

# Air Monitoring Technology for DER-10



# New York State DER-10 Community Air Monitoring

Site remediation processes within New York State’s Department of Environmental Conservation (NYSDEC) remedial programs are administered by the Division of Environmental Remediation (DER). The DER-10 Technical Guidance document released in 2010 requires a Community Air Monitoring Plan (CAMP) to ensure the cleanup and restoration is undertaken safely. According to NYSDEC the DER-10 Technical Guidance document is under review and the updated draft is expected to be published for public consultation late 2025.

The DER-10 CAMP requirements include the use of continuous real-time air monitoring for VOCs and PM<sub>10</sub> during the demolition of structures and the remediation of contaminated or potentially contaminated soil. Continuous monitoring is required at the upwind (background) and downwind perimeters of the site. The difference in levels is used to determine mitigation actions (Table 1).

Parameter	Range	Action Required
Total Organic Vapours	15 min avg. is >5 ppm above background at the downwind perimeter of the work area or exclusion zone	Temporarily halt work activities and monitor. If instantaneous readings readily decrease below 5 ppm over background, work may resume
	15 min avg. persists at levels >5 ppm above background but <25 ppm at the downwind perimeter of the work area or exclusion zone	Halt work activities, identify the source of vapors, take corrective actions, and continue monitoring. Resume work activities if the total VOC level 200 ft downwind of the exclusion zone or half the distance to the nearest potential receptor or residential commercial structure, whichever is less – but in no case less than 20 ft, is below 5 ppm over background for the 15 min avg.
	>25 ppm at the perimeter of the work area	Shutdown work activities
Particulates	15 min avg. is >100 µg/m <sup>3</sup> above background or if airborne dust is observed leaving the work area.	Employ dust suppression techniques. Work activities may continue with dust suppression in place provided that downwind PM <sub>10</sub> levels do not exceed 150 µg/m <sup>3</sup> above the upwind level and no visible dust is migrating from the work area.
	Downwind PM <sub>10</sub> is > 150 µg/m <sup>3</sup> above upwind level.	Stop work and re-evaluate activities initiated. Work can resume when suppression measures reduce downwind PM <sub>10</sub> levels do not exceed 150 µg/m <sup>3</sup> above the upwind level and no visible dust is migrating from the work area.

Table 1: A summary of monitoring, response levels, and actions for total VOC and particulate matter monitoring under DER-10. Source: Appendix 1A New York State Department of Health Generic Community Air Monitoring Plan, Final DER-10 Technical Guidance for Site Investigation and Remediation (May 2010).

# Siting Guidance for AQS and Dust Sentry Dust Monitoring

Correct siting of monitors on remediation sites is important to ensure representative air quality measurements. Published air quality instrument siting guidance provided by USEPA for ambient air quality stations is not easily applied on such sites and state level regulations are often silent or have sparse detail on micro-siting expectations.

Care should be taken in siting monitors on remediation sites to get the most representative data. Sampling inlets should be located in a clear, unobstructed position, and some metres away from any large structures (such as walls of buildings) that might interrupt airflow. Above the monitor should be open sky, with no overhanging trees or other structures. The aim of monitoring at these sites is to ensure that the agreed dust mitigation measures are being effectively applied, and that impacts upon the local community are minimised. In such circumstances, monitoring at, or close to, the site boundary is recommended as this will record the maximum dust levels that the local community could be subjected to.

## Some guidelines to follow are:

- Air monitors should be placed at the prevailing upwind and downwind perimeter of the immediate work area.
- Place each monitor as close to the property line as feasible while still keeping at least a few metres from obstructions. This is especially important if wind sensors are used.
- The sampling inlets should be between 5 - 7ft above ground.
- Avoid placement of monitors near roadways or truck movements as this could result in extremely high, short duration coarse dust levels ( $\text{mg}/\text{m}^3$ ) that are not representative of boundary levels.

## VOC Measurement Technology

Volatile organic compounds (VOCs) according to DER-10 are defined as those organic compounds on the USEPA's OLM04.2 target compound list. Such compounds are 'volatile' because they evaporate into the gas-phase at ambient temperatures. Many such compounds can impact human health via the respiratory system.

Continuous measurement of VOCs is most commonly achieved by Photo-Ionization Detectors (PID). PIDs use a small UV lamp that ionizes VOCs in the air sample producing positive ions and electrons. A detector then measures the electron current from the ionized gas, which is proportional to the concentration of VOCs present in the sample. The UV lamps used in PID sensors are available at three different energies, 9.8 eV, 10.6 eV and 11.7 eV. The higher the lamp energy, the more compounds that can be detected. The 10.6 eV lamp is the most widely used and has the longest life.

PID sensors respond to a broad range of VOCs but with different sensitivities depending on the ionization potential of the compound. PID sensors are typically calibrated with isobutylene, which means 1 ppm of isobutylene in air generates a reading of 1 ppm on the PID. Different VOCs give different responses which are described by a response factor.

For example, if a PID sensor is used to measure 17 ppm of heptane, it will give a reading of 10 ppm because heptane has a response factor of 1.7. The reading on the PID is equal to the gas concentration divided by the response factor (17 ppm/1.7 = 10 ppm). Response factors are provided by the PID manufacturer. If an atmosphere contains a mixture of VOCs, the measurement is the sum of the VOC concentrations in ppm of isobutylene. PID sensors cannot be used to discriminate between different hydrocarbons.

## PM<sub>10</sub> Measurement Technology

DER-10 requires continuous PM<sub>10</sub> monitoring at a 15-minute interval time which rules out many reference PM monitoring technologies. Federal Reference Method (FRM) gravimetric samplers are non-continuous and designed for 24-hour sampling. Federal Equivalent Method (FEM) Beta Attenuation Monitors (BAM) and Tapered Element Oscillating Microbalance (TEOM) based systems are continuous but lack sensitivity for the 15-minute measurements specified by DER-10. The technology for DER-10 PM monitoring is typically based on optical technologies. There are two main optical or light-scattering techniques used in air monitoring, those based on particle counting and nephelometers.

Optical particle counters (OPC) count and size individual particles and then convert the resultant size distribution to a mass distribution using volume and density assumptions. They are sensitive and fast enough to generate reliable data at 1-minute resolution. They are also able to measure multiple PM fractions simultaneously such as PM<sub>10</sub> and PM<sub>2.5</sub>. Recently, instruments based on OPC technology have achieved US EPA FEM designation for PM<sub>10</sub> and PM<sub>2.5</sub>.

Nephelometers measure total scattered light and convert that to a mass measurement using scattering coefficients. They are also sensitive and fast but cannot discriminate size fractions. Hence a mechanical separator should be used in the sample flow such as a sharp cut cyclone or impactor. Cyclones are more accurate and reliable at sizing particles than impactors because impactors are vulnerable to particle bounce and entrainment over time.

No nephelometer-based systems have achieved US EPA FEM designation yet.

Optical PM measurement technologies are best calibrated against an optical Reference Instrument using aerosol standards that are similar to the aerosol of interest because of the different scattering properties of atmospheric aerosols. ISO12103-1 test dust is a useful proxy for construction dusts.

“The monitors and software are reliable, easy to relocate, and use modern data tools for decision-making on-site and remotely. Aeroqual is the new standard on these outdoor perimeter air monitoring projects.”

**John Van Kirk,**  
Project Manager, Quandary Consultants

# How Aeroqual's Technology Makes It Easier to Manage Your CAMP

Aeroqual is a specialist provider of perimeter air monitoring equipment. Our solutions have been specifically developed to make it easier for consultants and operators to meet the compliance requirements of regulations such as DER-10. The technologies and designs that combine to provide a comprehensive monitoring solution are described below.

## Automatic Background and Downwind Calculations

As work and weather conditions change throughout the day, the upwind (background) and downwind locations will vary. Rather than physically move equipment around a site, Aeroqual has addressed this issue with OneView™'s automated designation of upwind and downwind monitors based on current wind conditions. This reduces site overheads and the risk of human error by automating contribution calculations and helps you generate defensible data with minimal intervention.

Aeroqual OneView™ is a real-time site contribution and reporting tool specifically designed to support local regulations such as NYSDEC DER-10 and NJDEP PAM with fully customizable exceedance levels.

Aeroqual also employs self-orientating Ultrasonic Wind Sensors with an inbuilt compass to make it easier to set up. There is no need to manually orientate the wind sensor. Deploy and forget – the wind data is automatically referenced to True North making it easy to gather accurate data.

## Smart Project Management Tools

Remote access and two-way communication capabilities of Aeroqual's software empower consultants to gather data, manage alerts, and troubleshoot on-the-go.

Check project status across all your operations without visiting the work site. Respond in real time to SMS and email alerts and remote sensor diagnostics via a single mobile dashboard.

# The ABC's of VOC Measurement

Aeroqual 's VOC module uses a 10.6eV PID sensor, but then wraps patented technology around it to deliver a super-stable, accurate VOC measurement. This Automatic Baseline Correction (ABC) technology continuously cycles between sampling ambient air and air that has been filtered using a proprietary selective scrubber. This process corrects for sensor drift caused by variable temperature and humidity conditions, and cross-interferences (two of the biggest problems for PID-based monitors), ensuring more accurate measurements.

ABC technology uses proprietary selective filters and response algorithms to provide baseline stability and lower detection limits for ambient gas measurement. ABC is integrated into all Aeroqual gas modules (e.g. SO<sub>2</sub>, H<sub>2</sub>S, TVOC, NO<sub>2</sub>, and other gases), reducing the risk of false exceedances, helping you maintain regulatory compliance with confidence. With the automatic correction of the 'zero' baseline every 60 seconds, ABC eliminates sensor drift (as shown in the graph comparison below), reducing the need for field recalibration and saving time on site.

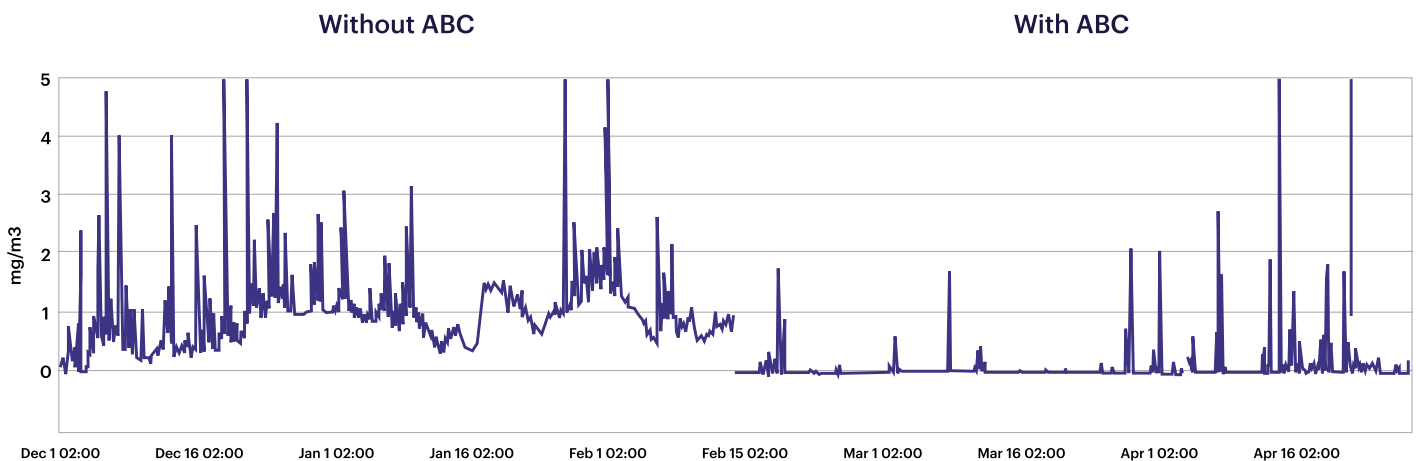


Fig. 1: ABC Comparison Chart



“Since adopting the Aeroqual solution, our project team has saved 80% more time over the older system we used. The modern GIS software gives us reliable data for reports and mitigation activities.”

**Alex Valli**

Senior Project Geoscientist, Tetra Tech  
South Brooklyn Marine Terminal Brownfield Cleanup, Brooklyn, NY, USA

## Easy Calibration

The VOC module can be field calibrated using standard calibration equipment and reference gases. This ensures the module calibration is fully traceable to NIST primary standards. The sensitivity of the Aeroqual VOC module is highly stable showing low drift over several weeks (see data below) The calibration interval will be dependent on the user's data quality objectives and DER-10 CAMP requirements. Based on the low rate of field drift, and taking a conservative approach, Aeroqual recommends a span calibration interval of one month for the VOC module to maintain optimum measurement accuracy.

### VOC Module Span Stability

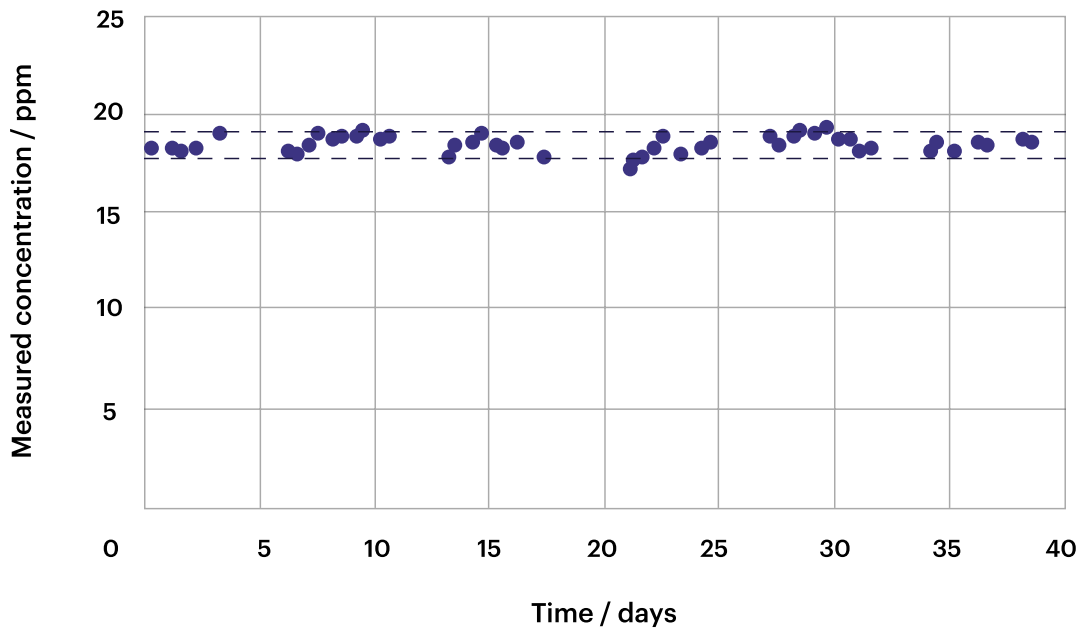


Fig. 2: Isobutylene concentration measured by VOC module over a 40-day measurement period. The purple dotted lines represent the calculated error band for the mass flow controllers

## Foolproof PM<sub>10</sub> Measurement

The Aeroqual PCX PM module comprises an optical particle counter that uses scattered light to size and count particles. The amount of scattered light is converted to a voltage pulse and the amplitude of that voltage pulse is calibrated to a particle diameter. Based on diameter, the particles are assigned to one of six particle count channels. Using a proprietary algorithm, particle counts for each size fraction are converted into mass measurements, providing continuous and simultaneous measurement of PM<sub>1</sub>, PM<sub>2.5</sub>, PM<sub>4</sub>, PM<sub>10</sub> and TSP.

### Easy Calibration

The PCX module is factory calibrated against a EN16450 certified reference instrument and ISO 12103-1 test dust (A1 Arizona Test Dust). The recommended re-calibration interval is 2 years. The PCX module also features an automatic internal zero calibration. The zero calibration can be triggered on start-up, placed on a continuous schedule, or manually triggered on the Aeroqual Cloud platform.

## Impact of Humidity and Water Vapor

High humidity (e.g. fog) can lead to inaccurate PM measurement if not mitigated because it causes aerosol particle growth through adsorption of water vapor causing erroneously high measurements. The PCX module contains an integrated inlet heater which reduces the sample air humidity and prevents particle growth. This maintains the accuracy of the PM measurement even when the water content in the air is very high.



“The Aeroqual system is all-in-one, so rather than having to switch between devices, we’ve got everything we need right there. Other brands we’ve used in the past also required daily calibration, while the Aeroqual system only needs to be calibrated every three months. That saves a whole lot of time over the life of a project, and the easy calibration, plus the on-demand access to real-time data through the Aeroqual OneView app, provides a much smoother experience.”

**Carli Piretra**

Environmental Scientist, Langan  
Anable Basin Development Project, Brooklyn, NY, USA

## Customized Reporting and Alerts

### Documentation

The DER-10 CAMP guidance mandates that air monitoring data is recorded, evaluated and summarized in the Remedial Investigation Report. Aeroqual OneView simplifies this requirement by automatically generating a regulation-specific report according to DER-10 and delivering it directly to your inbox, helping you reduce manual workload and streamline end-of-day reporting.

### Centralized Dashboard

PM, VOC and wind data is displayed on a single, user-friendly dashboard. This centralized view provides an instant snapshot of air quality across your entire project site, making it easy to identify trends, spot potential issues early, and dive deeper into the data when needed.

### Alerts for Swift Action

Set alerts to trigger at action levels for key contaminants, when a monitor goes offline, or when a contribution can’t be calculated. Receive instant SMS or email notifications so you can act before an exceedance or issue occurs, keeping your site compliant and running smoothly.

## Easy to deploy system

The Aeroqual modular air monitoring solution is easy to deploy, saving time in the field. Quick to set up, the unit is battery-powered with a cellular connection and onboard stored data for added security. Aeroqual monitors are rugged and weatherproof – there is no need to return them to the site office at the end of each day. Just mount your monitor, attach the weather sensor, connect your chosen power solution and turn on the instrument. Then let the Aeroqual OneView compliance software do all the heavy lifting.

The Winterization Kit for the Aeroqual AQS 1 extends the monitor's environmental operating range for measurement in cold temperatures (-40° with jacket and heater module, or -4°F with jacket alone) while maintaining high data quality and reliability.



“Aeroqual’s solution automates our data reporting, simplifies deployment, and allows less frequent calibrations without compromising data.”

**Greg Wyka**

Sr Project Geologist, Langan

Alafia Development Vital Brooklyn Initiative, Brooklyn, NY, USA

# Summary

Advances in air quality monitoring technologies make compliance with the CAMP requirements of NYSDEC DER-10 regulations easier. Aeroqual's all-in-one air monitoring systems seamlessly integrate software features like automated site contribution reporting, smart alerts, and hardware features such as auto-zeroing calibration cycle and self-orientating met sensors.

Aeroqual reduces maintenance via advanced diagnostics and two-way communications that allow you to check instrument operation, manage alerts and change settings remotely. Automatic Baseline Correction, automated flow control and auto-zero on start-up drastically reduce calibration requirements on site. Aeroqual technology gives you consistent and reliable air quality data in challenging environmental conditions. These systems make it more efficient and less costly for site remediation professionals to comply with local air quality regulations like DER-10.

“When you combine portability with integrating mercury meters into a single CAMP station, and real-time cloud reporting, it equates to major time and cost savings over the project.”

**Michael Au**

Project Manager, Langan  
250 Water Street Brownfield Cleanup, Manhattan, NY, USA

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# Appendix 1: AQS 1 Specification Sheet

## Near reference real-time monitor for particulates plus O<sub>3</sub>/NO<sub>2</sub>/CO/SO<sub>2</sub>/H<sub>2</sub>S/CH<sub>4</sub>/VOC

Designed for environmental professionals who need to monitor and manage specific outdoor dust, particulates, and gases continuously, in real-time.

The AQS 1 delivers affordable and defensible measurement of PM<sub>1</sub>, PM<sub>2.5</sub>, PM<sub>4</sub>, PM<sub>10</sub>, TSP, and up to three gases, O<sub>3</sub>, NO<sub>2</sub>, CO, SO<sub>2</sub>, H<sub>2</sub>S, CH<sub>4</sub> and VOC, all simultaneously.

The AQS 1 PM<sub>10</sub> is MCerts certified and South Coast AQMD Rule 1466 pre-approved.

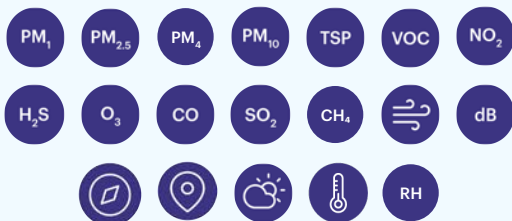


### Benefits

- Minimize downtime and failure with a purpose-built outdoor monitor
- Reduce site visits with filter change notifications, and two-way communications that allow you to calibrate, remotely troubleshoot, upgrade software, and change settings
- Eliminate flow checks with integrated flow sensing and automated control (PCX)
- Avoid invalid data caused by incorrect wind sensor orientation with the self-orienting met sensor
- Act swiftly before an exceedance occurs with real-time alerts
- Industry-leading gas sensing technology from Aeroqual comes fully integrated in the same compact format

### What can it measure?

- Specific dust fractions, gases, wind, weather, noise, and location



### Who is it for?

- Industrial site operators who need to manage dust and gas emissions from site activities, within regulatory or permitted limits:
  - Construction and remediation
  - Oil and gas facilities
  - Quarry and mine operators
  - Port and bulk handling terminals
  - Landfills and Wastewater treatment plants
- Environmental consultants who want defensible data without the usual time and hassle of air monitoring projects
- Regulatory authorities who need to fill the gaps in the regulatory air quality monitoring network
- EHS managers who need to demonstrate that they are providing a safe environment for the people in their care
- Researchers who want to collect accurate, scientifically robust data without the cost of a reference monitor

# Specifications | AQS 1

Particle module	Particle Sizes	Range	Display Resolution	LDL (2σ)	Precision	Accuracy	Zero Stability	Particle Size Range
PCX <sup>1</sup>	PM <sub>1</sub> , PM <sub>2.5</sub> , PM <sub>4</sub> , PM <sub>10</sub> and TSP	0 to 30,000 µg/m <sup>3</sup>	0.1 µg/m <sup>3</sup>	0.1 µg/m <sup>3</sup>	± 3% of reading	< 5% of reading	± 0.1 µg/m <sup>3</sup> over 24 hour period	0.1 µm to 40 µm
Nephelometer	PM <sub>1</sub> , PM <sub>2.5</sub> , PM <sub>10</sub> or TSP	0 to 60,000 µg/m <sup>3</sup>	0.1 µg/m <sup>3</sup>	<1 µg/m <sup>3</sup>	± 1% of reading	±(2 µg/m <sup>3</sup> + 5% of reading)	± 0.1 µg/m <sup>3</sup> over 24 hour period	0.1 µm to 40 µm
Gas module	Range	Display Resolution	Noise Zero; Span % of reading	Lower Detection Limit (2σ)	Precision	Linearity (% of FS)	Drift 24 hour Zero; Span % of FS	
Ozone O <sub>3</sub>	0-500 ppb	0.1 ppb	<1 ppb; 1%	<1 ppb	2% of reading or 2 ppb	1%	1 ppb; 0.2%	
Nitrogen dioxide NO <sub>2</sub>	0-500 ppb	0.1 ppb	<1 ppb; 1%	<1 ppb	2% of reading or 2 ppb	1.5%	1 ppb; 0.2%	
Carbon Monoxide CO	0-25 ppm	0.001 ppm	0.02 ppm; 1%	0.04 ppm	3% of reading or 0.05 ppm	1%	0.14 ppm; 2%	
VOC (Low range)	0-500 ppb	0.1 ppb	<1 ppb; 1%	<1 ppb	2% of reading or 1 ppb	1%	1 ppb; 1%	
VOC (High range)	0-30 ppm	0.01 ppm	<0.1 ppm; 1%	<0.1 ppm	2% of reading or 0.05 ppm	2%	0.1 ppm; 1%	
Hydrogen Sulfide H <sub>2</sub> S	0-5,000 ppb	0.1 ppb	1 ppb; 0.1%	2 ppb	1% of reading or 3 ppb	0.5%	<1 ppb; <0.5%	
Sulfur Dioxide SO <sub>2</sub>	0-10,000 ppb	0.1 ppb	1 ppb; 0.02%	2 ppb	0.14% of reading or 2 ppb	0.6%	1 ppb; 0.3%	
Methane CH <sub>4</sub>	0-500 ppm	0.01 ppm	0.02 ppm; 0.3%	0.04 ppm	0.4% of reading or 0.06 ppm	<1%	0.04ppm; 1%	

## Base System Specifications

Control system	Embedded PC with on board data storage (>5 years)
Communications <sup>2</sup>	Standard: WIFI, Ethernet (LAN) Optional modem: Cellular IP 4G LTE, Integrated high gain antenna
Software	Talk to our sales team to learn more about Aeroqual's software products.
Averaging period	User selectable averaging interval from 1 min to 24 hr
Power requirements <sup>3</sup>	100-260 VAC or 9-36VDC battery/solar: Power usage: 15 to 30 W max steady state (configuration dependent)
Enclosure	Lockable IP65 GRP cabinet with integrated aluminum solar shield armor, built in temp/RH sensor (PCX)
Dimensions	685 mm x 330 mm x 187 mm (27" x 13" x 7½") Includes PM inlet
Weight <sup>4</sup>	< 13 kg (28.6 lbs)
Operating range	-10 °C to +45 °C (14 °F to 113 °F) Low temperature operation extendable with winterization pack
Mounting	Pole, tripod and wall mounting brackets included
Factory integrated sensors <sup>5</sup>	Gill WindSonic (ultrasonic wind sensor), Vaisala WXT536 (weather transmitter), Cirrus MK427 Class 1 (noise sensor), Novalynx Pyranometer (solar radiation), Airmar 200WX (weather station)
Compatible tested sensors	A wide range of other sensors can be connected including: Victron SmartSolar MMPT 100-20 (solar charge controller), BSWA 308 (sound level meter) and Svantek SV971A (sound level meter). Contact Aeroqual for more information.
Inputs/Outputs <sup>6</sup>	0-5V analog input, 4-20mA input, configurable relay output

## PM System Specifications

Inlet	Omni-directional sample inlet with integrated heater
Pump	Long life 12 V brushless DC diaphragm, with automated flow measurement and control system (PCX)
Optics	PCX: 650 nm industrial laser, hemispherical-focusing OPC, Nephelometer: 670 nm laser, near-forward scattering nephelometer
Zero calibration	Auto-zero on start-up and at user selected intervals

## Gas System Specifications

Inlet	Inert glass-coated stainless steel and Teflon sample inlet
Pump	Long life 12 V brushless DC diaphragm
Module Tech	Automatic Baseline Correction (ABC) minimizes sensor baseline drift

## Compliance

In conformity with EC Directives 2014/30/EU and 2014/35/EU; FCC 47 CFR Part 15; RoHS 3 (EU2015/863), REACH		
Certified Modules	MCERTS	South Coast AQMD rule 1466
AQS 1 PM <sub>10</sub> Nephelometer	Yes - Sira MC210385/00	Yes
AQS 1 PCX	PM <sub>10</sub> PM <sub>2.5</sub>	Yes N/A

<sup>1</sup> Representative values for PM<sub>2.5</sub>; for individual channel performance please see the Aeroqual Technical Performance Guide

<sup>2</sup> 4G LTE not available in all markets

<sup>3</sup> Configuration used for power and weight calculations: base unit, nephelometer, PM<sub>10</sub> sharp cut, modem, heater on

<sup>5</sup> Optional

<sup>6</sup> Available with optional PDI Core upgrade



MRK-D-0500 V15

## Appendix 2: Span Stability of the Aeroqual VOC Module

### Introduction

The Aeroqual VOC module incorporates a PID sensor to monitor a wide range of VOCs in ambient air. It uses Aeroqual's patented baseline correction design to maintain long-term stability. Here we demonstrate the span stability of the Aeroqual VOC module and provide evidence for Aeroqual's recommended span calibration interval of one month for reliable VOC measurements in the field.

### Equipment

- Aeroqual AQS 1 containing a VOC module, serial number PDL-2305051-043
- 0-100 cc/min Alicat mass flow controller, serial number 64054
- 0-10 L/min Alicat mass flow controller, serial number 117414
- Isobutylene, 1000 ppm balance air, provided by CAC Gas and Instrumentation, cylinder number W0383882-3
- Zero air generated from a compressed air source with activated carbon and Purafil scrubbers.

The experimental set up is shown in Figure 1. Test Procedure

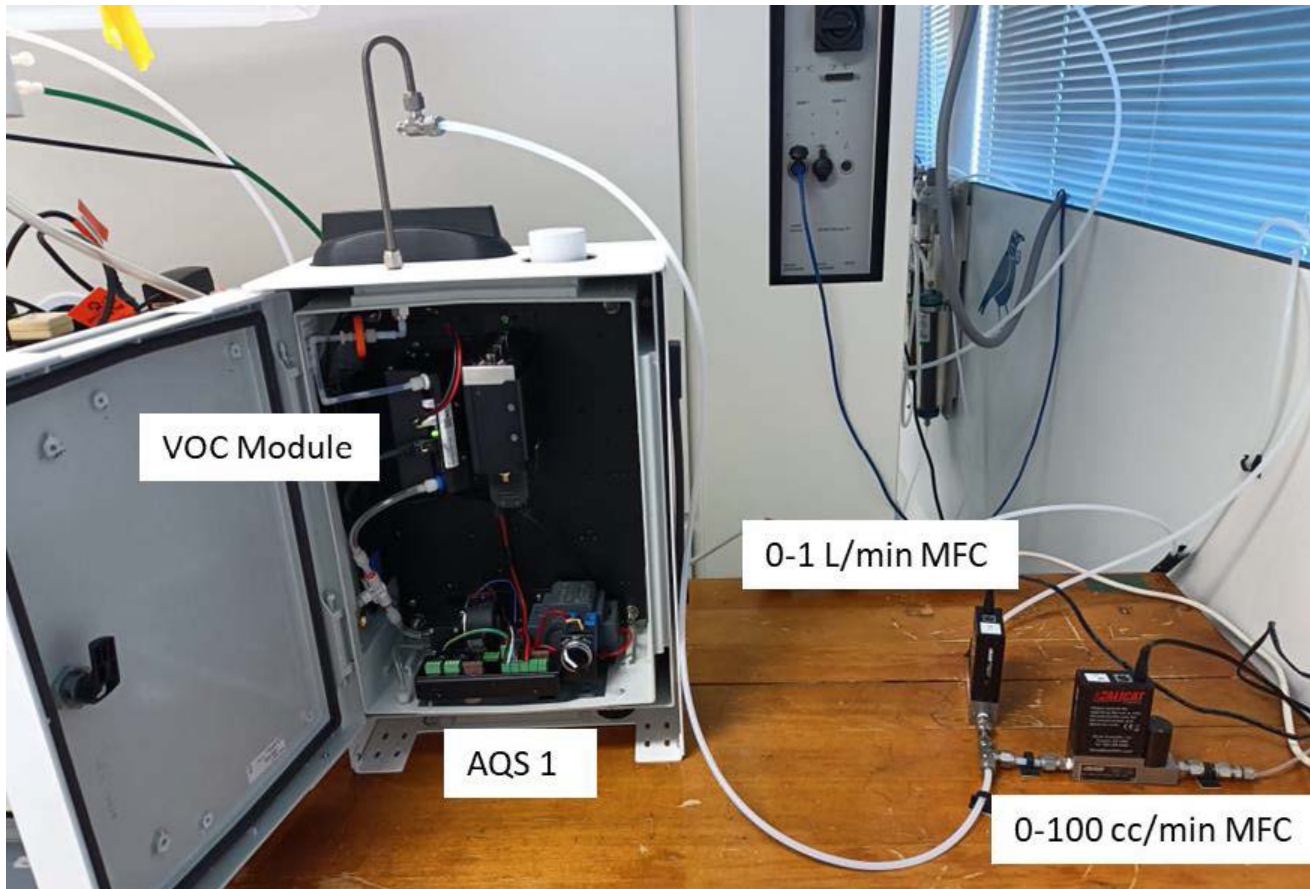


Fig 1: Experimental set up for span stability test of the Aeroqual VOC module.

The VOC module was installed in an Aeroqual AQS 1, flow rate set at 0.07 LPM and run continuously in the Aeroqual laboratory for the duration of the test, sampling laboratory air. Test gases were periodically injected into the sample inlet via a T fitting.

The test gas injection sequence was:

01. 10 mins zero air (1.0 LPM)
02. 10 mins 19.6ppm isobutylene (0.02LPM isobutylene + 1.0 LPM zero air)
03. 10 minutes zero air (1.0 LPM)

The injection sequence was repeated twice daily.

## Results

Figure 2 shows the concentration measured by the VOC module over a 40-day period. Error bands were calculated based on the stated accuracy of the mass flow controllers ( $\pm 0.8\%$  of reading +  $0.2\%$  full scale) and are shown on the plot.

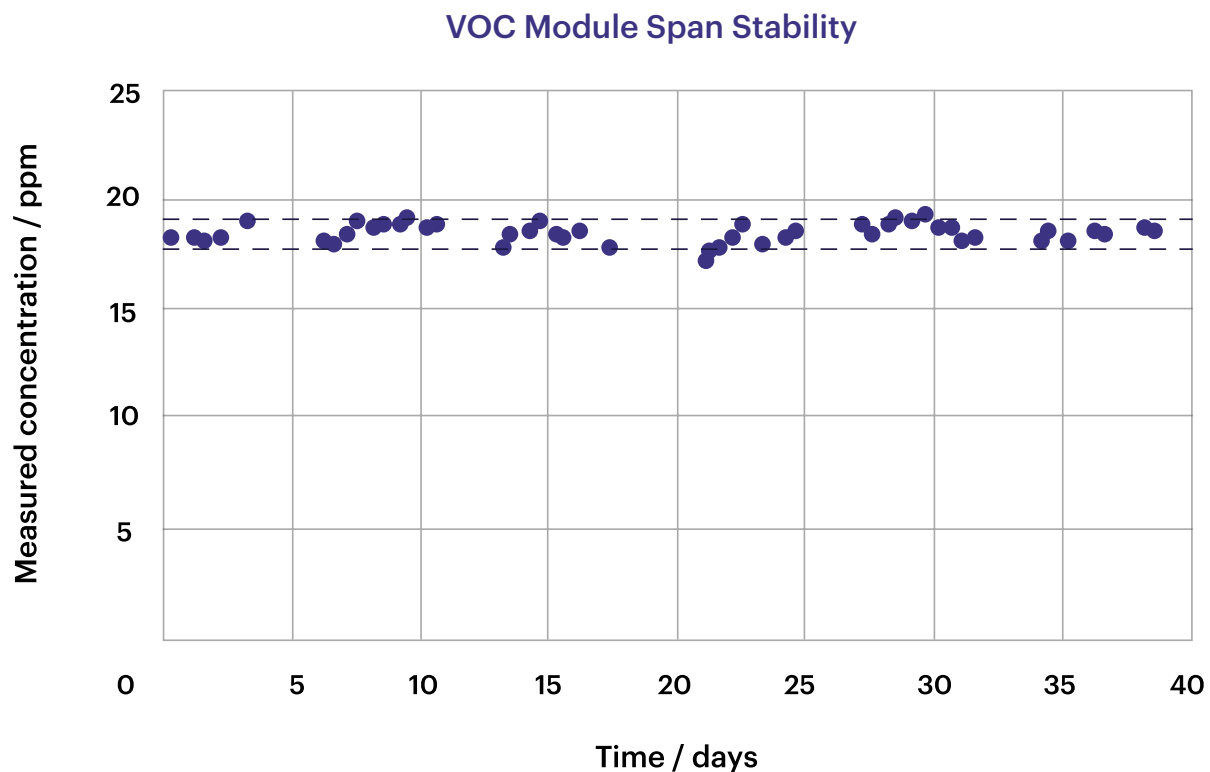


Fig. 2: Isobutylene concentration measured by VOC module over a 40-day measurement period. The purple dotted lines represent the calculated error band for the mass flow controllers

## Conclusion

The Aeroqual VOC module span readings were stable within the mass flow controller accuracy for the period of the test. Based on the test results, and taking a conservative approach, Aeroqual recommends a **span calibration interval of one month** for the VOC module to maintain optimum measurement accuracy.

## Appendix 3: Manufacturer's Guidelines — Aeroqual AQS 1 Scheduled Maintenance<sup>1</sup>

The service frequencies should be considered conservative. Monitor operators are encouraged to develop a service schedule suitable for their local conditions and data quality objectives.

Service activity	Section	Service frequencies
Gas inlet filter change	6.5.2	4-12 weeks <b>Initially 4 weeks</b> . Later this can be modified to suit local conditions and data quality objectives
PM inlet filter change	6.3.3	4-12 weeks <b>Initially 4 weeks</b> . Later this can be modified to suit local conditions and data quality objectives
Gas inlet flow check	6.5.3	4-12 weeks <b>Initially 4 weeks</b> . Later this can be modified to suit local conditions and data quality objectives
PM inlet flow check	6.3.4	Every <b>12 months</b> (1 year)
Gas inlet flow adjustment	6.5.6	Adjust as required following gas inlet flow check
PM inlet flow adjustment	6.3.4	Adjust as required following PM inlet flow check
PM leak check	6.3.5	Every <b>3 months</b> (Quarterly)
PM zero calibration check	6.3.6	Every <b>3 months</b> (Quarterly)
PM zero calibration flow check	6.3.6	Every <b>3 months</b> (Quarterly)
PM inlet cleaning	6.3.7	Every <b>6 months</b> (Half-yearly)
Factory calibration Particle Profiler	7.2	Every <b>12 months</b> (1 year)
Factory calibration Particle Nephelometer	7.2	Every <b>24 months</b> (2 year)
Factory calibration PCX Module	7.2	Every <b>24 months</b> (2 year)
Gas module calibration	5.1	See Section 7.1
<b>Unscheduled maintenance</b>		
Service activity	Section	Service frequencies
Measure flow rate of gas modules	6.5.3	As required following gas inlet flow check
Leak check a gas module	6.5.7	As required following module flow check
Add, remove, replace gas module	6.5.8	As required

Table 1: Service frequency guidelines for various service activities.

<sup>1</sup>Refer to 'AQS & Dust Sentry User Guide'

# Appendix 4: OneView™ Upwind and Downwind Monitor Designation

## Algorithm Version 2

This document explains how upwind and downwind monitors are selected and used within Aeroqual's OneView™ software.

### 1. Upwind/downwind logic

#### 1.1 Example Scenarios

The following figures showcase different scenarios and outline how we choose which monitors are upwind and downwind, along with the corresponding site contribution calculation. The upwind and downwind monitors, along with the contribution, are calculated independently for each pollutant.

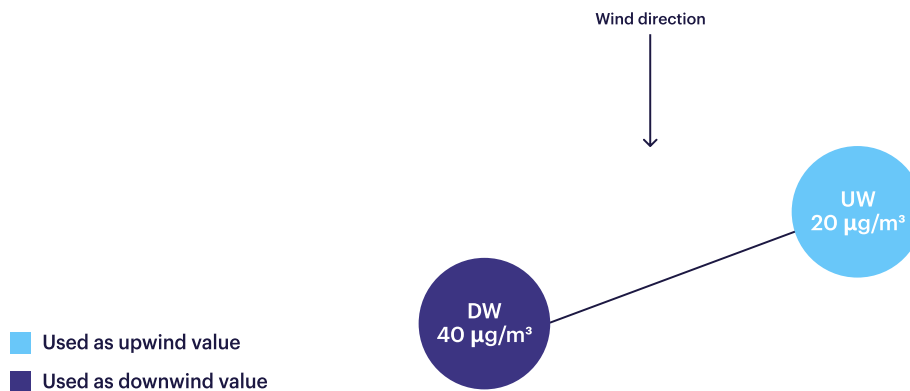


Figure 1. Two monitors in a line not perpendicular to wind direction

- Upwind monitor(s): The monitor that is closest to the source of the wind.
- Downwind monitor(s): The non-upwind monitor.
- Contribution: Downwind value minus the upwind value.
- Justification: Meets SCAQMD Rule 1466 and New York State DER-10 requirements

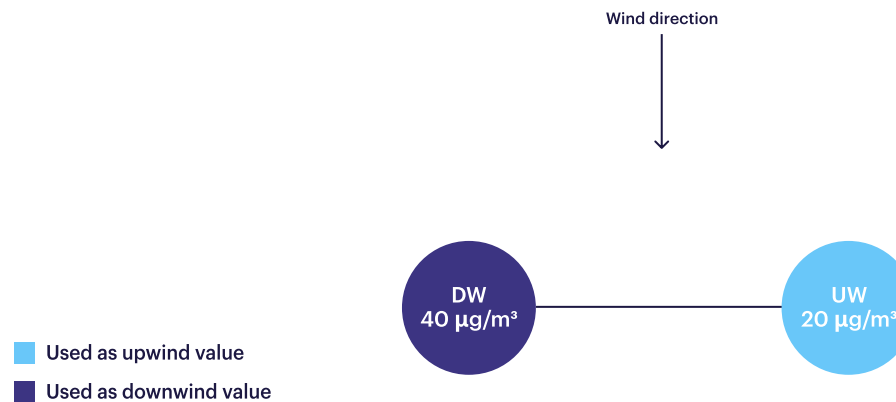


Figure 2. Two monitors in a line perpendicular to wind direction.

- Upwind monitor(s): The monitor with the lowest reading.
- Downwind monitor(s): The non-upwind monitor.
- Contribution: Downwind value minus the upwind value.
- Justification: To provide the most conservative contribution value.

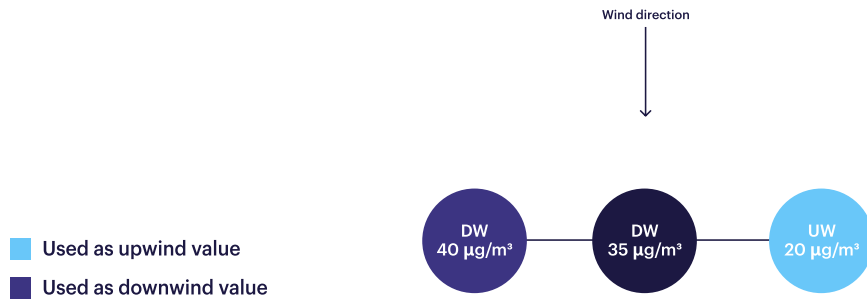


Figure 3. All monitors are in a line perpendicular to the wind direction.

- Upwind monitor(s): The monitor with the lowest reading.
- Downwind monitor(s): All non-upwind monitors.
- Contribution: Maximum downwind value minus the upwind value.
- Justification: To provide the most conservative contribution value.

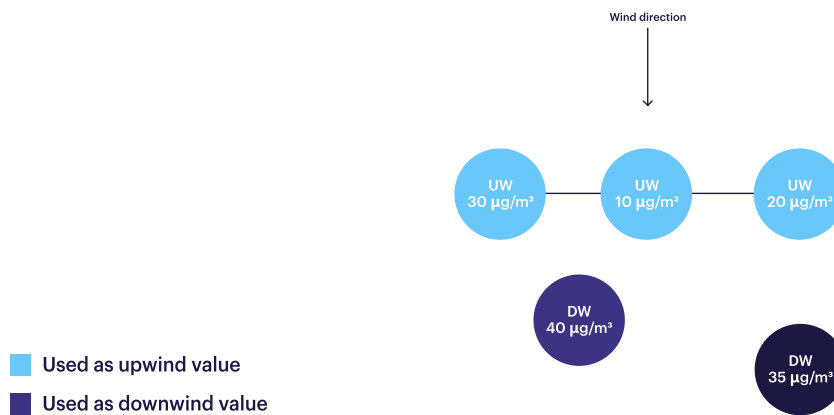


Figure 4. Two or more monitors are in a line perpendicular to wind direction.

- Upwind monitor(s): The average of the line of monitors nearest to the wind source.
- Downwind monitor(s): All non-upwind monitors.
- Contribution: Maximum downwind value minus the average upwind value.
- Justification: Meets SCAQMD Rule 1466 and New York State DER-10 requirements.

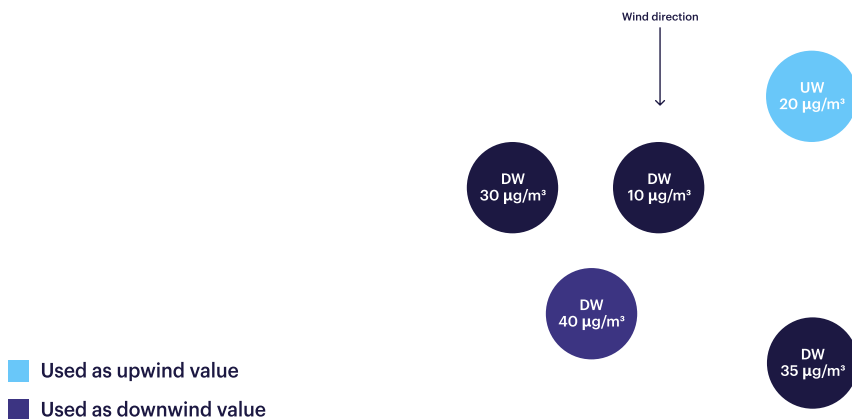


Figure 5. None of the monitors are in a line perpendicular to wind direction.

- Upwind monitor(s): The monitor that is closest to the source of the wind.
- Downwind monitor(s): All non-upwind monitors.
- Contribution: Maximum downwind value minus the upwind value.
- Justification: Meets SCAQMD Rule 1466 and New York State DER-10 requirements.

## 1.2 Automated detection of wind data

If a user selects “Wind data auto-detection” when setting up a contribution, the algorithm will automatically select wind data from one of the monitoring locations listed in the contribution “Data sources”. It follows the alphabetical order of the monitoring location IDs. If the wind data from that specific source is unavailable for any reason, it will select the next monitoring location with wind data, in alphabetical order.

## 1.3 User defined wind data source

If a user selects the “Wind data source” while configuring a contribution, the algorithm will only use the wind data from this source for the calculation. If, this data isn’t available, the contribution calculation will stop until wind data from that source is available again.

## 1.4 Wind speed

Wind speed is not considered when determining the upwind/downwind monitor(s).

## 1.5 Wind direction

Wind direction data is logged from instruments with a resolution of 0.1°. When presented in the user interface, the wind direction data is rounded to the nearest degree. The upwind/downwind monitor designation uses non-rounded data. A straight line between two monitors is considered perpendicular to the wind when it is at  $90^{\circ} \pm 0.1^{\circ}$ .

## 1.6 Pollutant averages

Pollutant averages are calculated as time ending by the contribution algorithm. If the instantaneous contribution cannot be calculated (e.g. no data is available), the algorithm will revert to the start of the initial averaging period once data is available again.

### 1.6.1 Pollutant initial average

The OneView™ software calculates an instantaneous contribution every minute, using data collected from the designated upwind and downwind monitors during that minute. When a contribution is first started, the OneView™ software reports the accumulative average every minute until the defined averaging period is reached and then the calculation becomes a rolling average (see 1.6.2). For example, in the first minute, the average represents a one-minute average. In the second minute, it becomes a two-minute average, and so on, until it reaches the averaging period that was defined when the contribution was created.

### 1.6.2 Pollutant rolling average

After the initial averaging period is complete, the software continually computes a rolling average, updating and reporting it every minute. The duration of this averaging period is defined when the contribution is created.

## 1.7 Wind averages

All wind averages calculated by the contribution algorithm are time ending. Average wind velocity is calculated as a vectorised average. If there is a gap in the data that exceeds the defined averaging period, the algorithm will revert to initial averaging. Otherwise, it disregards any missing data point(s).

### 1.7.1 Initial wind average

Behaves in the same way as the pollutant initial average (see 1.6.1).

### 1.7.2 Rolling wind average

Behaves in the same way as the pollutant rolling average (see 1.6.2).

## 2. Filters

### 2.1 Negative number filters

If the user selects negative number filtering when configuring a report, the negative number filters will only be applied to averaged contribution values after all other calculations have been completed. It will also affect contribution alerts triggered by the average contribution value.

## 3. Regulation specific variations

### 3.1 South Coast AQMD Rule 1466

#### 3.1.1 Wind speed

For Rule 1466 contributions, the contribution will be stopped if the 15 minute rolling average windspeed exceeds 15 mph, or if the instantaneous wind speed exceeds 25 mph. It will automatically resume when the average wind speed drops below 15 mph or the instantaneous wind speed drops below 25 mph, reverting to the start of the initial averaging period.

#### 3.1.2 Automated switching between averaging periods

If the calculated PM10 concentration exceeds 25  $\mu\text{g}/\text{m}^3$  over a rolling 2 hr average the averaging mode automatically changes to a 30 minute rolling average. The 30 minute rolling average is calculated and reported every minute. For time periods less than 30 minutes, the software reports the accumulative average every minute until the 30 minute period is reached and then the calculation becomes a rolling average. For example, at 5 mins the average value is the 5 minute average starting from the first valid data point after the exceedance occurred. When the 30 minute average drops below 25  $\mu\text{g}/\text{m}^3$  the averaging reverts to the initial again.

### 3.2 New York DER-10

For DER-10 calculations, the contribution and wind rolling average period is fixed to 15 minutes. There is no change in averaging mode in the event of an exceedance.

### 3.3 New Jersey PAM

#### 3.3.1 Contribution calculation

The algorithm follows the same approach for assigning upwind/downwind monitors as outlined in Section 1.1. However, it uses the vectorised average wind direction over a 15 minute averaging period to determine the upwind/downwind monitors. The algorithm does not calculate contributions for New Jersey PAM.

#### 3.3.2 Block average

The averaging methodology used in the charts, wind rose, data table, and the upwind-downwind calculation for New Jersey PAM reports differs from other contribution types. New Jersey PAM calculations utilize a time-ending block average over a 15 minute period. The average is reported at the next standard time interval past the hour.

For example, if the first data point is recorded at 11:37 am, the first average data value would be reported at 11:45 am, then 12:00 pm, 12:15 pm, and so on.

# Appendix 5: Example DER-10 Community Air Monitoring Plan (CAMP)

Site-specific conditions or additional requirements stipulated by regulatory agencies may necessitate modifications or supplemental monitoring protocols to this document.

## Overview

This Community Air Monitoring Plan (CAMP) has been developed to provide protection for nearby communities, including residences and businesses, from potential airborne emissions resulting from remedial or investigative activities. Real-time monitoring for volatile organic compounds (VOCs) and particulate matter less than 10 microns (Dust) will be conducted at the upwind and downwind perimeter of each designated work area. This CAMP complies with the New York State Department of Environmental Conservation (NYSDEC) DER-10 Technical Guidance for Site Investigation and Remediation (Appendix 7) and is supplemented by specific details provided herein.

## Objectives

- Protect the downwind community from airborne contaminant releases.
- Provide a real-time measure of airborne contaminants.
- Implement corrective actions swiftly if action levels are exceeded.
- Document that work activities do not adversely impact off-site air quality.

## Methodology

Dust and VOCs will be continuously monitored at the upwind and downwind perimeter of each work area during activities with the potential to cause airborne emissions. Fugitive dust migration will be visually assessed during this period. A meteorological station will be used at one location on site to record the wind speed and direction every minute. Real-time monitoring will be conducted using an Aeroqual AQS 1 in accordance with the manufacturer's specifications. Monitor performance, calibration and service requirements can be found in Appendix 3. The concentration of airborne contaminants above background (site contribution) will be determined by calculating the difference between the upwind (background) and downwind 15 min running averages. The designation of upwind and downwind will be calculated based-on the wind direction and location of monitors in accordance with the methodology described in Appendix 4. If the site contribution exceeds the response levels in Table 1, real-time alerts via SMS and email will be sent to designated workers responsible for undertaking correction actions.

Table 1: Response Levels and Actions

Parameter	Response Level (15 min average)	Required Action
VOCs	5 ppm above background	Temporarily halt work, resume when levels drop below 5 ppm.
VOCs	5-25 ppm above background	Halt work, identify emission source, implement corrective actions. Work resumes once levels are below 5 ppm.
VOCs	25 ppm above background	Immediately cease all activities and implement corrective actions.
Dust (PM <sup>10</sup> )	100 µg/m <sup>3</sup> above background or visible dust	Employ dust suppression techniques.
Dust (PM <sup>10</sup> )	Above 150 µg/m <sup>3</sup>	Halt work, reassess, and implement enhanced dust suppression. Resume work when particulate levels drop below 150 µg/m <sup>3</sup> and no visible dust migrates from the site.

## Corrective Actions

Dust and vapor control measures implemented on site may include water spray systems to suppress dust, covering excavation and stockpiles, restricting vehicle speeds to 10 mph and applying vapor suppression foam.

## Quality Assurance and Quality Control (QA/QC)

QA/QC of the CAMP will include a record keeping plan, regular maintenance, calibration and inspection of monitoring instruments, periodic performance audits to validate monitoring data accuracy and operator training to ensure reliable data collection. In addition to these activities, the QAQC methodologies utilized by the Aeroqual AQS 1 are shown below.


Table 2. Documentation and Reporting

Aeroqual AQS1 QAQC Methods	Description
Heated Inlet	Removes the effects of humidity and fog, which can cause false positive readings
PM Auto Zero on Start-up	Daily calibration using a zero filter
VOC Automatic Baseline Correction	Zero check every minute to stabilize readings
Data Back-up	Data is stored locally and securely in the cloud
Monitor Offline	SMS/Email alert if monitor goes offline
PID electrical conductivity test	SMS/Email alert if PID lamp stops working
Filter Change	SMS/Email alert if filter needs changing
Electronic Journal	Records all events including calibration data, alerts and operator maintenance

All 15 minute recordings will be available for State (DEC and NYSDOH) personnel to review. A daily CAMP report will be prepared and include environmental and monitoring summary, site map, wind rose plot, monitoring data tables and graphs, comparison of results to the response levels and a summary of exceedances.

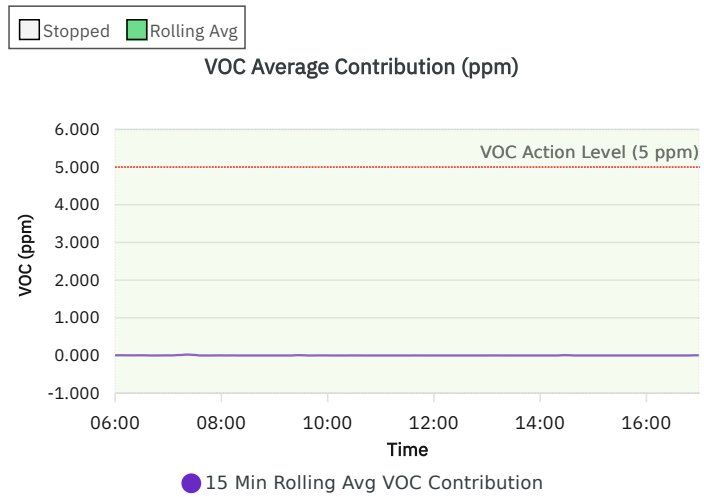
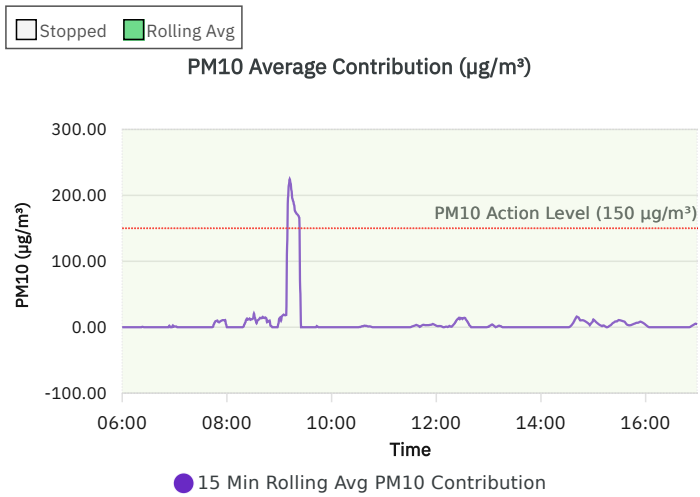
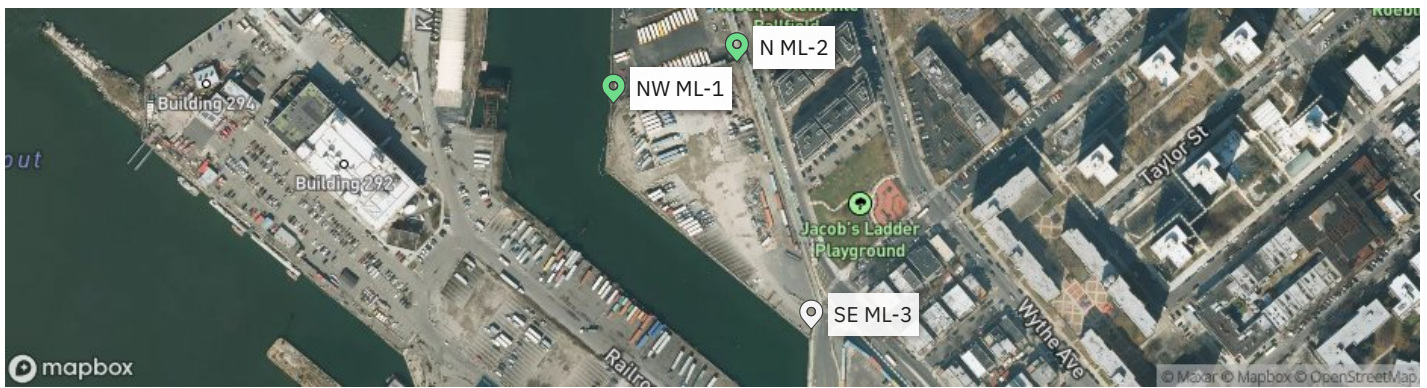
An example daily CAMP report can be found in Appendix 6.

# Appendix 6: Example NYS DER-10 Report

	<b>NYS DER-10 Report</b>	<b>Navy Yard Demo Project</b>		
		<b>Report Period</b>		
		From:	7/14/2025 06:00	
		To:	7/14/2025 17:00	
		PM10 Action Level:	150 $\mu\text{g}/\text{m}^3$	
VOC Action Level:	5 ppm			

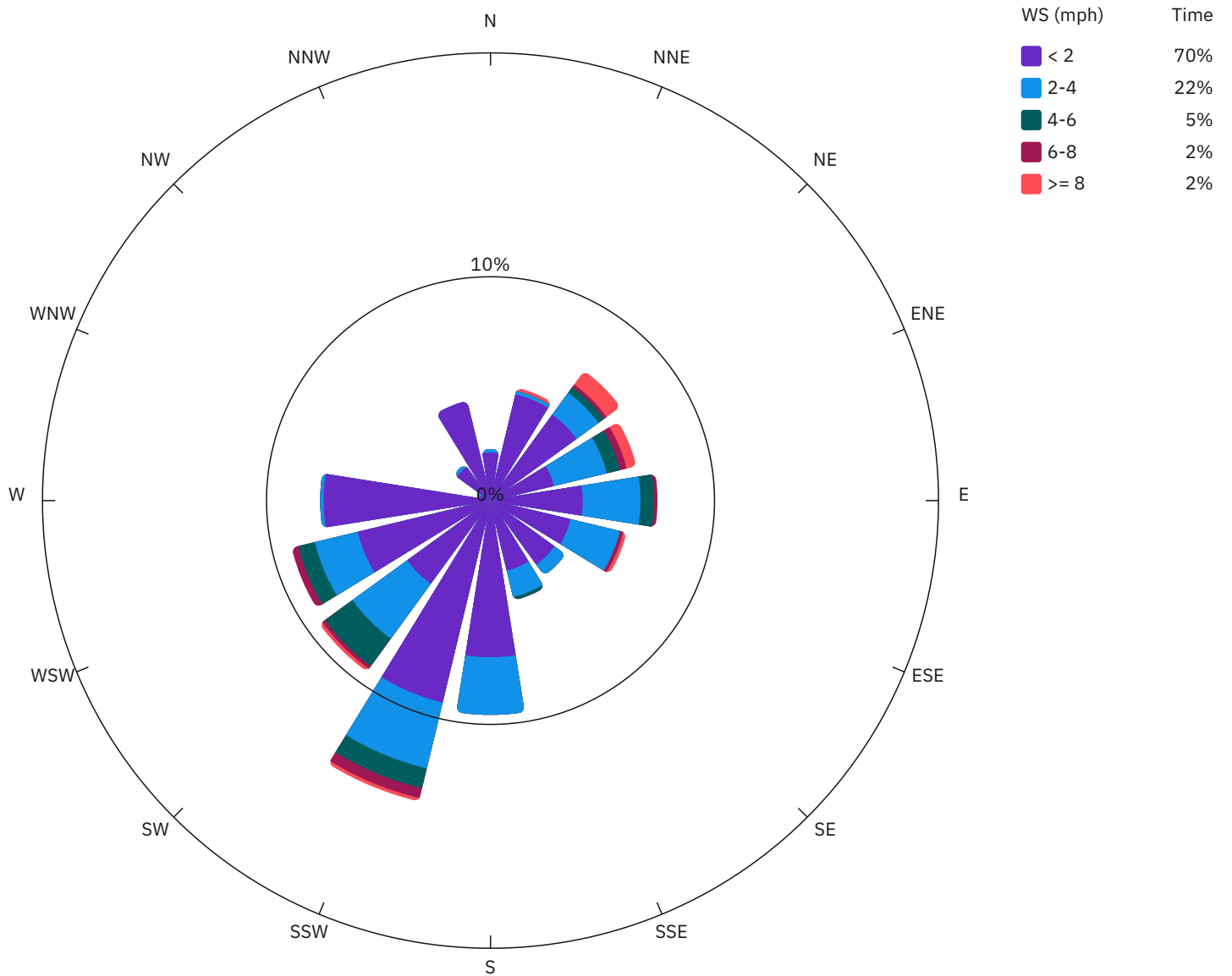
Daily Environmental Summary	Barometer (inHg)	Wind Speed (mph)	Prevailing Wind Direction
07/14/2025	0.900 - 0.900	0.7 - 5.1	S

Daily Monitoring Summary	PM10 ( $\mu\text{g}/\text{m}^3$ )	Time	VOC (ppm)	Time
Min Contribution (15 min avg.) - 7/14/2025	0.00	06:00	0.000	06:40
Max Contribution (15 min avg.) - 7/14/2025	224.58	09:12	0.025	07:21
Daily Avg. Contribution (15 min avg.) - 7/14/2025	6.79	-	0.002	-

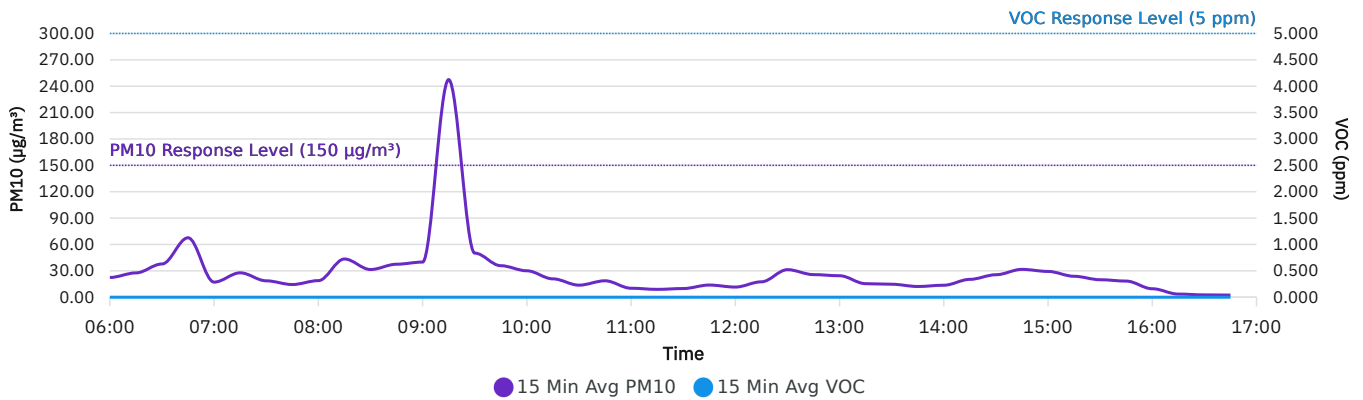


Navy Yard Demo Project  
 Report date: 07/14/2025  
 Negative number filter and rounding  
 applied after all data processing.

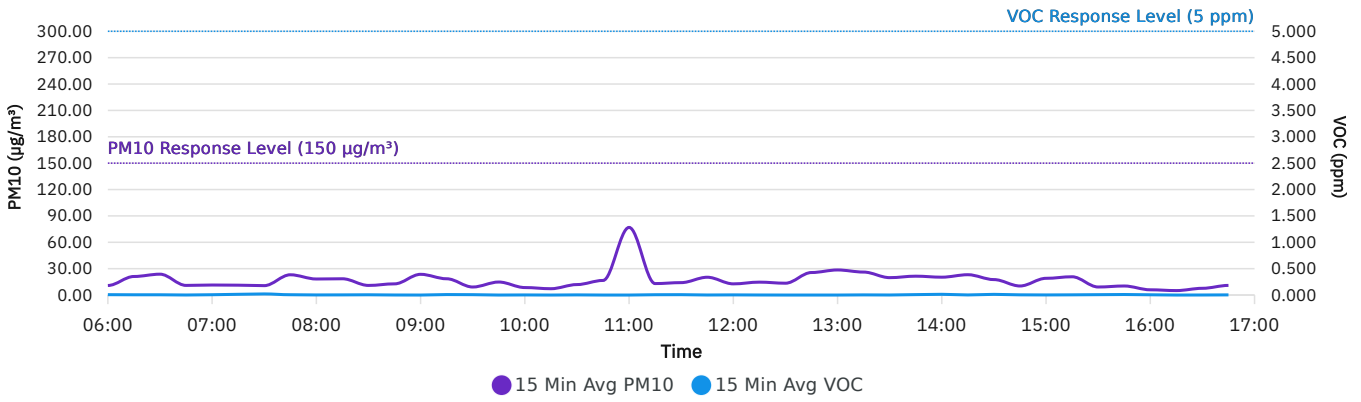
Wind rose (mph)



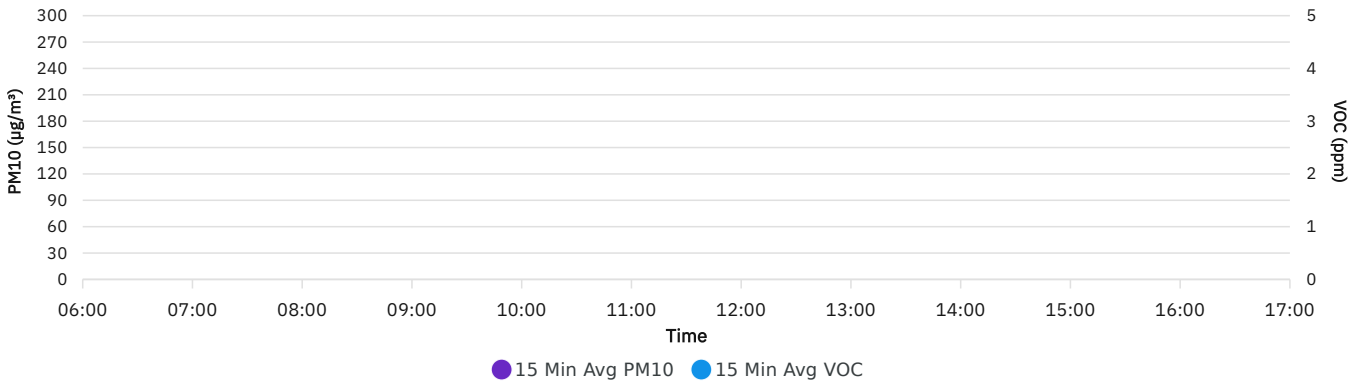
N ML-2



NW ML-1



SE ML-3



DER-10 Summary: 15 Min Rolling Avg Data

Date/Time	Average Upwind PM10 (µg/m³)	Average Downwind PM10 (µg/m³)	Average Contribution PM10 (µg/m³)	Average Upwind VOC (ppm)	Average Downwind VOC (ppm)	Average Contribution VOC (ppm)	Wind Speed	Wind Direction
7/14/2025 06:00	22.44	10.87	0.00	0.000	0.007	0.007	1.6	NNE
7/14/2025 06:01	21.26	10.45	0.00	0.000	0.006	0.006	1.6	NE
7/14/2025 06:02	21.56	10.11	0.00	0.000	0.006	0.006	1.6	NNE
7/14/2025 06:03	21.33	9.86	0.00	0.000	0.006	0.006	1.6	NNE
7/14/2025 06:04	20.91	9.95	0.00	0.000	0.006	0.006	1.6	NE
7/14/2025 06:05	22.03	10.10	0.00	0.000	0.006	0.006	1.6	NE
7/14/2025 06:06	22.17	10.41	0.00	0.000	0.006	0.006	1.6	ENE
7/14/2025 06:07	21.74	11.35	0.00	0.000	0.006	0.006	1.6	NE
7/14/2025 06:08	22.74	12.53	0.00	0.000	0.006	0.006	1.6	NE
7/14/2025 06:09	23.86	13.82	0.00	0.000	0.005	0.005	1.6	ENE
7/14/2025 06:10	24.19	15.27	0.00	0.000	0.005	0.005	1.6	NE
7/14/2025 06:11	23.97	16.21	0.00	0.000	0.005	0.005	1.6	NNE
7/14/2025 06:12	24.55	17.07	0.00	0.000	0.005	0.005	1.6	NNE
7/14/2025 06:13	24.84	18.43	0.00	0.000	0.005	0.005	1.6	NE
7/14/2025 06:14	25.13	19.88	0.00	0.000	0.005	0.005	1.6	NE
7/14/2025 06:15	27.66	21.10	0.00	0.000	0.005	0.005	1.6	NE
7/14/2025 06:16	32.68	22.55	0.00	0.000	0.005	0.005	1.6	E
7/14/2025 06:17	35.08	24.45	0.00	0.000	0.004	0.004	1.6	ENE
7/14/2025 06:18	35.06	26.30	0.00	0.000	0.004	0.004	1.5	ENE
7/14/2025 06:19	36.30	27.67	0.00	0.000	0.004	0.004	1.5	E
7/14/2025 06:20	35.89	28.81	0.00	0.000	0.004	0.004	1.5	E
7/14/2025 06:21	33.54	29.79	0.00	0.000	0.004	0.004	1.5	NE
7/14/2025 06:22	30.53	30.09	0.00	0.000	0.004	0.004	1.6	E
7/14/2025 06:23	29.08	29.71	0.63	0.000	0.004	0.004	1.6	ENE
7/14/2025 06:24	28.64	28.96	0.32	0.000	0.005	0.005	1.7	ENE
7/14/2025 06:25	30.83	28.11	0.00	0.000	0.005	0.005	1.7	NE
7/14/2025 06:26	32.74	27.75	0.00	0.000	0.005	0.005	1.8	ENE
7/14/2025 06:27	33.48	27.55	0.00	0.000	0.005	0.005	2.0	ENE
7/14/2025 06:28	33.36	28.67	0.00	0.000	0.005	0.005	1.8	S
7/14/2025 06:29	35.42	27.12	0.00	0.000	0.005	0.005	1.8	SE
7/14/2025 06:30	35.57	25.97	0.00	0.000	0.005	0.005	1.9	ENE

## Appendix 7: Specto Technology Field Deployment Solutions for Aeroqual DER-10 CAMP Monitoring Systems.

Community Air Monitoring Plan (CAMP) implementation requires not only reliable instrumentation but also field-ready deployment systems that ensure continuous operation, rapid installation, and dependable power in a variety of site conditions.

To support Aeroqual air monitoring systems used for perimeter monitoring under NYSDEC DER-10 guidance, Specto Technology provides integrated deployment accessories, power solutions, and mounting systems designed for construction, remediation, and industrial monitoring environments.

These solutions help ensure monitoring systems can be quickly deployed, securely mounted, and reliably powered during temporary or long-term monitoring projects.



### Integrated Deployment Accessories

#### Field-Ready Monitoring Kits

Specto Technology provides Aeroqual Field-Ready Kits designed for immediate deployment of perimeter air monitoring systems.

Each kit is pre-configured and shipped ready for field operation and typically includes:

- Air quality monitoring system
- Portable tripod or fence mount
- Battery or Solar power system (multiple options)
- Weather station
- Field service kit with calibration gases

Two configurations are available depending on project logistics:

## Compact Kit

A lightweight, modular configuration designed for projects requiring frequent relocation of monitoring equipment. The battery pack is transported separately to reduce weight and simplify transport.

## Integrated Kit

A single rugged protective case housing the monitor, tripod, battery pack, and accessories. This configuration is well suited for long-distance shipping or international deployments where maximum protection and simplified logistics are required.

These kits allow monitoring teams to **begin collecting defensible air quality data immediately upon arrival at the site.**



## Power Solutions

### Portable Battery Power Solutions

Continuous air monitoring at remediation and construction sites often requires portable off-grid power. Specto Technology provides a range of lithium-ion battery systems designed to support Aeroqual monitoring equipment during temporary deployments.

Available configurations include:

System	Capacity	Typical Runtime*
Mini Powermate	30 Ah Lithium-Ion	~15 hours
Midi Powermate	50 Ah Lithium-Ion	~28 hours
Maxi Powermate	100 Ah Lithium-Ion	~50 hours
Ultra Powermate	Dual 110 Ah battery enclosure	~100 hours

\*Runtime depends on instrument configuration and environmental conditions.

These rugged battery systems provide reliable portable power for monitoring locations where grid electricity is unavailable or impractical.

## Specto Power – Battery Options

### Battery Options

Mini Powermate



Midi Powermate



Maxi Powermate



Ultra Powermate



### BENEFITS

- ▶ Weatherproof durable case with handles
- ▶ Plug directly into wall for fast rapid recharge
- ▶ Battery voltage monitoring in Cloud
- ▶ LiFePO4 Batteries are lightweight and durable
- ▶ Standardized weatherproof quick connections
- ▶ Custom battery sizes for any project requirement
- ▶ Batteries pre-installed for ease of use

866-925-7737 | [sales@spectotechnology.com](mailto:sales@spectotechnology.com)



## Solar Power Kits for Extended Monitoring

For monitoring deployments where grid power is unavailable, Specto Technology provides integrated solar power kits designed to support continuous operation of Aeroqual monitoring systems.

### Ground-Mounted Solar Kit

A portable solar configuration designed for temporary monitoring sites. The system includes solar panels paired with the Specto Ultra Powermate battery enclosure, along with weatherproof cables and quick-connect Cnlinko and MC4 connectors for fast installation. Each system is fully tested prior to shipment and designed for secure pallet transport.

### Pole-Mounted Solar Kit

For more permanent installations, Specto offers a pole-mounted solar configuration with a lockable aluminum battery enclosure and solar panels designed to mount on standard 2-inch poles. Multiple battery enclosure options are available to support extended runtimes, with optional remote solar power diagnostics.

Both configurations feature a modular design that can be expanded to meet the runtime and power requirements of specific monitoring projects.

### Solar Panels with Anti-Shade Technology

With lower sun angles in winter, shading of solar panels is a more likely occurrence. Specto Technology now provides anti-shading N-Type panels to improve efficiency in low light or partially shaded conditions.



### Battery Protection and Cold-Weather Reliability

Cold temperatures can significantly reduce battery performance and lifespan. Specto Technology's winterized power configurations support insulated systems, self-heating LiFePO4 and cold weather AGM batteries (-40 °C) to maintain stable battery temperatures and prevent cold-related capacity loss.

### Programmable External Timer

The **Specto Technology External Timer** is a programmable device used to manage power supply to monitoring equipment.

Key benefits include:

- Reduced battery consumption during non-operational periods
- Automated monitoring schedules
- Manual override capability for immediate activation

The unit is housed in a **weatherproof enclosure with IP67-rated connectors**, making it suitable for outdoor monitoring environments.



## Mounting Systems

Proper installation and secure placement of monitoring equipment are critical to achieving representative air quality measurements.

Specto Technology provides portable and fixed mounting solutions to support Aeroqual monitors in perimeter monitoring applications.

### Aeroqual Fence Mount

A lightweight aluminum mounting system designed for attachment to fences or other structural supports commonly found along site boundaries. The mount provides approximately 30 inches of mounting space and can accommodate both the monitoring instrument and power supply.

### Portable Tripod

A lightweight aluminum tripod used when fixed mounting points are unavailable. The tripod allows monitors to be quickly installed in open areas while maintaining recommended inlet heights for perimeter monitoring.



## Noise and Vibration Monitoring Integration

In addition to air quality monitoring, Specto Technology can integrate **noise and vibration monitoring systems** alongside Aeroqual monitoring stations to support comprehensive environmental monitoring programs on construction and remediation sites. These systems allow project teams to track **particulate matter, VOCs, noise levels, and vibration events simultaneously**, providing a broader understanding of potential community impacts during site activities. Integrated monitoring can simplify site logistics, centralize data collection, and support environmental compliance and reporting requirements for complex infrastructure or remediation projects.

By combining **Aeroqual monitoring technology with Specto Technology deployment systems**, operators gain a practical field solution that simplifies installation, improves system reliability, and supports continuous monitoring for CAMP compliance.



# Appendix 8: NYSDEC DER-10 Technical Guidance

## Appendix 1A New York State Department of Health Generic Community Air Monitoring Plan

### Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

### Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

**Continuous monitoring** will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

**Periodic monitoring** for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. A periodic monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

### VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

### Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter ( $\text{mcg}/\text{m}^3$ ) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed  $150 \text{ mcg}/\text{m}^3$  above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than  $150 \text{ mcg}/\text{m}^3$  above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within  $150 \text{ mcg}/\text{m}^3$  of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

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## Appendix 1B Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

- (a) Objects to be measured: Dust, mists or aerosols;
- (b) Measurement Ranges: 0.001 to 400 mg/m<sup>3</sup> (1 to 400,000 :ug/m<sup>3</sup>);
- (c) Precision (2-sigma) at constant temperature: +/- 10 :g/m<sup>3</sup> for one second averaging; and +/- 1.5 g/m<sup>3</sup> for sixty second averaging;
- (d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
- (e) Resolution: 0.1% of reading or 1g/m<sup>3</sup>, whichever is larger;
- (f) Particle Size Range of Maximum Response: 0.1-10;
- (g) Total Number of Data Points in Memory: 10,000;
- (h) Logged Data: Each data point with average concentration, time/date and data point number
- (i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
- (j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
- (k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
- (l) Operating Temperature: -10 to 50° C (14 to 122° F);
- (m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 ug/m<sup>3</sup> (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m<sup>3</sup>, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m<sup>3</sup> above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m<sup>3</sup> continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM<sub>10</sub> at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

- (a) Applying water on haul roads;
- (b) Wetting equipment and excavation faces;
- (c) Spraying water on buckets during excavation and dumping;
- (d) Hauling materials in properly tarped or watertight containers;
- (e) Restricting vehicle speeds to 10 mph;
- (f) Covering excavated areas and material after excavation activity ceases; and
- (g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m<sup>3</sup> action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

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