Rose & Westra
A Division of GZA

GEOTECHNICAL
ENVIRONMENTAL
ECOLOGICAL
WATER
CONSTRUCTION MANAGEMENT

The Widdicomb Building
601 Fifth Street NW
Suite 102
Grand Rapids, MI 49504
T: 616.956.6123
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www.rosewestra.com
www.gza.com

AIR MONITORING PLAN

House Street Property – Tree Cutting Activities
1855 House Street NE
Belmont, Plainfield Township, Michigan

January 16, 2023
File No. 16.0062961.82

PREPARED FOR:
Wolverine World Wide, Inc.
Rockford, Michigan

Rose & Westra, A Division of GZA GeoEnvironmental, Inc.
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616-956-6123

30 Offices Nationwide
www.gza.com

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Submitted Via Email Only

January 16, 2023
File No. 16.0062961.82

Ms. Karen Vorce
District Supervisor
Remediation and Redevelopment Division – Grand Rapids District
Michigan Department of Environment, Great Lakes, and Energy
350 Ottawa Ave NW # 10
Grand Rapids, Michigan 49503

Re: Air Monitoring Plan, Tree Cutting Activities
House Street Property, 1855 House Street NE
Belmont, Plainfield Township, Michigan

Dear Ms. Vorce:

As requested, Rose & Westra, a Division of GZA GeoEnvironmental, Inc. (R&W/GZA) is providing you with a copy of the Air Monitoring Plan for tree cutting activities at the House Street Property located at 1855 House Street, Belmont, Plainfield Township, Michigan.

Very truly yours,

Rose & Westra, a Division of GZA GeoEnvironmental, Inc.

Kate McDonald
Senior Project Manager

Kimberly A. Hoppe Parr, PhD, CIH
Senior Project Manager

Mark A. Westra
Principal

Loretta J. Powers, CHMM
Associate Principal

Attachment

\\GZAGR1\Jobs\62000\629xx\62961.xx - WWW RAP-WP\62961.82 - House Street Pre-Construction\Air Monitoring Plan\62961.82 - Air Monitoring Plan_TreeClearing F.docx

TABLE OF CONTENTS

Acronym	Definition
6:2 FTS	6:2 Fluorotelomer Sulfonic Acid
ACGIH	American Conference of Governmental Industrial Hygienists
AQD	Air Quality Division
AMP	Air Monitoring Plan
DQOs	Data Quality Objectives
EGLE	Department of Environment, Great Lakes, and Energy
EPA	United States Environmental Protection Agency
HSP	House Street Property
EGLE	Michigan Department of Environment, Great Lakes, and Energy
Lpm	Liters of air per minute
MAK	Maximale Arbeitsplatz-Konzentration (German Occupational Health Standards)
NAAQS	National Ambient Air Quality Standard
NELAP	National Environmental Laboratory Accreditation Program
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PBZ	Personal Breathing Zone
PEL	Permissible Exposure Limit
PFAS	Per- and Polyfluoroalkyl Substances
PFOA	Perfluoro-n-octanoic acid
PFOS	Perfluorooctanesulfonic acid
PVC	Polyvinyl chloride
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limits
R&W/GZA	Rose & Westra, a Division of GZA GeoEnvironmental, Inc.
TLV	Threshold Limit Value
2D	Two-Dimensional
VOCs	Volatile Organic Compounds
Wolverine	Wolverine World Wide, Inc.

1.0 INTRODUCTION

On behalf of Wolverine, R&W/GZA prepared this AMP for tree-cutting activities at the HSP at 1855 House Street NE, Belmont, Plainfield Township, Kent County, Michigan per the *Revised Work Plan – Final Remedy, Wolverine World Wide, Inc., House Street Property, Plainfield Township, Kent County, Michigan* [1].

2.0 BACKGROUND

R&W/GZA conducted investigations in 2018 and 2019. The results of which are summarized in the reports titled *Implementation of 2018 Work Plan Summary Report* dated May 21, 2019 (2019 Report) and *Implementation of 2019 Work Plan - Summary Report* dated March 31, 2021 (2021 Report).

As part of remediation activities, caps will be installed covering waste-containing areas at the HSP. Tree cutting is required as part of cap construction. The tree cutting phase will include cutting and stockpiling trees and shrubs on the HSP for later inclusion into the capped areas. Stumps will not be removed during the tree cutting phase, and logs and brush will be moved to a central staging area for storage. There will be no chipping during the tree cutting phase.

Fence-line monitoring is proposed during tree cutting activities. A separate AMP will be developed for activities where either tree/vegetation material is being chipped or soil and/or waste materials are being excavated. The following sections describe the objectives, constituent selection, and air monitoring methodology for tree-cutting activities at the HSP.

3.0 PROJECT OBJECTIVES

The overall project objective is to monitor and document ambient airborne concentrations of constituents historically identified in soil at concentrations that pose an occupational health risk. These target constituents are metals, PFAS and dust, and the selection criteria are described in **Section 4.0**. Target constituents will be monitored before and during the tree-cutting activities to be performed at the HSP. The following sections summarize the objectives for each monitoring type and the DQOs. The Sampling Plan is presented in **Section 8.0**.

3.1 FENCE-LINE AIR MONITORING OBJECTIVES

Fence line air monitoring will be performed at upwind and downwind locations before and during tree cutting activities. Fence-line air monitoring will continue until the contractor has demobilized from the Site. The fence line air monitoring system is designed to:

- Establish background levels of target constituents in ambient air prior to initiation of tree-cutting activities;
- Monitor and document fence-line ambient air levels of target constituents during tree-cutting activities;
- Establish a notification system to prevent elevated off-site airborne concentrations by responding to exceedances of short-term action levels; and,

[1] *Revised Work Plan – Final Remedy, Wolverine World Wide, Inc. – House Street Property, Plainfield Township, Kent County, Michigan*. Submitted to EGLE, December 2, 2022.

- Evaluate on-going effectiveness of, and the need for, additional dust suppression controls and/or alteration of work activities, to reduce target constituent airborne concentrations to below action levels.

Implementation of these fence-line air monitoring objectives are provided in **Sections 6.0** through **8.0**. Proposed fence line monitoring locations are provided on **Figure 1**.

3.2 AMBIENT AIR SAMPLING

Background air sampling will be conducted on the HSP at the fence line; one selected upwind and two downwind locations to document background levels of target constituents prior to tree cutting and ambient levels of target constituents during tree-cutting operations.

3.3 DATA QUALITY OBJECTIVES

DQOs have been established to evaluate the quality of the data collected in accordance with established methods.

During tree cutting, real-time air monitoring data will be collected to evaluate dust levels in ambient air at the HSP fence line. The airborne concentration of dust will be used as a surrogate to evaluate potential airborne concentrations of other target constituents. The number of samples collected for field screening depends on the level of data quality that can be expected from the testing method employed. Below is a discussion regarding DQOs and the relative quality of the samples needed for real-time data collection.

The following DQO levels will be utilized during tree-cutting activities:

- Real-time screening data: This screening data applies to all field screening using portable equipment, such as an ambient dust monitor. The data collected generally does not include QA/QC information. The real-time data will be used to document conditions during tree-cutting activities and determine the need for more aggressive dust suppression or alteration of work activities. In addition, the real-time data will be used to show compliance with the established action levels.

4.0 SELECTION OF TARGET CONSTITUENTS AND ACTION LEVELS

R&W/GZA evaluated soil gas, soil and waste material data that were previously collected using EPA methods during sub-surface activities at the HSP. The selection of target constituents was based on the concentrations of individual constituents and published inhalation toxicity information and exposure standards promulgated by governmental agencies, including EGLE AQD standards for PFOA, PFOS, and 6:2 FTS (collectively hereafter referred to as “PFAS”). R&W/GZA did not include VOCs in the target constituents list for the HSP as no soil disturbance is planned to occur and waste material is unlikely to be encountered during the tree-cutting activities (i.e., VOCs are unlikely to be encountered or disturbed). Therefore, RCRA 8 metals plus vanadium and PFAS will be the target constituents for the HSP. Due to the lack of direct measurement equipment for airborne metals and PFAS, total respirable particulates (“dust”) will be used as a surrogate for the RCRA 8 metals, vanadium, and PFAS.

Subsurface activities are not planned as part of the tree cutting. The Contractor will not perform soil or waste excavation or relocation activities and is not anticipated to disturb soil or waste material on the HSP with the exception of traversing small areas of exposed soil with tree-cutting equipment. Since the tree-cutting activity is proposed to occur primarily during winter conditions, the HSP is anticipated to be wet, frozen, and/or snow-covered, further reducing dust generation.

The attached **Table 1** includes the maximum concentration detected in soil for each of the target constituents. The maximum concentration detected in the soil was conservatively utilized to calculate the total airborne concentration of dust required to be present that would exceed corresponding established exposure limits. This is conservative as no material soil or waste movement is expected during the tree-cutting operations. The exposure limit presented for each constituent is the lowest of the OSHA PEL, NIOSH REL, or ACGIH TLV except where noted.

The PM10 particulate (0.15 milligrams per cubic meter as a 24-hour average concentration) was selected as the Action Level for dust and a surrogate for the other target constitutes on this project. Using the highest concentrations of metals and PFAS measured in the materials potentially disturbed on the HSP, the Action Level established for dust is more stringent than potential airborne concentrations of target compounds (i.e., metals and PFAS) identified in **Table 1**. The fence line (i.e., ambient air) Dust Action Level will be triggered as a 15-minute duration.

Table 2 (attached) summarizes the selected Action Level to be used for the real-time monitoring system. This Action Level may be adjusted as more background information becomes available.

5.0 AIR MONITORING STRATEGY

The environmental monitoring required for the HSP will be conducted using the AirLogics perimeter air monitoring system. The AirLogics perimeter air monitoring system is an updated version of the perimeter air monitoring system used at both the HSP and the former tannery in Rockford during 2019-2020 construction activities. In 2021-2022 the AirLogics systems were upgraded to include updated meters, larger capacity batteries, and the ability to run exclusively on solar power with battery backup. AirLogics systems are operated year-round on numerous sites throughout the northern and eastern United States.

The primary advantage of real time measurements over traditional methods of manually collecting samples is the immediate availability of the data for pro-active intervention by Site staff in controlling potential off-site migration of emissions. The fence line air monitoring system is intended to provide early identification of air quality readings which are elevated but not above exposure limits so that mitigation and control measures can be implemented to protect public health in the vicinity of the HSP. The real-time air monitoring system is designed to provide an immediate means to evaluate control measures for airborne concentration of metals and PFAS, if necessary. Refer to **Sections 6.0** through **8.0** for additional details on notifications and communication pathways.

6.0 REAL-TIME FENCE-LINE AIR MONITORING

The fence-line air monitoring systems incorporate an automated alarm notification system in the form of visual and text message alarms via cell phone to quickly identify conditions where Site-related emissions may be approaching the set Action Levels. The notification alarm allows for the prompt implementation of controls to maintain airborne concentrations below action levels. The real-time air monitoring system includes the instrumentation of four separate sampling locations along the HSP fence line. Since multiple sampling locations will be used, the system has inherent equipment redundancy that should prevent interruption of monitoring during tree cutting activities.

During tree-cutting activities, the system's internal sensors will provide continuous air quality measurements from the four sampling locations and compare the measurements to established action levels. If a specific action level is exceeded, a visual alarm is illuminated. In the event of an alarm condition, the Site manager will identify the

source and initiate the controls to mitigate the emissions within 30 minutes. Dust monitoring will occur during Contractor working hours for the duration of the tree cutting activities.

6.1 MONITORING SYSTEM

The air monitoring system is designed to measure Site-related contaminants, namely respirable particulate matter as a surrogate for selected metals and PFAS. The analytical component of the air monitoring system consists of continuous respirable particle monitors. Real-time methods for monitoring particle-bound metals and PFAS does not exist, thus particle levels will be used as a surrogate for metals and PFAS.

The automated fence-line air monitoring system consists of the following four basic components: (1) dust monitors, (2) meteorological system, (3) computer control system, and (4) alarm system, and each of these system components is described in the following sections. Equipment Specifications are provided in **Appendix A**.

6.1.1 Dust Monitors

Direct reading, real-time Aeroqual AQS 1 particulate meters, or equivalent, will be used to monitor for dust in the upwind and downwind locations. The measurement of dust levels is accomplished using infrared electromagnetic radiation to sense airborne particles. The dust meter will be configured to respond to dust particles <10 micron in diameter (PM10). The AQS 1 will collect one sample every minute and an average sample over 15 minutes will be utilized to compare to the Action Level. Dust monitoring will occur during Contractor working hours for the duration of the tree-cutting activities.

6.1.2 Meteorological System

An on-Site meteorological tower will be utilized to differentiate between upwind and downwind sample locations. The meteorological system consists of a wind speed and direction, temperature, and relative humidity sensors mounted on a portable meteorological tower. The wind meteorological data is continuously recorded on a personal computer data logging system.

Each sampling port location has a corresponding range of wind direction that identifies when winds are blowing from the site activities toward that sampling location.

6.1.3 Computer Control System

Data generated by the instrumentation, meteorological station, as well as operational parameters (i.e., status of the telemetry system, the solar charging system, battery voltage, and alarm), is continuously uploaded via radio telemetry links to a central computer system located in the operations trailer. The central computer system communicates with each perimeter monitoring station every minute to obtain the latest data values from the individual sensors. The data are then displayed on the central computer screen, and stored in a database along with the meteorological data and other operational status information. The monitoring data is automatically archived and used to print out summary graphs at the end of each day.

6.1.1 Alarm System

The system allows for the programming of two alarm levels (yellow warning, and red alert). If any pre-programmed particulate action levels are exceeded, the system initiates both visual and electronic alarm notifications to Site managers. The alarms are electronically sent from the central computer via text message or email to assigned individuals' cell phones. The alarm notification system is active when the system is active. The monitoring data is automatically archived and used to print out summary graphs at the end of each workday.

The alarm will activate if dust Action Levels are exceeded.

6.2 MONITORING SYSTEM OPERATION

A technician will routinely inspect and test the system daily, or as required by site conditions. The technician is responsible for routine evaluation of the equipment, operation, replacement of expendable supplies, and testing the system performance. The Site operator's responsibilities include calibration of sensors (if required), daily maintenance of system components, troubleshooting as needed, communications with Site managers regarding Action Level alerts, and documentation of alarms.

The system calibration is tested through routine calibration checks. The system is designed to provide for daily equipment calibrations to test the calibration drift. Meteorological system maintenance and calibrations are conducted annually.

7.0 SAMPLING PLAN

As presented in previous sections, sampling for PM10 dust (as a surrogate for target constituents) will occur on a real-time basis during Site tree-cutting activities. Air sampling will occur as follows:

7.1 BASELINE (PRE-REMEDIAL) MONITORING

Prior to the initiation of tree-cutting activities, baseline monitoring will be performed to measure "background" levels of the target constituents using the automated system. Background sampling will be performed during the week preceding the planned tree-cutting activities startup.

7.2 ROUTINE MONITORING

Routine monitoring will occur daily during working hours of mobilization, tree cutting, stockpiling, and demobilization activities. Additional details regarding routine monitoring are included in **Section 6**.

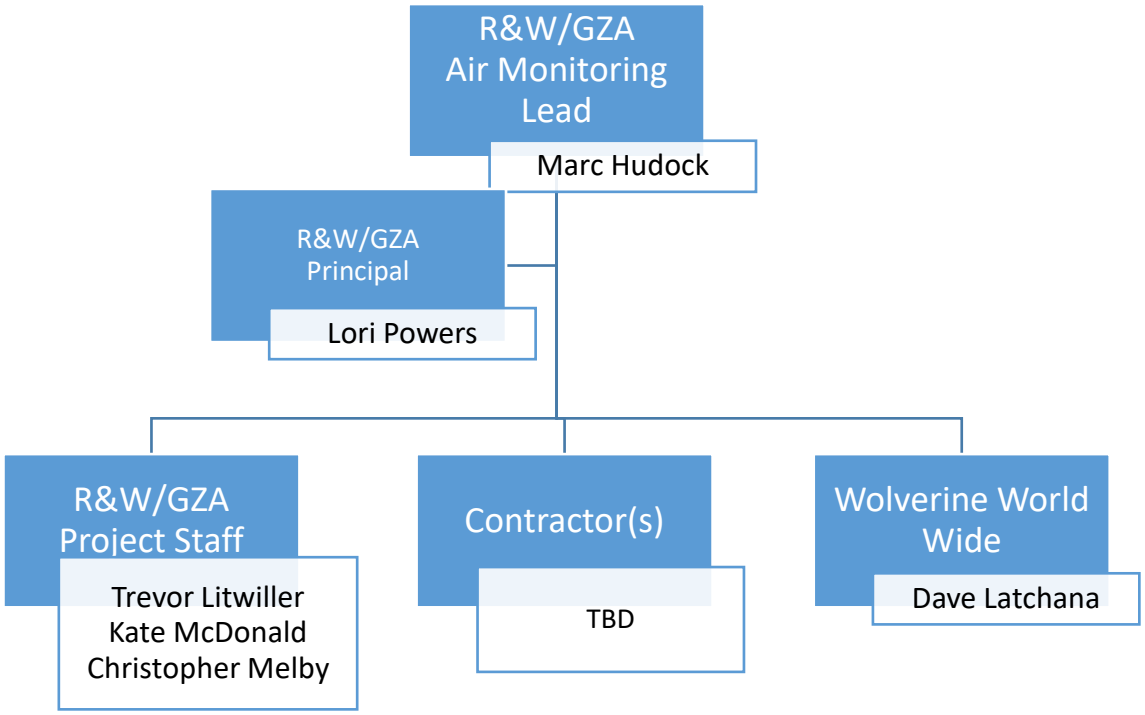
7.3 EQUIPMENT CALIBRATION

Equipment calibration will be performed in accordance with the manufacturer's instructions. Field checks using the appropriate reference standards must be made on-Site at the minimum frequency of twice per shift (pre and post sampling). The AQS 1 will be zero checked and calibrated according to the operation manual. A daily log of all instrument readings, as well as all field reference checks and calibration information, will be maintained.

Spare monitoring instrumentation and sampling equipment will be maintained on-Site and available for use as needed. If monitoring or sampling equipment is determined not to be in proper working order, it will be removed from service, replaced with other equipment and sent to the appropriate manufacturer or supplier for service and calibration.

8.0 COMMUNICATIONS

The following flow chart depicts the communications chain for responding to an actionable level.



Contact List			
Name	**Role**	**Cellular No.**	**Company Office**
Lori Powers	Associate Principal	[To be posted onsite]	Grand Rapids, Michigan
Kate McDonald	Senior Project Manager	[To be posted onsite]	Portland, Maine
Trevor Litwiller	Project Manager	[To be posted onsite]	Grand Rapids, Michigan
Christopher Melby	Field Team Lead	[To be posted onsite]	Grand Rapids, Michigan
TBD	Tree Contractor	[To be posted onsite]	TBD
Rick Ecord	EHS Director	[To be posted onsite]	Providence, Rhode Island
Dave Latchana	Wolverine	[To be posted onsite]	Rockford, Michigan
Scott Watson	WN&J	[To be posted onsite]	Grand Rapids, Michigan

If an Action Level is approached (particulates), triggering a yellow (warning, duration less than 15 minutes) or red alert (Action Level exceeded, duration more than 15 minutes), the AirLogics system operator will notify the first individuals for each company listed above. If the primary contact is not available then, the AirLogics System operator will contact the second contacts for each company as appropriate. If corrective actions are required to respond to the red alert condition, then the R&W/GZA field representatives are responsible for notifying the on-Site Contractor supervisor. R&W/GZA will be responsible for directing the corrective actions to be implemented by the Contractor. A summary of specific responses to the project-specific Action Levels is presented in the following section.

9.0 SUMMARY OF ACTION LEVELS AND RESPONSES

The following table presents the appropriate action levels and responses for the Site-specific air-monitoring plan at the fence line.

Alert Level	Action Level	Potential Response Action(s)
Green	PM10 particulates < 0.150 mg/m^3	1. None – continue monitoring
Yellow	PM10 particulates > 0.150 mg/m^3	1. Confirm particulate exceedances are downwind of work area and away from Site activities 2. If particulates are attributable to Site activities, take following actions as appropriate: • Use water or other material to mist exposed surface materials and/or roadways to suppress dust • Slow the pace of the tree-cutting activities • Change the process or equipment to alternatives that minimize air emissions
Red	PM10 particulates > 0.150 mg/m^3 for more than 15 minutes	1. Apply yellow alert controls 2. Cease tree-cutting activities if Action Level exceedances are not resolved 3. Re-initiate tree-cutting activities after reaching concurrence between HSP personnel.

10.0 REFERENCES

R&W/GZA. 2022. *Health and Safety Plan, House Street Property*.

R&W/GZA. 2018. *Quality Assurance Project Plan, Former Wolverine Tannery, House Street Property, and Wolven/Jewell Area, Revision 3*. Submitted to EGLE June 2022.

R&W/GZA. 2022. *Revised Work Plan – Final Remedy, Wolverine World Wide, Inc. – House Street Property, Plainfield Township, Kent County, Michigan*. Submitted to EGLE December 2, 2022.

TABLES

Table 1. Target Compounds and Total Concentration of Dust at Which Each is at its Exposure Limit

Compound or Element	Exposure Limit (mg/m^3)	Exposure Limit Source	Maximum Concentration Detected in Soil (mg/kg)	Total Concentration of Dust at which Compound is at its Exposure Limit (mg/m^3)
Arsenic	0.01	OSHA PEL	80.8	62
Barium	0.5	OSHA PEL	200	1,800
Total Chromium	0.5	OSHA PEL	110,000	2
Lead	0.05	OSHA PEL	460	54
Mercury	0.025	ACGIH TLV	13	70
Selenium	0.2	OSHA PEL	3.9	14,000
Vanadium	0.05	OSHA PEL	1,100	230
Zinc	5	OSHA PEL	6,700	380
PFOS	0.01	See Note 1	220	23
PFOA	0.0005	See Note 1	1.7	2,900
6:2 FTS	0.01	See Note 2	0.11	4,500

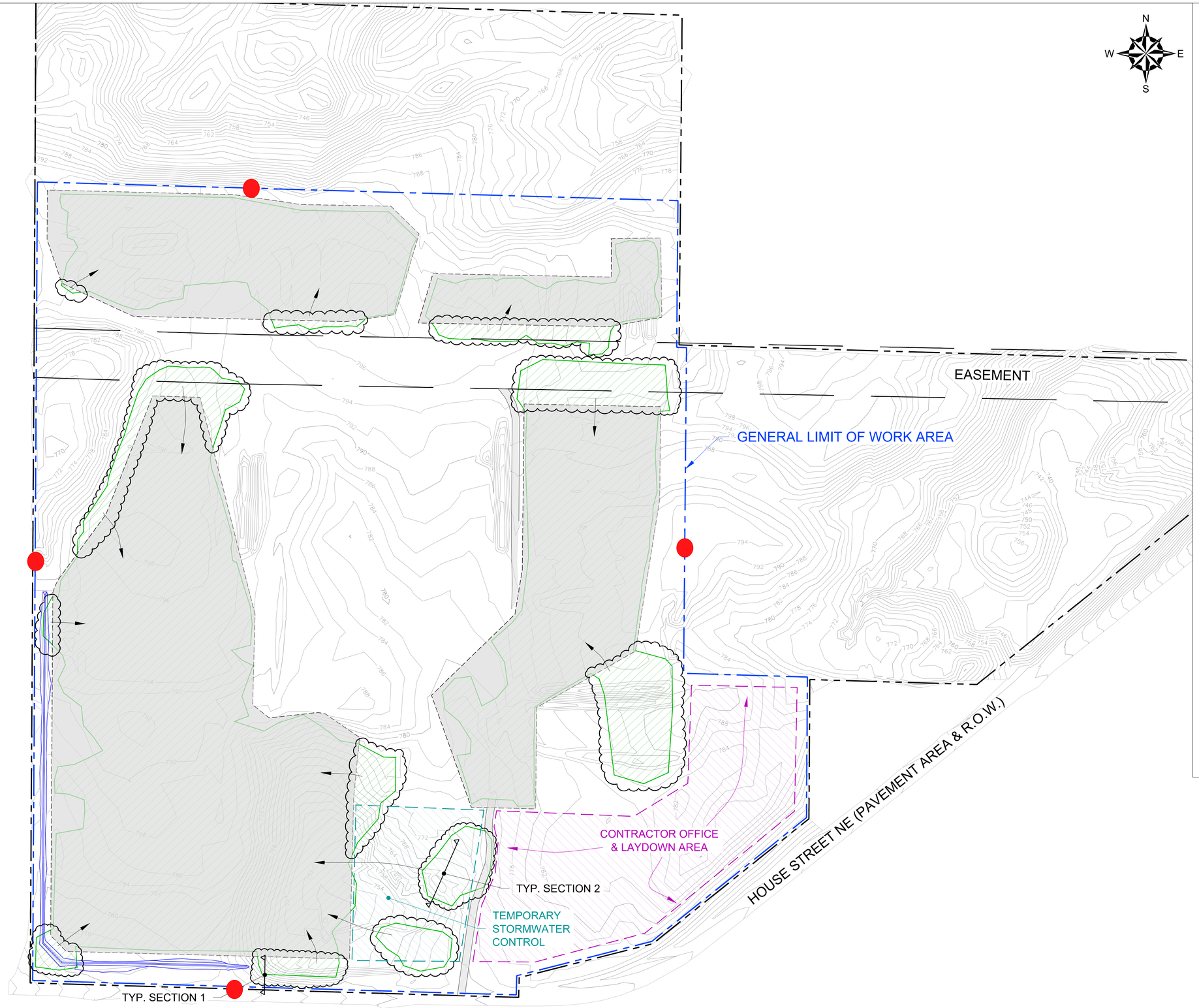
Notes:

1. There are no OSHA PELs, NIOSH RELs, or ACGIH TLV®s for PFOA or PFOS. Exposure Limits for PFOA and PFOS are the German Occupational Health Standards (MAK) for an 8-hour exposure. These standards were referenced by EGLE AQD in an internal communication regarding development of their 24-hour initial threshold screening levels in 2018.
2. There is no OSHA PEL, NIOSH REL, or ACGIH TLV® for 6:2 FTS. Exposure limit for 6:2 FTS is the EGLE AQD screening threshold for annual exposure.

Table 2. Action Level

Monitoring Location	Compound	Action Level	Duration of Reading
Fence Line	Total Dust (PM10)	0.15 mg/m^3	15 minutes

FIGURE



N
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GENERAL NOTES

1. BASE MAP TOPOGRAPHY PROVIDED BY EXXEL ENGINEERING, INC DATED OCTOBER 6, 2020.
2. STATION DATUM IS NAVD88, BASED ON GPS OBSERVATIONS USING MDOT CORS.
3. SEE TYPICAL DETAIL OF WASTE EXCAVATION FROM OUTSIDE MOUND AREAS.

LEGEND

- SITE BOUNDARY
- GENERAL LIMIT OF WORK AREA
- EASEMENT
- EXISTING SITE ACCESS ROAD
- 760 EXISTING GROUND CONTOURS
- ESTIMATED EXTENT OF WASTE
- PERIMETER SWALE BREAKLINES (SW CORNER)
- 40-MIL LLDPE GEOMEMBRANE
- AREA OF IDENTIFIED WASTE MATERIAL TO BE RELOCATED TO MOUND AREAS AND CAPPED
- PROPOSED AIR MONITORING STATION

0 50 100 200
SCALE IN FEET

NO.	ISSUE/DESCRIPTION	BY	DATE

ROSE & WESTRA, A DIVISION OF GZA
601 FIFTH STREET NW, SUITE 102
GRAND RAPIDS, MICHIGAN 49504

AIR MONITORING PLAN

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
WN&J/WWW

PROJ MGR: LJP	REVIEWED BY: LJP	CHECKED BY: JC	FIGURE
DESIGNED BY: KHM	DRAWN BY: TAK	SCALE: AS SHOWN	1
DATE: APRIL 2022	PROJECT NO. 16.0062961.81	REVISION NO.	

APPENDIX A

AIRLOGICS
AIR MONITORING SYSTEMS

AQS-1

POWER OPTIONS:
110-line
16-hour rechargable lithium batteries
Solar

AQS-1 and the Dust Sentry are AirLogics' newest and most nimble, modular, and customizable air monitoring systems.

About AirLogics, LLC

AirLogics occupies a unique place in the environmental consulting and air monitoring sector. Our company was formed from a top-tier environmental consultancy that was trying to help a client manage their risk on a remediation site. In developing a solution to reduce their risk, an innovative and patented air monitoring system was born. From there, a company was built around that system. What evolved was a company that appears to be a rental equipment company, but functions like and has the sensibilities of a professional consulting firm, including the professional staff, expertise, and attention to solving our clients problems. We are proud of the position that AirLogics occupies in the environmental and air monitoring space.

The AirLogics Advantage

The primary advantages of AirLogics over traditional rental equipment providers are:

Professional Services

Our degreed and licensed professionals are scientists, engineers, and consultants with subject matter experience who can help you better achieve your site management goals. From planning to execution to post-mobilization reporting, AirLogics can assist you reduce your risk.

State-of-the-Art Industry Leader

Whether its developing our own systems or acquiring systems and sensors made by others, AirLogics is continually investing in state-of-the-art technology.

Real-time

Numerous stakeholders can benefit from actionable, real-time data. Real-time management of ambient air quality, rather than passive measurement and retrospective documentation, helps users immediately identify potential emissions and begin corrective action.

AQS-1 by Aeroqual

Near reference real-time monitor for particulate fractions plus O3 /NO2 /VOC

Designed for those who need to monitor and manage specific outdoor dust and particulates, and gases continuously and in real-time. The AQS-1 delivers affordable and defensible measurement of PM10, PM2.5, PM1, TSP, and up to three gases, all simultaneously.

What is it?

- A robust weather-proof monitor with integrated solar shielding for outdoor monitoring of dust, VOCs and other gases

- A modular and configurable monitoring platform for measurement of a targeted particulate and gases, and the option to integrate weather sensors (e.g. wind, humidity, precipitation, and solar)

- A flexible communications platform that transfers real-time data wirelessly, and gives you access through an API

- A web interface accessed via browser on any device, see all your data in one place and set email / SMS alerts on parameters of concern

AQS-1 by Aeroqual

What can it measure?

Particulates, up to three gases, wind meteorology, and noise

- **PM_{10}**
- **PM_{25}**
- **PM_{1}**
- **TSP**
- **NO_2**
- **O_3**
- **Total VOCs**
- **dB**
- **H2S**

WEATHER
wind speed, wind direction, rain, humidity, temp

AQS-1
by Aeroqual

Specifications

Control System: 1

Embedded fanless PC, Intel Atom N2600, 1.6 GHz, 2 GB RAM, 32 GB SSD, Ubuntu Linux Operating System

Communications: 2

Standard: WIFI, Ethernet (LAN)
Optional: Cellular IP HSPA 4G modem

Data Logging: 3

32 GB Hard Drive (>5 years data storage)

Averaging Periods 4

1 min, 5 min, 10 min, 15 min, 20 min, 30 min, 1 hr, 2 hr, 4 hr, 8 hr, 12 hr, 24 hr

Power Requirements: 5

100-260 VAC (standard): 21W / 30W* Regulated 12 VDC (if required): 21W / 30W*

PM Sampling System: 6

Inlet: Omni-directional 36cm (14.1 inches) heated inlet; Optional sharp cut cyclones for PM10, PM2.5 or PM1 size selection
Pump: 12V brushless DC diaphragm
Optics: 670nm laser, near-forward scattering nephelometer with sheath air protection

Dimensions: 7

483 H x 330 W x 187 D mm (19 H x 13 W x 7.4 D inches)
Includes solar shield armour & mounting brackets

Weight: 8

<13 kg (28.6 lbs)

AQS-1 by Aeroqual

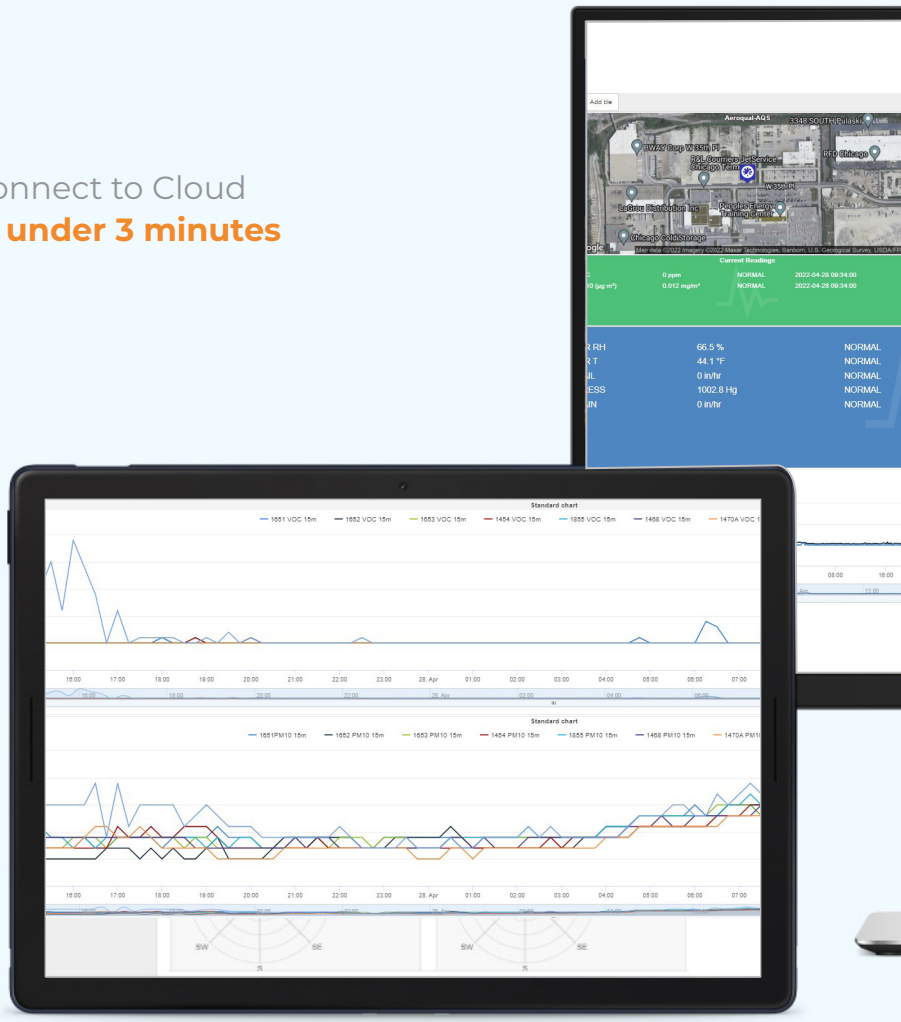
Particle Module	Sizes	Range	Accuracy	Resolution	Lower Detectable Limit (2σ)
Nephelometer	PM1/PM2.5/ PM10/TSP	0 to 60,000 µg/m3	<±(2 µg/ m3 + 5% of reading)	0.1 µg/m3	<1 µg/m3
Profiler (OPC)	PM1/PM2.5/ PM10/TSP	PM1 200 µg/m3 PM2.5 2000 µg/m3 PM10 5000 µg/m3 TSP 5000 µg/m3	<±(5 µg/m3 + 15% of reading)	1.0 LPM	<1 µg/m3

Gas Module	Range	Resolution	Noise	Lower Detectable Limit/ppb	Precision	Linearity (% of FS)	Drift 24 Hour
Ozone O3	0-500 ppb	0.1	<1 <1%	1	<2% of reading or 2 ppb	<1.5%	1; 0.2%
Nitrogen dioxide NO2	0-500 ppb	0.1	<1 <1%	2	<2% of reading or 3 ppb	<2.0%	2; 1%
VOC (Low range)	0-500 ppb	0.1	<1 <1%	<1	<2% of reading or 1 ppb	<1.0%	1; 1%
VOC (High range)	0-30 ppm	10	<100; <0.20 or 1%	<50	<2% of reading or 20 ppb	<2.0%	100; 1%

AQS-1
by Aeroqual

Data Access, Management & Visualization

Connect to Cloud
in **under 3 minutes**



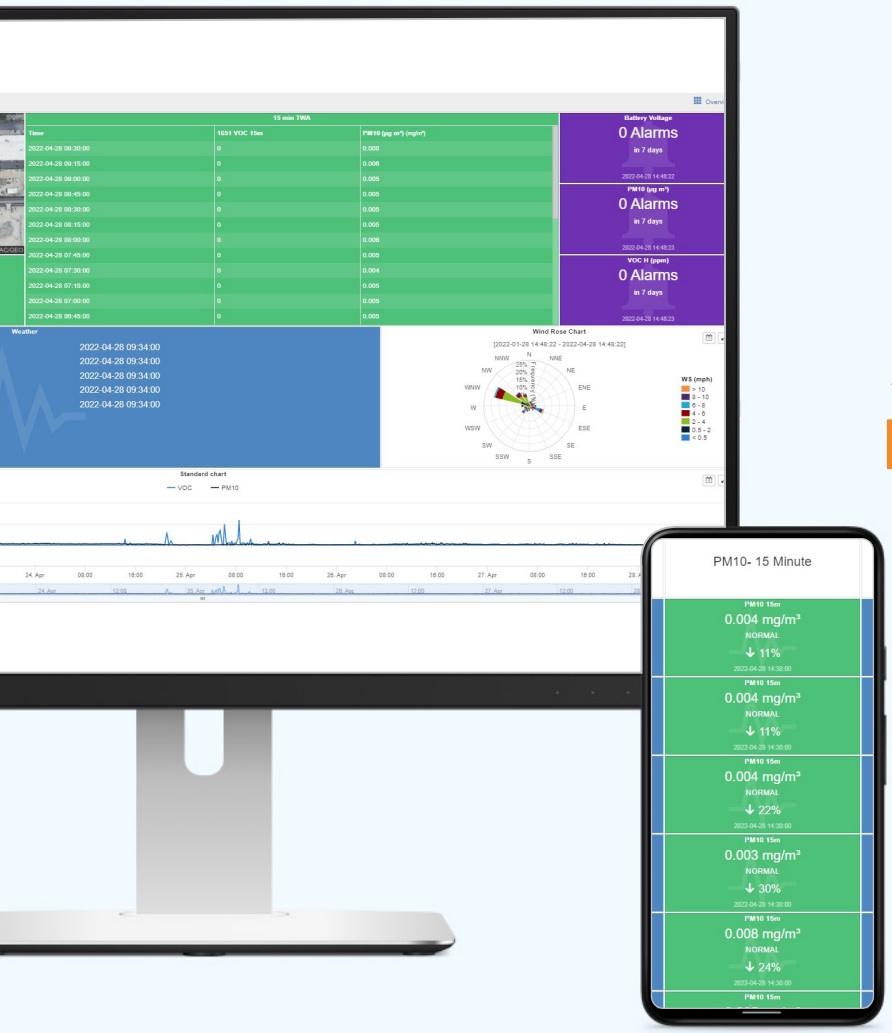
Compatible with
1,000's of different
monitor configurations

SMS

Get alerts via SMS / email
within **90-120 seconds** of an event

AQS-1
by Aeroqual

Our system processes over
6 million datapoints per day



Customizable Data
Visualizations

Achieve greater
than **99% uptime**

AIRLOGICS
AIR MONITORING SYSTEMS

Need an air monitoring solution? Contact us today so we can discuss the specifics of your project.

Address
150 Cooper Road
Suite I-24
West Berlin, NJ 08091

Phone
Tel: 908.803.1014

Email
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AQS 1

Specification Sheet

Near reference real-time monitor for particulates plus O_3/NO_2/CO/VOC

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

The AQS 1 delivers affordable and defensible measurement of PM_{10}, $PM_{2.5}$, PM_1, TSP, and up to three gases, O_3, NO_2, CO, H_2S and VOC, all simultaneously.

MCERTS certified for PM_{10} by the UK Environment Agency.

What is it?

- Reduce failure and downtime thanks to this robust purpose-built outdoor monitor for dust and gaseous pollutants
- Industry-leading gas sensing technology from Aeroqual comes fully integrated in the same compact format
- Reduce site visits using two-way communications – remotely troubleshoot, upgrade software, change settings, and calibrate
- Plug in all your devices – noise, weather, reference monitors – to the AQS 1 power and data interface and view data in one software dashboard
- Power up with quick and easy interface to solar and battery systems
- Respond in real-time via configurable email / SMS alerts

What can it measure?

- Specific dust fractions, wind, weather and noise

Who is it for?

- Industrial operators who need to manage dust and particulates from site activities, within regulatory or permitted limits:
  - Construction and remediation
  - Oil and gas facilities
  - Quarry and mine operators
  - Port and bulk handling terminals
  - Waste management sites
- 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 PM 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 PM monitor

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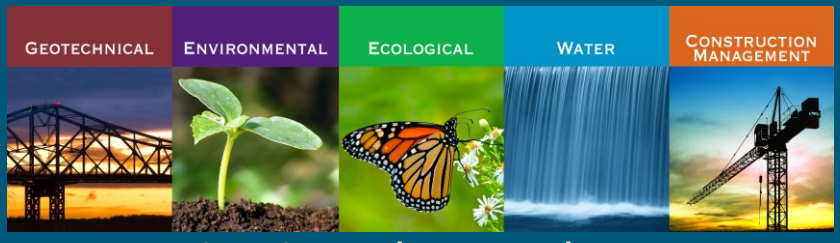
Specifications | AQS 1

Particle module	Sizes	Range	Accuracy	Resolution	Lower Detectable Limit (2σ)
Nephelometer	PM_1, $PM_{2.5}$, PM_{10} OR TSP	0 to 60,000 µg/m³	±(2 µg/m³ + 5% of reading)	0.1 µg/m³	1 µg/m³
Profiler (Optical Particle Counter)	PM_1, $PM_{2.5}$, PM_{10} AND TSP	PM_1 200 µg/m³ $PM_{2.5}$ 2000 µg/m³ PM_{10} 5000 µg/m³ TSP 5000 µg/m³	±(5 µg/m³ + 15% of reading)	0.1 µg/m³	1 µg/m³
	Optional Particulate Counts: 0.3, 0.5, 0.7, 1.0, 2.0, 3.0, 5.0, 10 microns (counts range: 0-100,000 counts/L)				

Gas module	Range	Resolution	Noise Zero; Span % of reading	Lower Detection Limit (2σ)	Precision	Linearity (% of FS)	Drift 24 hour Zero; Span % of FS
Ozone O_3	0-500 ppb	0.1 ppb	1 ppb; 1%	1 ppb	2% of reading or 2 ppb	1.5%	1 ppb; 0.2%
Nitrogen dioxide NO_2	0-500 ppb	0.1 ppb	1; 1%	1 ppb	2% of reading or 2 ppb	1%	2 ppb; 1%
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%	0.05 ppm	2% of reading or 0.05 ppm	2%	0.1 ppm; 1%
Hydrogen Sulfide H_2S	0-10,000 ppb	0.1 ppb	1 ppn; 0.1%	2 ppb	1% of reading or 3 ppb	0.5%	1 ppb; 0.5%

System specifications	
Control system	Embedded fanless PC (Intel Celeron® N3350, 1.6GHz, dual core, 4GB RAM, 32GB SSD hard drive), Ubuntu Linux Operating System
Communications[1]	Standard: WIFI, Ethernet (LAN) Optional modem: Cellular IP 4G LTE
Software	**Aeroqual Cloud** – Choose a plan that is right for you **Optimize**: Reduce site visits and improve data quality by managing your monitors and optimizing network performance remotely. **Plus**: Stay one step ahead with enhanced features for viewing and sharing data, real-time alerts, and analysis. Talk to our sales team to learn more about Aeroqual Cloud plans.
Data logging	32 GB Hard Drive (> 5 years data storage)
Averaging period	1 min, 5 min, 10 min, 15 min, 20 min, 30 min, 1 hr, 2 hr, 4 hr, 8 hr, 12 hr, 24 hr
Power requirements[2]	100-260 VAC (standard): 31.3 W Regulated 12 VDC (if required): 34.3 W
Enclosure	Lockable IP65 GRP cabinet with integrated aluminum solar shield armor
PM sampling system	Inlet: Omni-directional 36 cm (14.1 inches) heated inlet; Optional sharp cut cyclones for PM10, PM2.5 or PM1 size selection Pump: 12 V brushless DC diaphragm Optics: 670 nm laser, near-forward scattering nephelometer with sheath air protection
Dimensions[3]	483 H x 330 W x 187 D mm (19 H x 13 W x 7.4 D inches) Includes solar shield armor & mounting brackets
Weight[4]	< 13 kg (28.6 lbs)
Operating range	-10 °C to +45 °C (14 °F to 113 °F)
Mounting	Pole, tripod and wall mounting brackets included
Factory integrated sensors[5]	Gill WindSonic (ultrasonic wind sensor), Vaisala WXT536 (weather transmitter), Met One MSO (weather transmitter), Cirrus MK427 Class 1 (noise sensor), Novalynx Pyranometer (solar radiation)
Compatible tested sensors	BSWA 308 (sound level meter), Met-One BC-1060 (black carbon monitor), Met-One E-BAM PLUS (Beta-Attenuation Mass Monitor)

[1] 4G LTE not available in all markets.
[2,4] Configuration used for power and weight calculations: base unit, nephelometer, PM_{10} sharp cut, modem, heater on.
[3] Dimensions are for enclosure. PM sampling inlet with cyclone adds 360 mm (14.17") to total height.
[5] Optional



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