contact provided in Table 1 immediately of the resumption of work activities. The event response will be documented in the field logbook by the Field Manager and that record immediately transmitted to the EPA and MDE Project Coordinators.

9.3 SCENARIO NO. 3 – PM_{10} ALERT LEVEL EXCEEDANCE AT COVER SOIL STOCKPILE MONITOR LOCATION

In order to reduce the likelihood of dust release from the clean cover soil stockpile, SOP BMPs will include:

a. The stockpile will be completely covered with plastic sheeting secured by sand bags at all times, except for when it is being loaded or unloaded;

b. During the loading/unloading operation, aerosolized water mist will be continuously applied at the downwind face.

If the stockpile PM_{10} Alert Level (150 µg/m^3, 15-minute average) is exceeded, then loading/unloading operations will stop and aerosolized water misting will continue until the alert condition ceases. This will be documented in the field logbook.

9.4 SCENARIO NO. 4 – CrVI ALERT LEVEL EXCEEDANCE AT PERIMETER MONITOR LOCATION

All the BMPs used for dust control also control particulate CrVI. Particulate CrVI can be suspended by intrusive activities. Within one work day of receiving laboratory results indicating a perimeter CrVI measurement above the Alert Level of 0.178 ng/m^3, 24-hour average, The Field Manager, or designee, in consultation with the air monitoring consultant's Project Manager, MDE inspector or on-site EPA representative, or alternate Agency contacts, will notify the primary points of contact provided in Table 1. The air monitoring consultant will perform an assessment of the filter sampler used to collect the sample exceeding the Alert Level. At a minimum, this assessment will include reviewing the instrument diagnostics and performing a sample flow rate verification. A senior monitoring specialist will review the raw data and confirm the accuracy of the calculation of the measured CrVI concentration.

a. Within 24 hours of receipt of the lab results indicating the CrVI exceedance, the air monitoring consultant will set up a sampler to collect 24-hour particulate CrVI filter samples at each intrusive work zone and commence monitoring.

b. Assuming the instrument that collected the exceedance sample is found to be operating within specification and the calculations are verified, the Field Manager will consult with the air monitoring consultant's Project Manager, MDE inspector or on-site EPA representative, or alternate Agency contacts, to determine whether intrusive activities must be suspended while further investigation is performed, or whether it is adequate to boost the degree of BMP controls.

c. Regardless of the decision regarding continued intrusive construction activities, the air monitoring consultant will collect all relevant air and meteorological monitoring data and provide a summary analysis within three working days of receipt of the lab results indicating the exceedance. The report will be distributed the contacts listed in Table 1.

d. The Field Manager will convene a meeting of representatives from each of the stakeholder organizations to discuss the exceedance report and develop a Corrective Action Plan.

e. The Field Manager will distribute the Corrective Action Plan, as well as weekly progress reports, to each of stakeholder organizations.

10. FOLLOW-UP DOCUMENTATION

1. Monitor site conditions once the measured PM_{10} and/or CrVI concentrations have subsided; advise the individuals in Table 1.
2. Fully document and Alert Level exceedances and response actions in the field logbook

11. VERSION HISTORY

Version	Sect.(s) Revised	Change(s)	Author	Approved By	Date
1	All	Original Draft	J. Maska	R. Osa	6/30/2021

SOP 003 -- Version 1.0

Procedure Name: Filter Sample Handling

1. APPLICABILITY

The designated air monitoring consultant's Field Manager is responsible for implementing this procedure to handle sample filters used in a DustTrak Model 8533, or equivalent sampler at the Harbor Point site.

2. PURPOSE

This procedure is designed to ensure proper handling of the collection filters used to sample air tor inhalable particulate matter with aerodynamic diameter less than 10 micrometer (PM_{10}) and/or hexavalent chromium (CrVI) when using a DustrTrak Model 8533, or an equivalent sampler. This document provides instructions for handling these sample filter cassettes when they are received from the laboratory, stored on site before and after sampling, exposed to sampling, and shipped to the laboratory for analysis. This is intended to guide the Field Manager on the necessary protocol to ensure accurate and reliable operation of this sampling process.

3. EQUIPMENT REQUIRED

- DustTrak Model 8533 or equivalent sampler capable of collecting air filter samples;
- Freezer;
- Ice Packs;
- Spare Styrofoam Coolers;
- Filter Cassettes (proper size for sampler being used);
- Disposable Nitrile Gloves; and
- Laboratory Chain of Custody (COC) Form.

4. PROCEDURE

The air monitoring consultant is responsible for implementing this procedure to ensure that all filter cassettes are properly handled, stored and exposed to samples.

4.1 Shipping and Acceptance

1. Filter cassettes prepared for sampling PM_{10} and CrVI will be shipped to the Harbor Point construction site by an independent laboratory. Filters intended for CrVI sampling will have been specifically treated and will be shipped to the site in a cooler with ice packs. PM_{10} sampling cassettes need not be kept cold.
2. The laboratory will have pre-numbered each filter, placed them in individual cassettes, and sent each batch of filters in a sealed ziplock bags, accompanied by a COC form. Upon receipt at the site, the Field Manager will verify that the shipment matches the COC form, and immediately transfer CrVI cassettes to a freezer in a secure location for storage. PM_{10} sampling cassettes may be stored in a secure location, at room temperature.

3. If the COC form includes fields for all necessary information (i.e., sample ID, date and time of filter set up, date and time of exposure, instrument flow rate, temperature/pressure during time of exposure, and retrieval date and time of filter) then it can be used to document sampling activities. Otherwise a supplemental form must be used to hold this information.

4.2 Filter Exposure & Retrieval

1. The air monitoring consultant's Project Manager will establish the fixed monitors' sampling schedule. The work zone monitoring schedule will be determined by the Field Manager, with the Project Manager's guidance. A written sampling schedule will be maintained in a secure, on-site location.
2. When a sampling event is due, the air monitoring technician will remove a filter cassette from inventory, document the serial number, date and time that the filter has been set up to be exposed, and the sampler location and unit number. NOTE: Filters intended for CrVI sampling and analysis should only be exposed to ambient temperature during the sampling process, otherwise filters are to remain in a freezer to ensure a temperature of less than 0 ºC. The technician must transport CrVI filters to and from the sampler, in a cooler supplied with blue ice. PM_{10} filter samples need not be temperature controlled.
3. Using disposable nitrile gloves, remove the appropriate filter (PM_{10} or CrVI) from the zip lock bag and place into the instrument filter holder.
4. Set the instrument to the sample duration specified in the schedule and verify this setting has been saved on the instrument.
5. Once the sample period has been completed, the filter sample should be retrieved and the sample end time documented on the COC or log form. CrVI samples must be immediately placed back into the ziplock bag and into the freezer. PM_{10} filter samples need not be temperature controlled.

4.3 Filter Shipment

1. Once all filters have been used from the initial shipment (or at such time as directed by the monitoring consultant's Project Manager), exposed filters will be retrieved and packed for shipment. If specified by the QAPP, a field blank will also be included with the shipment. (See the QAPP for field blank handling directions.)
2. The COC form should be filled out and included with shipment – including Filter Serial Number, Dates, Times, Operator Signature, Flow Rate, Ambient Temperature, Ambient Pressure, and Filter Temperature. The analysis requested for each sample (PM_{10} or CrVI) must be noted.
3. Filters will be packed with ice packs (to maintain a temperature of below 0 degree C) in styrofoam containers (retained from initial shipment from vendor) and shipped by overnight express to the laboratory. CrVI filter samples will be shipped daily for the first two weeks of intrusive activities, and then twice a week thereafter. An expedited turnaround time (TAT) of 3 days must be implemented in that event that a 24-hour CrVI sample is collected at the work zone. After the first two weeks of operation, a 5 day TAT will be implemented, with sample shipments to be sent out on Mondays and Thursdays.
4. It is the responsibility of the laboratory to perform CrVI and/or PM_{10} analysis, as requested, and provide a comprehensive report to the air monitoring consultant.

5. REPORT DOCUMENTATION

1. All reports and documentation will be retained electronically on a secure server, and in hard copy on site. Reports and other documentation will be retained for five years from cessation of monitoring.

6. VERSION HISTORY

Version	Sect.(s) Revised	Change(s)	Author	Approved By	Date
1	All	Original	J. Maska/ERM	R. Osa/ERM	6/30/2021

SOP 004 -- Version 1.0

Procedure Name: Data Handling & Review

1. APPLICABILITY

The air monitoring consultant's Field Manager is responsible for implementing this procedure, which describes the use of data provided by real-time PM10 Monitors and filter samples within the air monitoring program at the Harbor Point site. Other air monitoring consultant staff provide data review and support.

2. PURPOSE

To properly set up real-time PM_{10} monitors for continuous monitoring, data logging and telemetry. This document provides instructions for how data logging, telemetry, data review, real-time monitoring, and monthly implementation of a calculated factor of mass calibration in accordance with the instrument manufacturer's guidance will be performed. This procedure guides the Field Manager on the necessary protocol to ensure accurate and proper operations of this instrument for its intended use.

3. EQUIPMENT REQUIRED

- DustTrak Model 8533 Monitor (or equivalent) configured for PM_{10} monitoring;
- Datalogger (Campbell Scientific CR1000x or equivalent);
- Datalogging/database software (Loggernet, or equivalent);
- Battery and power source (for air monitor, datalogger, and cellular modem);
- Cellular modem (Sierra Wireless RV50 or equivalent) and associated data plan of at least 250 MB for each instrument; and
- Computer with internet access.

4. PROCEDURE

The air monitoring consultant's Field Manager is responsible for implementing this procedure to ensure that all instruments are being continuously powered, logging data, and associated website and data center are regularly updating.

4.1 Instrument Setup Confirmation

1. See SOP-001, "Air Monitor Set Up" for acceptance checking and installation of the monitoring instrument. The following instructions assume the instrument has been properly set up for continuous PM_{10} operation.
2. Confirm that the site is being provided with sufficient power to power the instrument, modem and datalogger. Consult the individual equipment users manuals for power requirements. The current power supply status can be accessed by connecting to the site using Loggernet and monitoring the datalogger voltage parameter.
3. Using the monitor's user access process, confirm that it is set up to provide 15-minute averages of PM_{10} and communicate the data to the datalogger. Depending on the specific instrument, data may

be transmitted via serial, Ethernet, or USB connection. Refer to the monitor's user manual for specific instructions on using the user interface.

4. Confirm that the datalogger is connected to the cellular modem. Test communications by using Loggernet to access the datalogger, confirming that data are being updated on a 1-minute frequency. If this is not the case, contact the air monitoring consultant's Project Manager for troubleshooting instructions.

4.2 Real-Time Data Polling & Data Review

4.2.1 Real-Time Data Polling

1. The real-time PM_{10} and wind measurements will be collected from the fixed and portable monitoring stations by the remote database server using a cellular modem connection, at least once every five minutes.
2. The database server will continuously execute a script that will perform the following tasks:
   a. Read in all 1 minute data and diagnostics.
   b. Compute 5-minute, 15-minute, and 1-hour averages.
   c. Adjust raw continuous PM_{10} measurements using the most recently-computed, instrument-specific mass calibration in accordance with the instrument manufacturer's guidance. The optical PM_{10} sensor is sensitive to the characteristics of measured dust: color, sheen, size distribution, shape, etc. There is also potential differences between different instruments. To account for these, a collocated filter sample is collected and analyzed gravimetrically. The laboratory analyses are then used to compute a mass calibration in accordance with the instrument manufacturer's guidance, which is multiplied by the raw optical measurement to yield an adjusted PM_{10} value, and performed monthly.
   d. If wind speed is greater than five mph, subtract the upwind PM_{10} concentration from the downwind concentration.
   e. Compare the raw or and adjusted calculated concentration against action level criteria.
   f. Send an alert, by email and text notifications, to the air monitoring consultant's Project Manager, the on-site Field Manager, Field Technician, and any other entity that requests notification if any of the monitors indicate an exceedance of a PM_{10} Action Level, or if instrument diagnostics indicate a potentially malfunctioning unit. This is applicable to both work zone and perimeter monitors.

4.2.2 Data Review

1. The most recent data will be reviewed by a qualified Air Quality Technician every weekday, though Microsoft Excel, EQuIS or equivalent database software.
2. The Air Quality Technician will review PM_{10} concentrations at 1-minute, 15-minute and 1-hour averages; instrument diagnostics; and wind speed and wind direction – looking for irregularities or alert levels triggered (which should also be issued by alarm via text message and email).
3. A database server script will automatically impose conditional formatting into the data review file, highlighting wind speed being above five mph, where upwind concentration adjustments have been made to the edited downwind concentration. All raw data will be archived, prior to adjustment.

4.2.3 Website

1. Real-time data will also be available via secure website, accessible by username and password provided by the client to necessary personal. The website will include line-graph depiction of all criteria listed in Step 2. See "Website Development & Maintenance" SOP for more details.
2. All irregularities should be reported to the necessary personal (Feld Manager, or equivalent) to determine what actions need to be taken.

5. FOLLOW-UP DOCUMENTATION

1. All laboratory reports and calculations will be stored electronically on a secure network drive, with hard copy records also maintained on site, and retained for five years from project completion.
2. Data review files and raw data will be stored electronically on a secure network drive, with hard copy records also maintained on site, and retained for five years from project completion.
3. Mass calibration values will be documented on a spreadsheet and stored electronically on a secure network drive, with hard copy records also maintained on site
4. Each data review will be documented in on a standardized data review form and submitted to the air monitoring consultant's Project Manager for review and approval.

6. VERSION HISTORY

Version	Sect.(s) Revised	Change(s)	Author	Approved By	Date
1	All	Original	J. Maska/ERM	R. Osa/ERM	6/30/2021

SOP 005 -- Version 0.0

Procedure Name: Lab Data Usage, Handling & Mass Calibration Factor Implementation

1. APPLICABILITY

The air monitoring consultant's Field Manager is responsible for implementing this procedure to associate the laboratory data with the real-time PM_{10} monitors that are operated at the Harbor Point construction site. Field technicians and other air monitoring consultant staff may be called upon to support follow-up activities.

2. PURPOSE

The optical PM_{10} sensor is sensitive to the characteristics of measured dust: color, sheen, size distribution, shape, etc. There is also potential differences between different instruments. To account for these, a collocated filter sample is collected and analyzed gravimetrically. The laboratory analysis is then used to compute a mass calibration factor in accordance with the instrument manufacturer's guidance, which is multiplied by the raw optical measurement to yield an adjusted PM_{10} value. This process is repeated on a monthly basis.

This SOP specified how to compute and apply the mass calibration factor, using laboratory gravimetric analysis results. This document provide instructions for using data collected from multiple sources, calculating the mass calibration factors, and applying them to the raw, real-time PM_{10} data to yield corrected values. This is intended to guide the Field Manager and project support staff on the necessary protocol to ensure accurate and proper operations of this instrument for its intended use.

3. EQUIPMENT REQUIRED

- DustTrak Model 8533 Monitor (or equivalent) configured for PM_{10} monitoring;
- Datalogging software;
- Computer with internet access; and
- Laboratory filter sample gravimetric analysis results.

4. PROCEDURE

The air monitoring consultant is responsible for implementing this procedure to ensure that all instruments are installed and operating correctly, and that the raw data are properly corrected using the calibration factors to yield accurate values.

4.1 Calculation of the Mass calibration factor

1. DustTrak 8533 instruments (or equivalent) will be used to collect PM_{10} samples on a filter, for subsequent laboratory gravimetric analysis. The air monitoring consultant's Project Manager will be responsible for collection of filter samples for mass calibration factor development purposes, as well as to specify the sample duration. (Longer sample durations can provide more precise mass calibration factors.)

2. The reported concentration from the laboratory will be used to relate the real-time optical signal to actual mass concentration and develop the mass calibration factor, for each monitor, on a monthly basis. Since inter-instrument response can vary, mass calibration factors will be developed and applied on an instrument-specific basis.
3. Data from the real-time monitor must be downloaded for the same period as the filter sample collection period.
4. Use the net filter gain mass (from the laboratory gravimetric analysis), divided by the sample volume (sample time multiplied by average sample volumetric flow rate) to compute the true PM10 mass concentration.
5. To calculate the instrument-specific mass calibration factor, divide the true PM10 mass concentration computed in above, in step 4, by the average raw PM10 concentration output by the monitor (per step 3). This process is computed using 1 month of data and is to be repeated every month.

4.2 Application of Mass Calibration Factors to PM_{10} Measurement Data

1. The mass calibration factor must be inserted into the real-time post-processing script running on the remote database server. That script applies the appropriate mass calibration factor to each real-time PM_{10} monitor's data stream to maintain accuracy of reported values.
2. In the post-processing script, update the mass calibration factor table with each of the new mass calibration factors computed as instructed in Section 4.1.
3. Repeat these steps each time a new PM_{10} filter sample analysis received from the laboratory.

5. FOLLOW-UP DOCUMENTATION

1. All mass calibration factor calculations will be performed and maintained in an Excel spreadsheet in the project folder on a secure network drive. Following each update, the data processor will notify the air monitoring consultant's Project Manager, who will confirm the accuracy of the mass calibration factor calculations, and ensure that the post-processing script has been properly updated.
2. The Project Manager will maintain a log of all mass calibration factor calculations, as well as his/her review.

6. VERSION HISTORY

Version	Sect.(s) Revised	Change(s)	Author	Approved By	Date
1	All	Original	J. Maska/ERM	R. Osa	6/30/2021

SOP 006 -- Version 1.0

Procedure Name: Website Development & Maintenance

1. APPLICABILITY

The air monitoring contractor's Project Manager is responsible for implementing this procedure to provide real-time data access to the Harbor Point air monitoring data to authorized individuals, including developer, construction, and regulatory agency staff.

2. PURPOSE

To ensure all variables are reported in real-time on a secure website that is accessible by username and password to the necessary personal involved with the project. This document will provide instructions for developing and maintaining the website to provide adequate data to support the client needs.

3. EQUIPMENT REQUIRED

- Computer with internet access;
- Credentials to develop website; and
- Credentials for Developer, Construction Contractor, Regulatory Agencies, and other authorized individuals.

4. PROCEDURE

The air monitoring consultant is responsible for implementing this procedure to ensure that data are continuously available in real-time for all active real-time monitors present on the site. This includes the output average concentrations of inhalable particulate matter with aerodynamic diameter less than 10 micrometer (PM_{10}), Wind Speed, Wind Direction, and instrument diagnostics (flow, pump speed, etc.).

4.1 Building the Website

1. A qualified Air Quality Data Technician will build a secure website that is accessible to the consultants, clients, and other project staff that is found to be necessary to access this material. Different levels of authorization will be available, depending on the individual. For instance, access to instrument diagnostic data will probably only be available to the air monitoring consultant's staff.
2. The data technician will develop a program to output real-time data logged by the system in a graphical format.
3. Graphs will include data for: 15-minute, and 1-hour, average values for PM_{10}, wind speed, and wind direction. CrVI data will be presented on a 24-hour average basis.
4. Data graphs will also be available for instrument diagnostics, such as sample flow rate, pump speed, and alarms – tracked in real-time.
5. The website displays will show real-time PM_{10} data that have been corrected by application of mass calibration factors to relate the monitors' outputs to gravimetric results, and are based on the specific instrumentation manual. When the 15-minute average wind speed has exceeded 5 mph, downwind

real-time PM_{10} monitoring data will also reflect adjustment by subtracting the measured upwind PM_{10} measurement.

4.2 Maintaining the Website

1. A qualified Air Quality Data Technician will be responsible for monitoring the website for anything that changes over the duration of the program.
2. In the event of a power outage, outlier value, or instrument downtime – the data technician must replace the graph with an 'Out of Order' message so that potentially invalid data are not used inadvertently.
3. If an 'Out of Order' message has been reported, the data technician is responsible for updating the website, by removing this message, once the instrument is back online.

4.3 Credentials Storage

1. All credentials, such as usernames and passwords, to access the sites will be stored on a secured network drive.
2. Credentials will be provided to the necessary personal for access by the data technician.

5. VERSION HISTORY

Version	Sect.(s) Revised	Change(s)	Author	Approved By	Date
1	All	Original Draft	J. Maska/ERM	R. Osa/ERM	6/30/2021

SOP 007 -- Version 1.0

Procedure Name: Field Instrument Flow Verifications

1. APPLICABILITY

The air monitoring consultant's Field Manager is responsible for performing volumetric flow verifications and associated instrument maintenance on the DustTrak 8533 (or equivalent) PM_{10} monitors used for both fixed and work zone air monitoring sites at the Harbor Point construction site. Other air monitoring consultant staff may be designated to assist with verifications. If a separate instrument is used for collecting particulate CrVI filter samples, this procedure is also applicable to them.

2. PURPOSE

Periodic checks must be performed in order to demonstrate the reliability of air monitoring data. This document provides instructions for performing flow verifications, associated maintenance, and leak checks in the field. This is intended to guide the Field Manager on the necessary protocol to ensure accurate and proper operations of this instrument for its intended use. The manufacturer's user manual should be used to supplement this procedure.

3. EQUIPMENT REQUIRED

- DustTrak Model 8533 (or equivalent) PM_{10} monitors;
- Power source;
- Certified Volumetric Flow Transfer Standard, BGI TetraCal (or equivalent); and
- Zero flow calibration device (from vendor).

4. PROCEDURE

The air monitoring consultant is responsible for implementing this procedure to ensure that all instruments are operating as intended.

4.1 Instrument Leak Check

NOTE: Instrument leak check procedures are instrument-specific. Following is the general approach; refer to the instrument's user's manual for specific guidance.

1. Set the instrument to a maintenance mode, and disable sampling during this test.
2. Remove the sample inlet and replace it with a vendor certified zero flow calibration device.
3. Ensure the zero flow calibration device blocks all incoming flow to the instrument.
4. Initiate instrument flow through the instrument, as if the instrument were under normal operating speed.
5. Allow the sample pump to operate for at least 30 seconds.
6. Report the value for flow. This value should be very close to zero.
7. Continue to perform flow verifications on the instrument (Section 4.2).

8. If performing the leak check prior to flow verification remove the zero flow device and move on to flow verifications, Section 4.2 at this time. Otherwise continue on to step 9, now.
9. If the instrument was found to be out of tolerance, apply vacuum grease to the inlet tube junction fittings to eliminate leaks. Repeat steps 3-6 to verify.
10. If instrument is still found to be out of tolerance, contact the air monitoring Project Manager for troubleshooting instructions. Repeat steps 3-6 to verify.
11. The leak check will be performed once again, if any changes to the instrument have been made, or for reporting the 'as left' status.

4.2 Instrument Flow Verification

1. Set the instrument to a maintenance mode, and disable sampling during this test.
2. Ensure that the flow standard has had at least 15 minutes to acclimate to the current outdoor conditions.
3. Remove the sample inlet and replace it with a BGI TetraCal flow standard, or equivalent.
4. Document the temperature and pressure, as it is reported by the flow standard and the instrument under test.
5. Activate the pump for the low flow setting, and allow air to flow through the instrument for about 2 minutes. Record the value reported by the flow standard and instrument under test.
6. Repeat Step 5 for all instrument flow settings.
7. Once completing all flow checks, turn off the pump.
8. Perform second leak check if necessary (refer to section 4.1).
9. Replace the sample inlet and return instrument to normal operation or sample mode.

5. FOLLOW-UP DOCUMENTATION

1. All flow verifications will be documented on a standardized form and submitted to the monitoring consultant's Project Manager for review.

6. VERSION HISTORY

Version	Sect.(s) Revised	Change(s)	Author	Approved By	Date
1	All	Original	J. Maska/ERM	R. Osa/ERM	6/30/2021

SOP 008 -- Version 1.0

Procedure Name: Independent Audits

1. APPLICABILITY

The air monitoring consultant's Project Manager is responsible for scheduling independent audits of the Harbor Point air monitoring program. Other air monitoring consultant staff may be called upon to support follow-up activities. The project's Quality Assurance Project Plan (QAPP) details the frequency and scope of these independent audits.

2. PURPOSE

The purpose of this SOP is to describe the process for engaging an independent organization to audit the quality system and performance of instruments used for the Harbor Point air monitoring program. This document provides auditor qualifications, logistical considerations associated with on-site instrument challenges, and the process for disseminating audit results. Additional detail can be found in the QAPP.

3. AUDITOR QUALIFICATIONS

The air monitoring consultant's Project Manager will engage an independent auditor with the following qualifications, experience, and knowledge:

- At least ten years experience operating or managing ambient air quality and meteorological monitoring systems;
- A thorough understanding of US EPA's air monitoring quality assurance guidance; and
- Ownership and supervisory reporting structure that is not associated with that of the air monitoring consultant.

In addition, prior to commencing project work, the auditor must become familiar with the project's Construction Air Monitoring Program (CAMP) and QAPP.

4. PROCEDURE

The QAPP calls for both "system" and "performance" audits. Both types of audits will be performed by individuals outside the direct supervisory line of responsibility, as the organization serving as air monitoring consultant.

System audits assess to what extent quality-related activities conform to the commitments made in the QAPP. The auditor may conduct this on a statistical basis (e.g., only reviewing 20% or the sample Chain of Custody forms, or calibration report forms). System audits typically include a records review and interviews of key project staff. They can be performed on-site, or remotely.

Performance audits challenge quality-related instruments with a known condition, and then compares the standard value against the instrument under test. Performance audits must use NIST-traceable standards that are different than the standards used for normal operations and calibrations.

4.1 System Audits

1. The air monitoring consultant's Project Manager will engage a qualified auditor and, after he/she has become familiar with the CAMP and QAPP, request a list of required documents, as well as a list of staff to be interviewed, as part of the audit.
2. The Project Manager will provide the auditor the requested documents and schedule interviews at mutually-convenient times.

4.2 Performance Audits

1. The air monitoring consultant's Project Manager will engage a qualified auditor and, after he/she has become familiar with the CAMP and QAPP, will schedule a field visit and arrange for access to the monitoring instruments.
2. The air monitoring consultant's Project Manager will ensure the field auditor uses appropriate PPE while on-site, and receives a site safety briefing.
3. If requested, the air monitoring consultant's staff will configure instruments for performance auditing and provide instrument response values.

5. AUDIT FOLLOW-UP

The air monitoring consultant's Project Manager will receive the audit report and review findings with the project team. If appropriate, the Project will develop Corrective Action Plans to address material findings. Upon completion of any required corrective actions, the auditor will be requested to sign off on their acceptability.

6. FOLLOW-UP DOCUMENTATION

1. All documentation and auditor reports should be stored on site in hard copy, or digitally on a secure file server.

7. VERSION HISTORY

Version	Sect.(s) Revised	Change(s)	Author	Approved By	Date
1	All	Original	J. Maska/ERM	R. Osa	6/30/2021

SOP 009 -- Version 1.0

Procedure Name: Quarterly Calibrations

1. APPLICABILITY

The air monitoring consultant's Project Manager is responsible for performing calibrations on the local meteorological sensors and DustTrak 8533 (or equivalent) monitors, at the fixed dust monitoring locations and in the work zones at the Harbor Point site. This procedure is also applicable to particulate CrVI filter samplers, if a separate instrument is used for collecting these samples. Other monitoring consultant staff may be delegated to perform this work, at the Project Manager's discretion.

2. PURPOSE

Ensuring data quality depends on periodic calibration of monitoring equipment. This SOP describes the procedures to be used to properly calibrate the meteorological sensors and DustTrak 8533 (or equivalent) inhalable particulate matter with aerodynamic diameter of less than 10 micrometer (PM_{10}) monitoring instruments employed by the Harbor Point air monitoring program. Background information is available in the Harbor Point Air Monitoring Quality Assurance Project Plan (QAPP). This SOP is intended to guide the air monitoring consultant's staff in the calibration procedures for these instruments.

3. EQUIPMENT REQUIRED

- DustTrak 8533 monitors (or equivalent), configured for PM_{10} monitoring;
- Certified BGI TetraCal Flow Transfer Standard (or equivalent);
- Zero Flow Calibration Device;
- Gloves: General Work Gloves, Disposable Nitrile Gloves; and
- Wind System NIST-traceable Calibration Standards (as applicable to instrument, see sec. 4.3).

4. PROCEDURE

The air monitoring consultant's Project Manager is responsible for implementing this procedure to ensure that instruments are maintained within calibration, in accordance with the QAPP. Additional field staff may be delegated to perform specific tasks.

4.1 Schedule Trip and Travel to the Site

1. Determine a schedule for quarterly calibrations.
2. Coordinate trip field staff, and schedule trip.
3. Pack equipment, proper clothing, and PPE to bring along, or ship in advance of trip.
4. Travel to site.

4.2 Perform Instrument Calibrations

Before going on site, perform any applicable site safety training. The PM_{10} monitor and wind sensor calibrations can be performed in any order.

4.2.1 PM_{10} Monitors

1. Disable the instrument being calibrated from reporting data, or move to maintenance mode so that invalid data will not be displayed or recorded.
2. Perform an 'as found' verification of the instruments. See SOP 007 for detailed instructions on performing leak checks and flow verifications.
3. Use the BGI TetraCal (or equivalent) NIST-traceable flow transfer standard to calibrate temperature, pressure, and flows according to the readings of the flow standard. See the applicable instrument manuals for additional details. Record calibration results on standardized forms.
4. Once calibrated, perform verification of flows, and record.
5. If an instrument is found to be out of tolerance, perform any necessary maintenance (replace parts, rebuild pump, and/or re-plumb).
6. Repeat calibration if significant maintenance has been performed.
7. Return all instrumentation to normal sampling operations.

4.2.2 Wind System Calibrations

1. Disable the wind system from reporting data, or move to maintenance mode so that invalid data will not be displayed or recorded.
2. Using a landmark of known bearing from the wind monitoring site, check the 'to and from' bearing of the sensor.
3. Using a protractor disk, check the linearity of the wind direction instrument at 30 degree increments. Read the sensor signal values from the datalogger, and record on a standardized form.
4. Using an anemometer velocity generator to generate eight different speeds using specified rpm, per the instrument's user's manual. Read the sensor signal values from the datalogger, and record on a standardized form.
5. Check the sensors bearings using the instrument-specific torque gauge.

5. FOLLOW-UP DOCUMENTATION

1. All calibration, certification, and verification information will be documented and stored digitally on the air monitoring consultant's secure server, with a hard copy maintained on site.

6. VERSION HISTORY

Version	Sect.(s) Revised	Change(s)	Author	Approved By	Date
1	All	Original	J. Maska/ERM	R. Osa/ERM	6/30/2021