

Quarterly Data Report

Cheltenham Borough Council

**July, August, September
2021**

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Cheltenham 1150100 - Site Information

The Cheltenham monitoring station is located in a roadside cabin near A40 Gloucester road.

UK-AIR ID: None

EU Site ID: None

Environment Type: Urban Traffic

Altitude (metres): None

Site Address: 18 Gloucester Road, Cheltenham

Government Region: Cheltenham

Easting/Northing: 560963.89, 5749904.91

Latitude/Longitude: 51.896565, -2.114000

Site location URL: <https://goo.gl/maps/196QLfK1iYj5AjDd9>

AQMesh Devices in Cheltenham

9 AQMesh devices have been installed at various locations after co-location study, scaling factors (slope and offset) generated by co-location study during first quarter 2021 have been retrospectively applied to each AQMesh device's historical data channels from 01 January 2020 to present. The following AQMesh and reference station data summary is using scaled data at raw data rate exported from www.airmonitors.net. Gaseous pollutant mass units are at 20 °C and 1013mb. Particulate matter concentrations are reported at ambient temperature and pressure. AQMesh data shown in this report are based on location, different AQMesh devices could be installed at the same location during different time periods.

AQMesh Statement

AQMesh is a multi-parameter small sensor system. When operated according to manufacturer's guidance and best practice the devices should provide reasonably accurate results "out of the box". Accuracy can be further improved by either physical co-location with Reference (or Equivalence) grade monitors or Acoem's network smart calibration methods and subsequent adjustment of calibration parameters. AQMesh devices, once calibrated, can provide accuracy close to that of a Reference for Equivalence monitor, but we recommend that AQMesh data alone should not be relied upon for compliance with EU or UK air quality directives.

AQMesh Status Flags

Flag	Description of when the status flag appears
Below Level Of Detection	The AQMesh reading is under the level of detection listed in the specification sheet .
Stabilising	AQMesh is running automatic self stabilising which is usually 2 days in duration. This occurs when AQMesh is switched on for the first time and after gas sensor replacement.
Rebasing	AQMesh is running automatic self rebasing on gas sensors which usually lasts 2-5 days. This occurs when AQMesh is switched on for the first time and after gas sensor replacement. There is no data when this flag is present.
Rebased	This status flag replaces the rebasing status flag once AQMesh finishes rebasing, the readings during the rebasing process are retrospectively populated with the rebased status flag.
Optimising	Occurs when a pod is power-cycled for more than an hour i.e. Maintenance or power failure.
Communication Error	AQMesh is unable to upload data successfully. This status will require investigation.
Failed Sensor	AQMesh gas sensor has been determined as failed and requires a replacement sensor to be installed.
Cross Gas Error	This status flag appears when a sensor fails which is relied upon for the removal or interferences on another sensor, e.g. NO ₂ sensor failure will affect O ₃ reading. O ₃ readings are then marked with the Cross Gas Error status flag.
Destabilised	The system has detected that the sensor August be compromised due to odd fluctuations in temperature and pressure.
Extreme Environment	This status flag appears when the manufacturer determines the combination of extremes in climate in which the electrochemical sensors do not provide consistent outputs. As such precise and accurate measurements are not possible.
Condensation	The NDIR sensor is affected by condensation on the detector. This flag is exclusive to CO ₂ data.
Deliquescence	This status flag appears when not using the heated inlet option. Outlying data points caused by hygroscopic particle size growth will be flagged following analysis of the particle count distribution. This flag is exclusive to PM data.

Misread	Occurs when the particle counter misreads. It is exclusive to PM data.
Greater Than Upper Limit	Occurs when the reading is above the device measurement range.
Greater Than Concentration Limit	This status flag appears when data is above the concentration limit, set for ambient air measurement.
Less Than Concentration Limit	This status flag appears when data is lower than the device concentration limit, set for ambient air measurement.
Less Than Lower Limit	This status flag appears when reading is lower than the device measurement range.
PM ₁ Greater Than PM _{2.5}	Prescaled PM ₁ readings are higher than PM _{2.5} readings.
PM ₁ Greater Than PM ₁₀	Prescaled PM ₁ readings are higher than PM ₁₀ readings.
PM _{2.5} Greater Than PM ₁₀	Prescaled PM _{2.5} readings are higher than PM ₁₀ readings.
Depletion Event	This status flag appears when there is abundant NO _x level in the air and AQMesh reports negative O ₃ levels. O ₃ readings should be considered and truncated to zero under this status flag.
Calibration	Device is under a calibration process.
Unknown Error	AQMesh encounters an unknown error. This is usually caused by a hardware related problem and requires further investigation.

Upper Limit, Lower Limit and Concentration Limit

This table shows the upper limit, lower limit and concentration limits that are set for AQMesh measured pollutants. The status flags “Greater Than Upper Limit”, “Greater Than Concentration Limit”, “Less Than Concentration Limit” and “Less Than Lower Limit” in the data summary are determined by values in this table.

AQMesh channels	Upper limit	High concentration limit	Low concentration limit	Lower limit	Unit
NO	1000	800	-5	-100	ppb
NO₂	1000	300	-5	-100	ppb
PM₁₀	3000	None	None	-100	µg m ⁻³
PM_{2.5}	3000	None	None	-100	µg m ⁻³
PM₁	1000	None	None	-100	µg m ⁻³

Glossary

Data Capture Rate - The amount of data captured as a percentage of the total possible in any period.

Valid Data Rate - The proportion of data considered valid after any invalid Status Flags have been considered and any Outliers have been removed.

Outliers - Data points which have been removed from a data set other than by predetermined Status Flags by a manually applied ratification process.

Status Flag - A marker applied to each data point based on a number of predetermined conditions which describe a condition which August render the data valid or invalid.

Pre-Scaled Data - Data which has not (yet) been subject to offset or slope adjustments as a result of a Calibration Process.

Scaled Data - Pre-Scaled data which has been subsequently adjusted by application of an offset and/or slope determined by a Calibration Process.

Reference - Data generated by a certified monitor complying with the requirements of an EU, UK or US Reference method.

Equivalence - A monitor which has been certified Equivalent to a EU, UK or US Reference Method according to the relevant Guidance on Equivalence Designation.

Co-location Study - A process of comparing data from a candidate sensor device with that of a Reference (or Equivalent) monitor for a period of time at a fixed location.

Sensor Calibration Process - A Co-location Study where a candidate sensor or sensor system is compared with a Reference (or Equivalence) grade monitor for a period of time and the candidate data is adjusted by application of an offset and/or slope in order to improve the level of agreement with the reference data source.

Scale Separation - A process of separating the local and regional concentration signals for an observed pollutant species within a network of sensors.

Network Calibration process - A Calibration Process applied to a group of sensors within a specified geographical area, using a common (regional) signal from ambient air as derived by a Scale Separation technique.

Emissions Indices - The amount of a criteria pollutant produced (or emitted) expressed as a percentage of the amount of fuel combusted. This is normally calculated as a ratio of the criteria pollutant concentration over that of CO₂.

Criteria Air Pollutant - A gaseous, particulate matter, aerosol or vapour consisting of a material designated as a controlled air pollutant within an EU, UK or US Air Quality Directive.

API (Application Program Interface) - A protocol allowing manual or automated, third party queries of data within a database and returning a predetermined response format. e.g. (JSON, CSV etc)

Relative Concentration - The concentration of an airborne pollutant expressed as ppb, ppm, etc

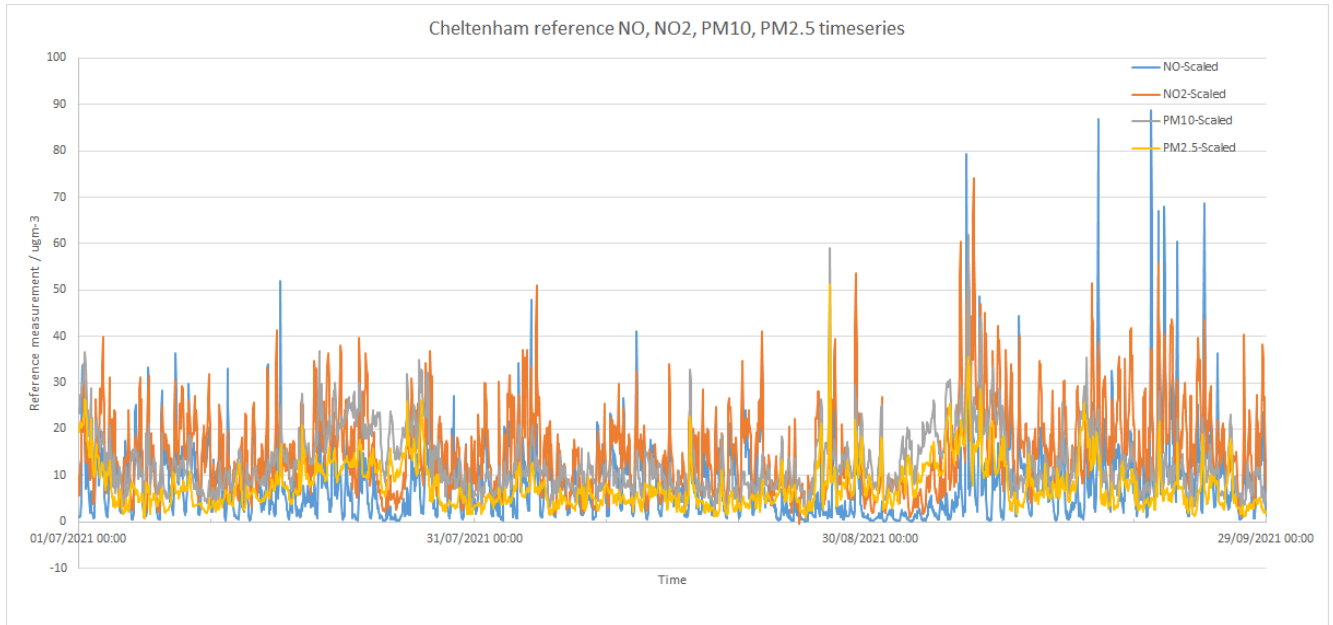
Absolute Concentration - The concentration of an airborne pollutant expressed in mg/m³, ug/m³, mole/m³ etc.

OpenAir - A set of data analysis tools using advanced data processing in "R"

"R" - R is a programming language and free software environment for statistical computing and graphics supported by the R Foundation for Statistical Computing. The R language is widely used among statisticians and data miners for developing statistical software and data analysis.

July - September 2021 Data summary

1150100 Cheltenham reference site - Data Summary



(Graph shows hourly averaged data)

This reference site has Thermo 42i NOx analyser and Palas Fidas PM analyser installed.

NO valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Data capture rate	100.00%	100.00%	100.00%	None
Max	159.80	58.90	130.30	µg m ⁻³
Min	0.10	0.10	0.10	µg m ⁻³
Median	6.50	4.90	7.10	µg m ⁻³
Monthly mean	8.48	7.29	10.18	µg m ⁻³
NO invalid data status flag				
	None	None	None	

(Min, Max & Median based on 15 minute data)

NO₂ valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Data capture rate	100.00%	100.00%	100.00%	None
Max	41.40	53.50	74.10	µg m ⁻³
Min	2.10	0.00	0.90	µg m ⁻³
Median	13.80	10.80	15.80	µg m ⁻³
Monthly mean	14.81	12.60	18.04	µg m ⁻³
NO₂ invalid data status flag				
	None	None	None	

(Min, Max & Median based on hourly data)

PM₁₀ valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Data capture rate	100%	100.00%	100.00%	None
Max	26.46	21.65	29.67	µg m ⁻³
Min	5.83	6.30	6.57	µg m ⁻³
Median	11.78	9.09	12.41	µg m ⁻³
Monthly mean	14.04	10.12	13.73	µg m ⁻³
PM₁₀ invalid data status flag				
	None	None	None	

(Min, Max & Median based on daily data)

PM_{2.5} valid data	July Scaled data	August Scaled data	September Scaled data	Unit
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Data capture rate	100.00%	100.00%	100.00%	None
Max	19.84	15.06	19.96	$\mu\text{g m}^{-3}$
Min	3.08	3.41	2.66	$\mu\text{g m}^{-3}$
Median	7.01	4.94	7.87	$\mu\text{g m}^{-3}$
Monthly mean	8.25	6.04	8.84	$\mu\text{g m}^{-3}$
PM_{2.5} invalid data status flag				
	None	None	None	

(Min, Max & Median based on daily data)

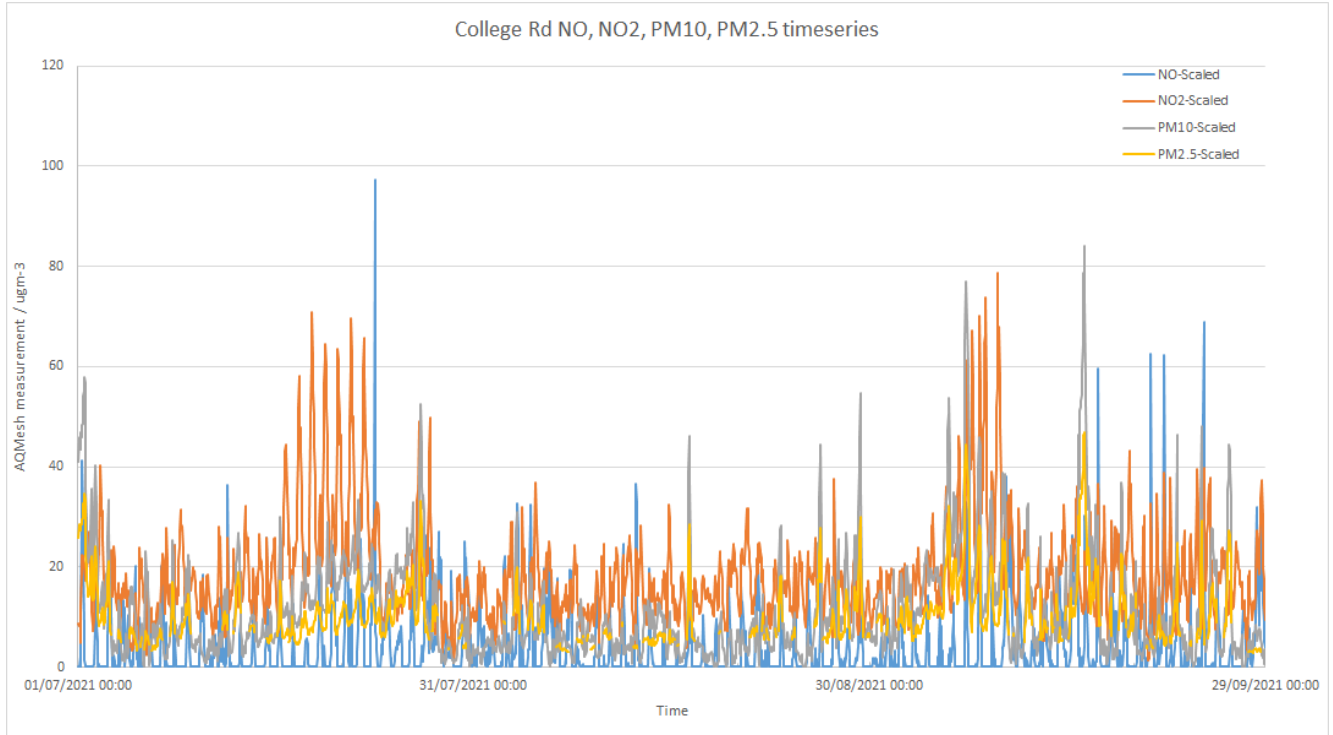
NOTE: Negative reading shown in the above tables are genuine data from the reference instrument. Negative values could be the noise readings when ambient pollution level is very low.

Exceedance count	July exceedance count	August exceedance count	September exceedance count	Quarterly exceedance count	UK AQ Objective
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NO2 hourly mean	0	0	0	0	Hourly mean, 200 $\mu\text{g m}^{-3}$ not to be exceeded more than 18 times a year
PM10 daily mean	0	0	0	0	24 hour mean, 50 $\mu\text{g m}^{-3}$ not to be exceeded more than 35 times a year

Annual exceedance	Q1 up to date average	Q2 up to date average	Q3 up to date average	Exceeded annual limit?	UK AQ Objective
NO2 annual mean (up to date)	19.40	15.16	15.15	No	Annual mean limit 40 $\mu\text{g m}^{-3}$
PM10 annual mean (up to date)	16.10	12.01	12.63	No	Annual mean limit 40 $\mu\text{g m}^{-3}$
PM2.5 annual mean (up to date)	10.31	8.02	7.71	No	Annual mean limit 25 $\mu\text{g m}^{-3}$

College Rd AQMesh - Data Summary



(Graph shows hourly averaged data)

NO valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100.00%	100.00%	100.00%	None
Max	349.50	63.90	125.30	$\mu\text{g m}^{-3}$
Min	0.00	0.00	0.00	$\mu\text{g m}^{-3}$
Median	0.70	0.00	1.30	$\mu\text{g m}^{-3}$
Monthly mean	4.90	3.46	5.80	$\mu\text{g m}^{-3}$
NO invalid data status flag:				
	None	None	None	

(Min, Max & Median based on 15 minute data)

NO₂ valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100.00%	100.00%	100.00%	None
Max	70.80	37.50	78.60	µg m ⁻³
Min	0.80	3.80	1.40	µg m ⁻³
Median	17.00	14.50	18.00	µg m ⁻³
Monthly mean	19.68	15.03	19.84	µg m ⁻³
NO₂ invalid data status flag				
	None	None	None	

(Min, Max & Median based on hourly data)

PM₁₀ valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100.00%	100.00%	100.00%	None
Max	38.62	18.75	41.73	µg m ⁻³
Min	2.94	2.73	2.79	µg m ⁻³
Median	10.67	6.12	11.30	µg m ⁻³
Monthly mean	12.46	7.39	13.94	µg m ⁻³
PM₁₀ invalid data status flag				
	None	None	None	

(Min, Max & Median based on daily data)

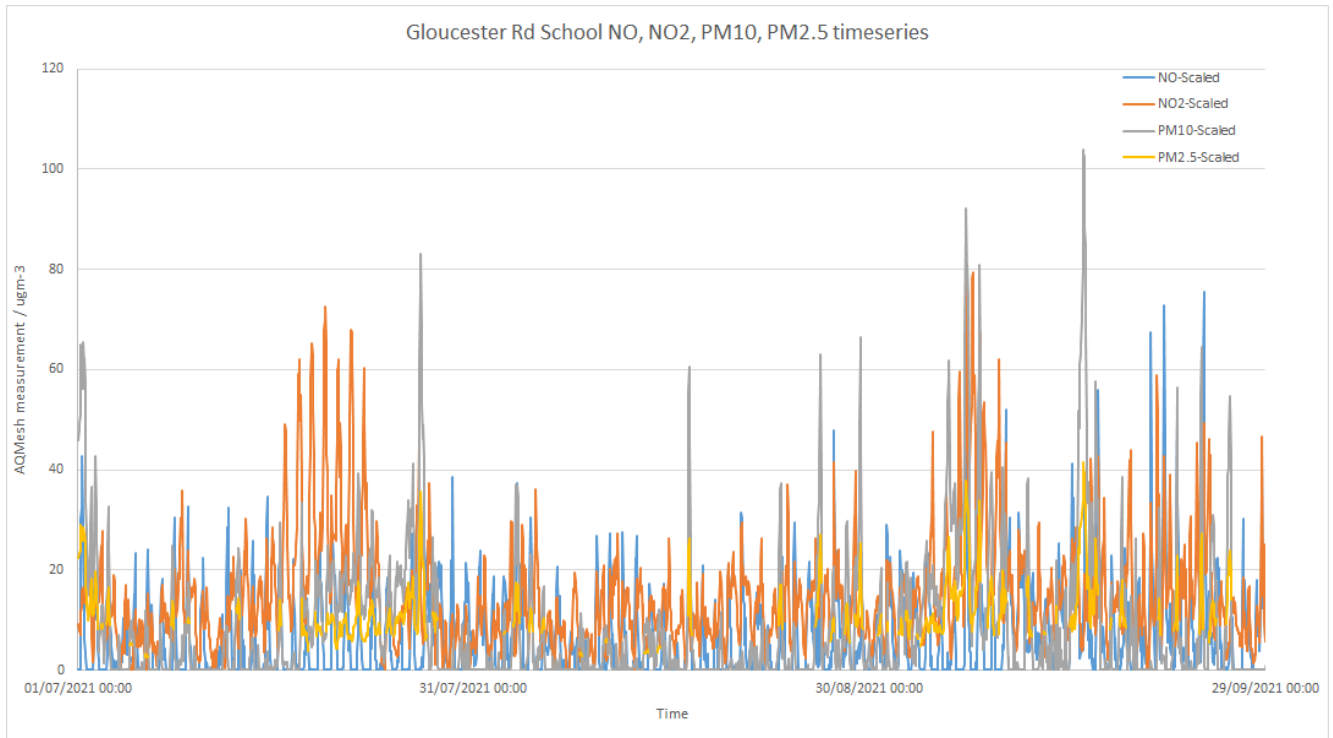
PM _{2.5} valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	54.84%	25.81%	46.67%	None
Max	24.12	11.85	25.94	µg m ⁻³
Min	4.39	5.23	5.48	µg m ⁻³
Median	10.21	8.31	12.36	µg m ⁻³
Monthly mean	10.62	8.30	13.41	µg m ⁻³
PM _{2.5} invalid data status flag				
	Deliquescence, PM25 Greater Than PM10	Deliquescence, PM25 Greater Than PM10	Deliquescence, PM25 Greater Than PM10	

(Min, Max & Median based on daily data)

Exceedance count	July exceedance count	August exceedance count	September exceedance count	Quarterly exceedance count	UK AQ Objective
NO ₂ hourly mean	0	0	0	0	Hourly mean, 200 µg m ⁻³ not to be exceeded more than 18 times a year
PM ₁₀ daily mean	0	0	0	0	24 hour mean, 50 µg m ⁻³ not to be exceeded more than 35 times a year

Annual exceedance	Q1 up to date average	Q2 up to date average	Q3 up to date average	Exceeded annual limit?	UK AQ Objective
NO2 annual mean (up to date)	22.10	15.57	18.18	No	Annual mean limit 40 µg m ⁻³
PM10 annual mean (up to date)	25.29	13.72	11.26	No	Annual mean limit 40 µg m ⁻³
PM2.5 annual mean (up to date)	13.11	7.99	10.78	No	Annual mean limit 25 µg m ⁻³

Gloucester Rd school AQMesh - Data Summary



(Graph shows hourly averaged data)

Note: The following tables exclude data measured during the co-location period.

NO valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100%	100%	100.00%	None
Max	85.30	54.90	96.10	$\mu\text{g m}^{-3}$
Min	0.00	0.00	0.00	$\mu\text{g m}^{-3}$
Median	1.65	2.20	5.55	$\mu\text{g m}^{-3}$
Monthly mean	5.96	5.75	9.53	$\mu\text{g m}^{-3}$
NO invalid data status flag				
	None	None	None	

(Min, Max & Median based on 15 minute data)

NO₂ valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100%	100.00%	100.00%	None
Max	72.50	41.50	79.40	µg m ⁻³
Min	0.00	0.00	0.00	µg m ⁻³
Median	12.90	10.25	13.80	µg m ⁻³
Monthly mean	15.60	11.07	16.88	µg m ⁻³
NO₂ invalid data status flag				
	None	None	None	

(Min, Max & Median based on hourly data)

PM₁₀ valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100.00%	100.00%	100.00%	None
Max	41.97	16.47	49.64	µg m ⁻³
Min	0.00	0.00	0.00	µg m ⁻³
Median	4.00	0.71	8.26	µg m ⁻³
Monthly mean	8.48	3.36	11.49	µg m ⁻³
PM₁₀ invalid data status flag				
	None	None	None	

(Min, Max & Median based on daily data)

PM _{2.5} valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	32.26%	0%	26.67%	None
Max	20.20	none	22.01	µg m ⁻³
Min	6.54	none	8.93	µg m ⁻³
Median	9.20	none	12.71	µg m ⁻³
Monthly mean	10.60	none	14.24	µg m ⁻³
PM_{2.5} invalid data status flag				
	Deliquescence, PM25 Greater Than PM10	Deliquescence, PM25 Greater Than PM10	Deliquescence, PM25 Greater Than PM10	

(Min, Max & Median based on daily data)

Exceedance count	July exceedance count	August exceedance count	September exceedance count	Quarterly exceedance count	UK AQ Objective
NO ₂ hourly mean	0	0	0	0	Hourly mean, 200 µg m ⁻³ not to be exceeded more than 18 times a year
PM ₁₀ daily mean	0	0	0	0	24 hour mean, 50 µg m ⁻³ not to be exceeded more than 35 times a year

Annual exceedance	Q1 up to date average	Q2 up to date average	Q3 up to date average	Exceeded annual limit?	UK AQ Objective
NO2 annual mean (up to date)	19.36	13.88	14.52	No	Annual mean limit 40 µg m ⁻³
PM10 annual mean (up to date)	22.02	7.51	7.78	No	Annual mean limit 40 µg m ⁻³
PM2.5 annual mean (up to date)	12.62	5.57	12.42	No	Annual mean limit 25 µg m ⁻³

Berkley Place AQMesh - Data Summary

(Graph shows hourly averaged data)

Note: The following tables exclude data measured during the co-location period.

NO valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	No data, offline	No data, offline	No data, offline	None
Max	No data, offline	No data, offline	No data, offline	$\mu\text{g m}^{-3}$
Min	No data, offline	No data, offline	No data, offline	$\mu\text{g m}^{-3}$
Median	No data, offline	No data, offline	No data, offline	$\mu\text{g m}^{-3}$
Monthly mean	No data, offline	No data, offline	No data, offline	$\mu\text{g m}^{-3}$
NO invalid data status flag				
	None	None	None	

(Min, Max & Median based on 15 minute data)

NO₂ valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	No data, offline	No data, offline	No data, offline	None
Max	No data, offline	No data, offline	No data, offline	$\mu\text{g m}^{-3}$
Min	No data, offline	No data, offline	No data, offline	$\mu\text{g m}^{-3}$
Median	No data, offline	No data, offline	No data, offline	$\mu\text{g m}^{-3}$
Monthly mean	No data, offline	No data, offline	No data, offline	$\mu\text{g m}^{-3}$
NO₂ invalid data status flag				
	None	None	None	

(Min, Max & Median based on hourly data)

PM₁₀ valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	No data, offline	No data, offline	No data, offline	None
Max	No data, offline	No data, offline	No data, offline	µg m ⁻³
Min	No data, offline	No data, offline	No data, offline	µg m ⁻³
Median	No data, offline	No data, offline	No data, offline	µg m ⁻³
Monthly mean	No data, offline	No data, offline	No data, offline	µg m ⁻³
PM₁₀ invalid data status flag				
	None	None	None	

(Min, Max & Median based on daily data)

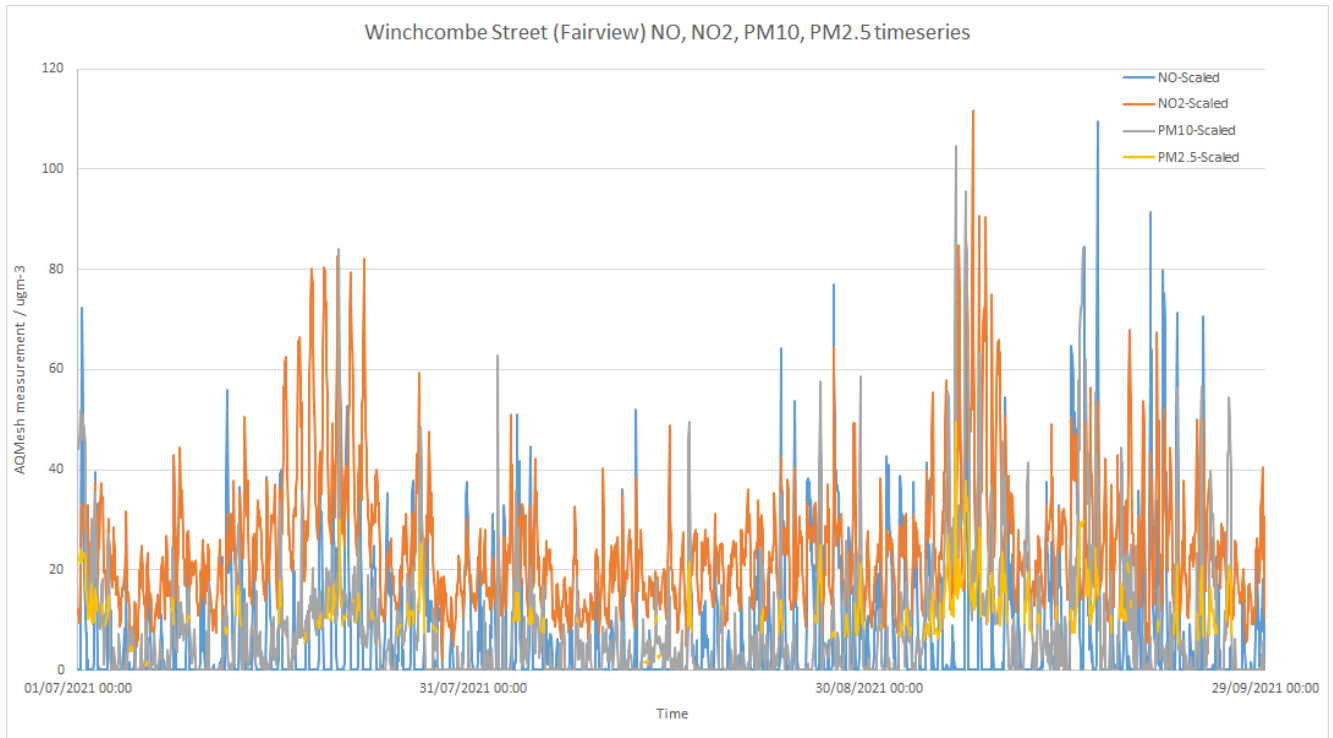
PM_{2.5} valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	No data, offline	No data, offline	No data, offline	None
Max	No data, offline	No data, offline	No data, offline	µg m ⁻³
Min	No data, offline	No data, offline	No data, offline	µg m ⁻³
Median	No data, offline	No data, offline	No data, offline	µg m ⁻³
Monthly mean	No data, offline	No data, offline	No data, offline	µg m ⁻³
PM_{2.5} invalid data status flag				
	None	None	None	

(Min, Max & Median based on daily data)

Exceedance count	July exceedance count	August exceedance count	September exceedance count	Quarterly exceedance count	UK AQ Objective
NO2 hourly mean	No data	No data	No data	0	Hourly mean, 200 $\mu\text{g m}^{-3}$ not to be exceeded more than 18 times a year
PM10 daily mean	No data	No data	No data	0	24 hour mean, 50 $\mu\text{g m}^{-3}$ not to be exceeded more than 35 times a year

Annual exceedance	Q1 up to date average	Q2 up to date average	Q3 up to date average	Exceeded annual limit?	UK AQ Objective
NO2 annual mean (up to date)	17.31	19.65	No data, offline	No	Annual mean limit 40 $\mu\text{g m}^{-3}$
PM10 annual mean (up to date)	17.19	15.95	No data, offline	No	Annual mean limit 40 $\mu\text{g m}^{-3}$
PM2.5 annual mean (up to date)	12.90	9.39	No data, offline	No	Annual mean limit 25 $\mu\text{g m}^{-3}$

Winchcombe Street (Fairview) AQMesh - Data Summary



(Graph shows hourly averaged data)

Note: The following tables exclude data measured during the co-location period between.

NO valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100.00%	100.00%	100%	None
Max	84.40	112.20	141.60	$\mu\text{g m}^{-3}$
Min	0.00	0.00	0.00	$\mu\text{g m}^{-3}$
Median	0.00	0.00	0.10	$\mu\text{g m}^{-3}$
Monthly mean	6.55	6.34	9.51	$\mu\text{g m}^{-3}$
NO invalid data status flag				
	None	None	None	

(Min, Max & Median based on 15 minute data)

NO₂ valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100.00%	100.00%	100%	None
Max	82.50	64.40	111.70	µg m ⁻³
Min	2.20	5.00	5.40	µg m ⁻³
Median	22.00	19.25	22.95	µg m ⁻³
Monthly mean	25.53	19.80	26.09	µg m ⁻³
NO₂ invalid data status flag				
	None	None	None	

(Min, Max & Median based on hourly data)

PM₁₀ valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100.00%	100.00%	100%	None
Max	35.06	13.43	50.34	µg m ⁻³
Min	0.00	0.00	2.58	µg m ⁻³
Median	6.56	1.53	14.66	µg m ⁻³
Monthly mean	7.27	3.61	15.62	µg m ⁻³
PM₁₀ invalid data status flag				
	None	None	None	

(Min, Max & Median based on daily data)

Note: The slightly higher monthly mean PM_{2.5} than PM₁₀ is due to the 51.61% of data truncation in PM₁₀ daily averaged data.

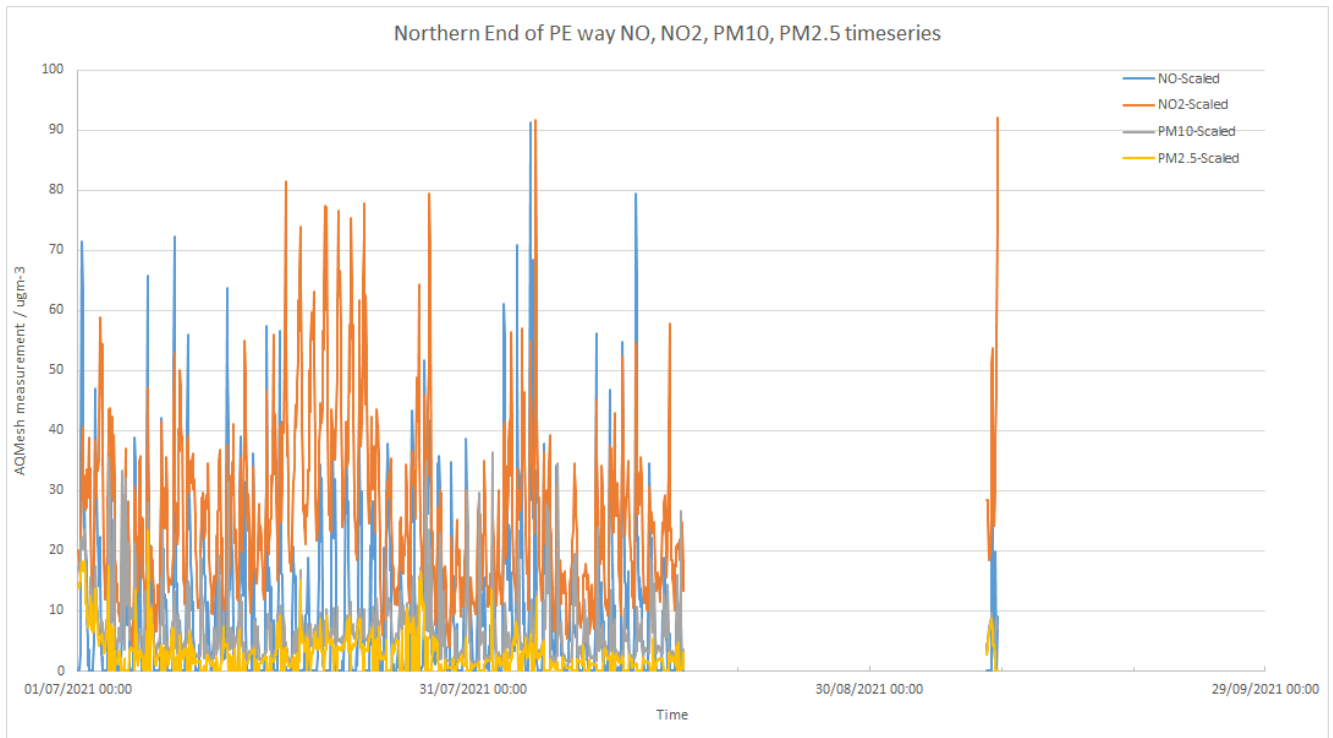
PM _{2.5} valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	6.45%	0%	30.00%	None
Max	18.54	none	21.52	µg m ⁻³
Min	14.19	none	8.99	µg m ⁻³
Median	16.36	none	13.68	µg m ⁻³
Monthly mean	16.36	none	14.93	µg m ⁻³
PM_{2.5} invalid data status flag				
	Deliquescence, PM25 Greater Than PM10	Deliquescence, PM25 Greater Than PM10	Deliquescence, PM25 Greater Than PM10	

(Min, Max & Median based on daily data)

Exceedance count	July exceedance count	August exceedance count	September exceedance count	Quarterly exceedance count	UK AQ Objective
NO ₂ hourly mean	0	0	0	0	Hourly mean, 200 µg m ⁻³ not to be exceeded more than 18 times a year
PM ₁₀ daily mean	0	1	0	1	24 hour mean, 50 µg m ⁻³ not to be exceeded more than 35 times a year

Annual exceedance	Q1 up to date average	Q2 up to date average	Q3 up to date average	Exceeded annual limit?	UK AQ Objective
NO2 annual mean (up to date)	21.69	21.75	23.81	No	Annual mean limit 40 µg m ⁻³
PM10 annual mean (up to date)	27.96	9.66	8.83	No	Annual mean limit 40 µg m ⁻³
PM2.5 annual mean (up to date)	15.45	8.88	15.65	No	Annual mean limit 25 µg m ⁻³

Northern End of PE Way AQMesh - Data Summary



(Graph shows hourly averaged data)

Note: The following tables exclude data measured during the co-location period.

NO valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100.00%	100.00%	100.00%	None
Max	100.20	118.40	84.30	$\mu\text{g m}^{-3}$
Min	0.00	0.00	0.00	$\mu\text{g m}^{-3}$
Median	4.90	4.90	0.00	$\mu\text{g m}^{-3}$
Monthly mean	10.80	10.99	6.01	$\mu\text{g m}^{-3}$
NO invalid data status flag				
	None	None	None	

(Min, Max & Median based on 15 minute data)

NO₂ valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100.00%	100.00%	91.67%	None
Max	81.50	91.60	156.50	µg m ⁻³
Min	3.90	5.40	18.40	µg m ⁻³
Median	25.50	20.65	30.90	µg m ⁻³
Monthly mean	27.54	22.31	46.29	µg m ⁻³
NO₂ invalid data status flag				
	None	None	Optimising	

(Min, Max & Median based on hourly data)

PM₁₀ valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100.00%	100.00%	100.00%	None
Max	16.59	9.26	7.00	µg m ⁻³
Min	2.32	3.96	4.69	µg m ⁻³
Median	6.60	5.49	5.84	µg m ⁻³
Monthly mean	7.38	5.72	5.84	µg m ⁻³
PM₁₀ invalid data status flag				
	None	None	None	

(Min, Max & Median based on daily data)

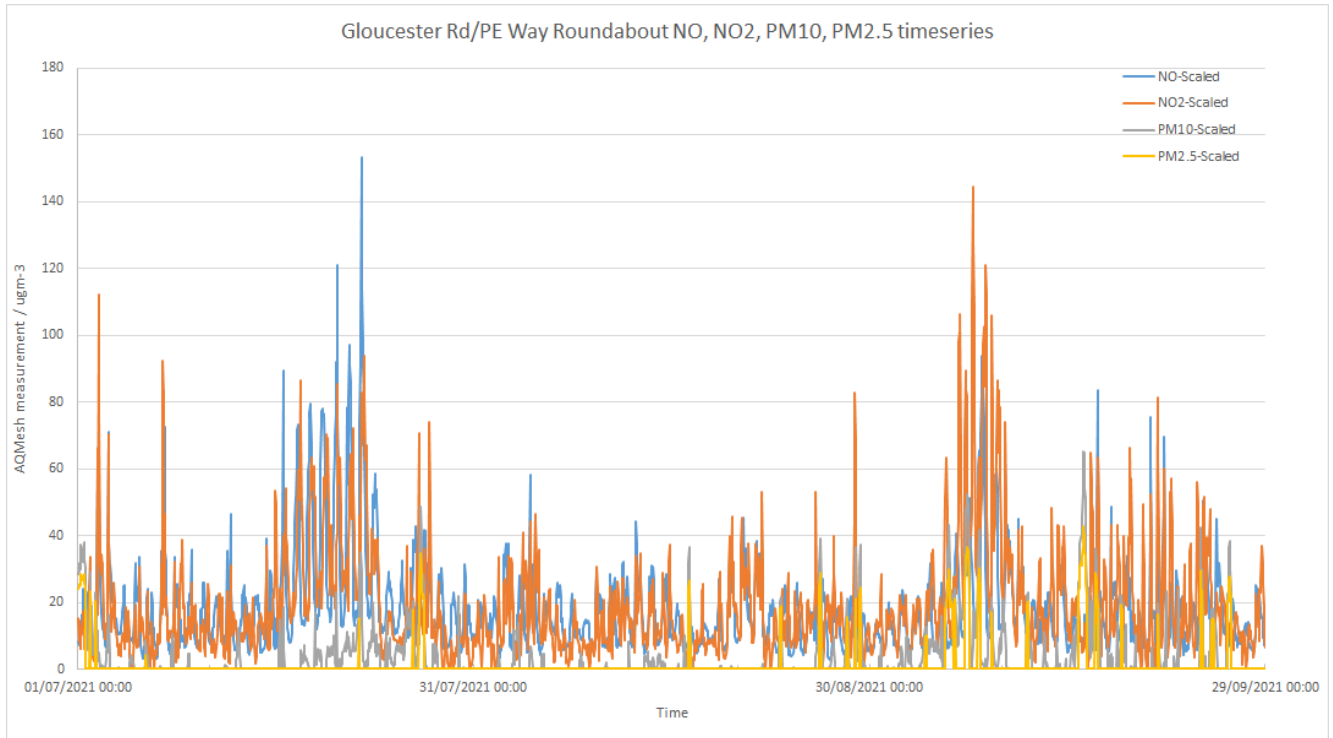
PM _{2.5} valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	64.52%	46.67%	100.00%	None
Max	13.31	6.78	6.51	µg m ⁻³
Min	1.63	3.81	3.70	µg m ⁻³
Median	5.21	4.52	5.11	µg m ⁻³
Monthly mean	5.70	4.94	5.11	µg m ⁻³
PM _{2.5} invalid data status flag				
	Deliquescence, PM25 Greater Than PM10	Deliquescence, PM25 Greater Than PM10	None	

(Min, Max & Median based on daily data)

Exceedance count	July exceedance count	August exceedance count	September exceedance count	Quarterly exceedance count	UK AQ Objective
NO2 hourly mean	0	0	0	0	Hourly mean, 200 µg m ⁻³ not to be exceeded more than 18 times a year
PM10 daily mean	0	0	0	0	24 hour mean, 50 µg m ⁻³ not to be exceeded more than 35 times a year

Annual exceedance	Q1 up to date average	Q2 up to date average	Q3 up to date average	Exceeded annual limit?	UK AQ Objective
NO2 annual mean (up to date)	27.41	25.23	32.05	No	Annual mean limit 40 $\mu\text{g m}^{-3}$
PM10 annual mean (up to date)	11.52	8.40	6.31	No	Annual mean limit 40 $\mu\text{g m}^{-3}$
PM2.5 annual mean (up to date)	7.00	6.02	5.25	No	Annual mean limit 25 $\mu\text{g m}^{-3}$

Gloucester Rd PE Way Roundabout AQMesh - Data Summary



(Graph shows hourly averaged data)

Note: The following tables exclude data measured during the co-location period.

NO valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100.00%	100.00%	100.00%	None
Max	268.40	61.40	123.10	$\mu\text{g m}^{-3}$
Min	1.80	0.00	0.30	$\mu\text{g m}^{-3}$
Median	15.90	11.80	13.40	$\mu\text{g m}^{-3}$
Monthly mean	22.42	14.22	17.63	$\mu\text{g m}^{-3}$
NO invalid data status flag				
	None	None	None	

(Min, Max & Median based on 15 minute data)

NO₂ valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100.00%	100.00%	100.00%	None
Max	112.00	82.60	144.50	µg m ⁻³
Min	0.00	0.00	0.00	µg m ⁻³
Median	14.20	11.30	17.10	µg m ⁻³
Monthly mean	19.65	13.77	22.79	µg m ⁻³
NO₂ invalid data status flag				
	None	None	None	

(Min, Max & Median based on hourly data)

PM₁₀ valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100.00%	100.00%	100.00%	None
Max	24.00	5.74	28.60	µg m ⁻³
Min	0.00	0.00	0.00	µg m ⁻³
Median	0.00	0.00	0.61	µg m ⁻³
Monthly mean	2.99	0.60	4.94	µg m ⁻³
PM₁₀ invalid data status flag				
	None	None	None	

(Min, Max & Median based on daily data)

Note: The higher monthly mean PM2.5 than PM10 is due to more than 70% of PM10 data truncation in PM10 daily averaged data.

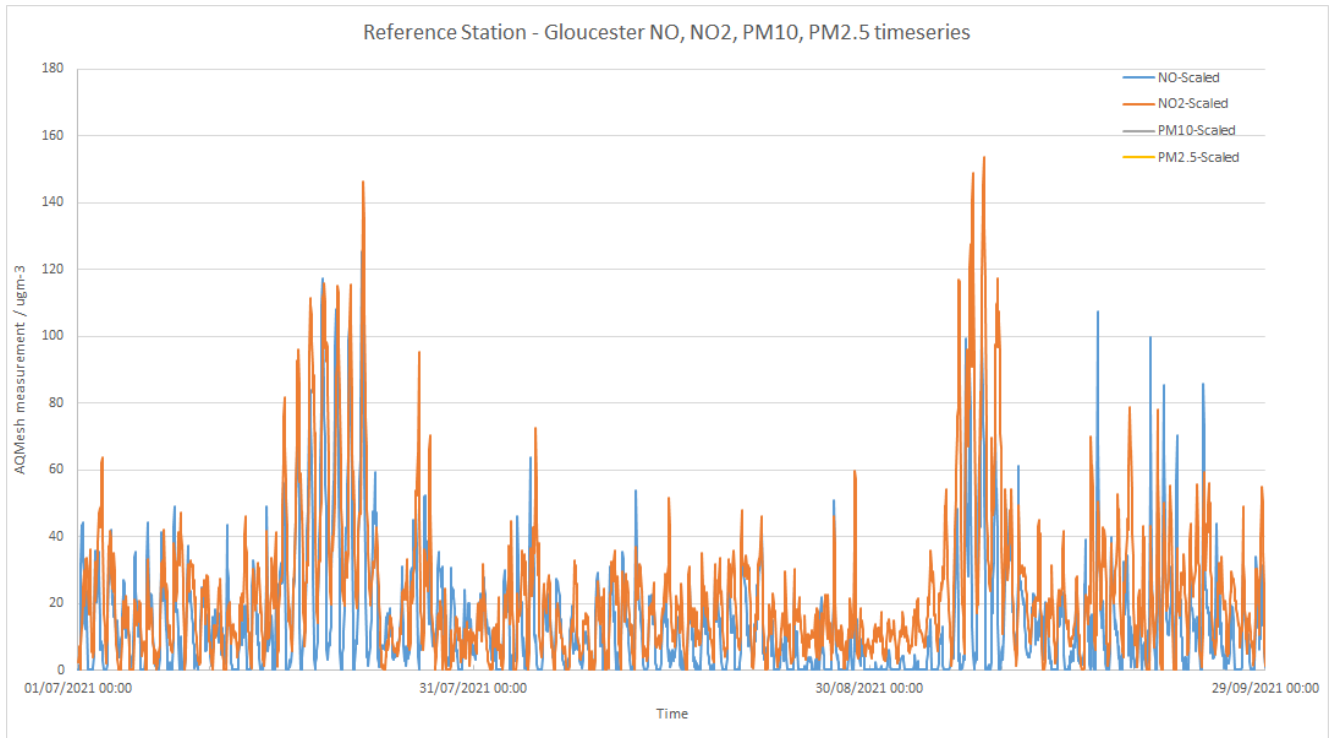
PM _{2.5} valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	0%	0%	0%	None
Max	none	none	none	µg m ⁻³
Min	none	none	none	µg m ⁻³
Median	none	none	none	µg m ⁻³
Monthly mean	none	none	none	µg m ⁻³
PM _{2.5} invalid data status flag				
	Deliquescence, PM25 Greater Than PM10	Deliquescence, PM25 Greater Than PM10	Deliquescence, PM25 Greater Than PM10	

(Min, Max & Median based on daily data)

Exceedance count	July exceedance count	August exceedance count	September exceedance count	Quarterly exceedance count	UK AQ Objective
NO ₂ hourly mean	0	0	0	0	Hourly mean, 200 µg m ⁻³ not to be exceeded more than 18 times a year
PM ₁₀ daily mean	0	0	0	0	24 hour mean, 50 µg m ⁻³ not to be exceeded more than 35 times a year

Annual exceedance	Q1 up to date average	Q2 up to date average	Q3 up to date average	Exceeded annual limit?	UK AQ Objective
NO2 annual mean (up to date)	20.24	14.15	18.74	No	Annual mean limit 40 $\mu\text{g m}^{-3}$
PM10 annual mean (up to date)	17.35	4.54	2.84	No	Annual mean limit 40 $\mu\text{g m}^{-3}$
PM2.5 annual mean (up to date)	9.17	6.36	none	No	Annual mean limit 25 $\mu\text{g m}^{-3}$

Reference Station - Gloucester Rd - Data Summary



(Graph shows hourly averaged data)

Note: The following tables exclude data measured during the co-location period.

NO valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100.00%	100.00%	100.00%	None
Max	134.60	73.10	155.30	$\mu\text{g m}^{-3}$
Min	0.00	0.00	0.00	$\mu\text{g m}^{-3}$
Median	12.20	4.75	7.80	$\mu\text{g m}^{-3}$
Monthly mean	18.96	8.75	13.92	$\mu\text{g m}^{-3}$
NO invalid data status flag				
	None	None	None	

(Min, Max & Median based on 15 minute data)

NO₂ valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100.00%	100.00%	100.00%	None
Max	146.20	72.40	153.50	µg m ⁻³
Min	0.00	0.00	0.00	µg m ⁻³
Median	19.45	13.30	20.65	µg m ⁻³
Monthly mean	25.58	14.77	26.76	µg m ⁻³
NO₂ invalid data status flag				
	None	None	None	

(Min, Max & Median based on hourly data)

PM₁₀ valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	none	none	none	None
Max	none	none	none	µg m ⁻³
Min	none	none	none	µg m ⁻³
Median	none	none	none	µg m ⁻³
Monthly mean	none	none	none	µg m ⁻³
PM₁₀ invalid data status flag				
	None	None	None	

(Min, Max & Median based on daily data)

Note: There is no PM data for AQMesh 780150 located at Gloucester road reference station since 31/05/2021.

PM _{2.5} valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	none	none	none	None
Max	none	none	none	µg m ⁻³
Min	none	none	none	µg m ⁻³
Median	none	none	none	µg m ⁻³
Monthly mean	none	none	none	µg m ⁻³
PM _{2.5} invalid data status flag				
	None	None	None	

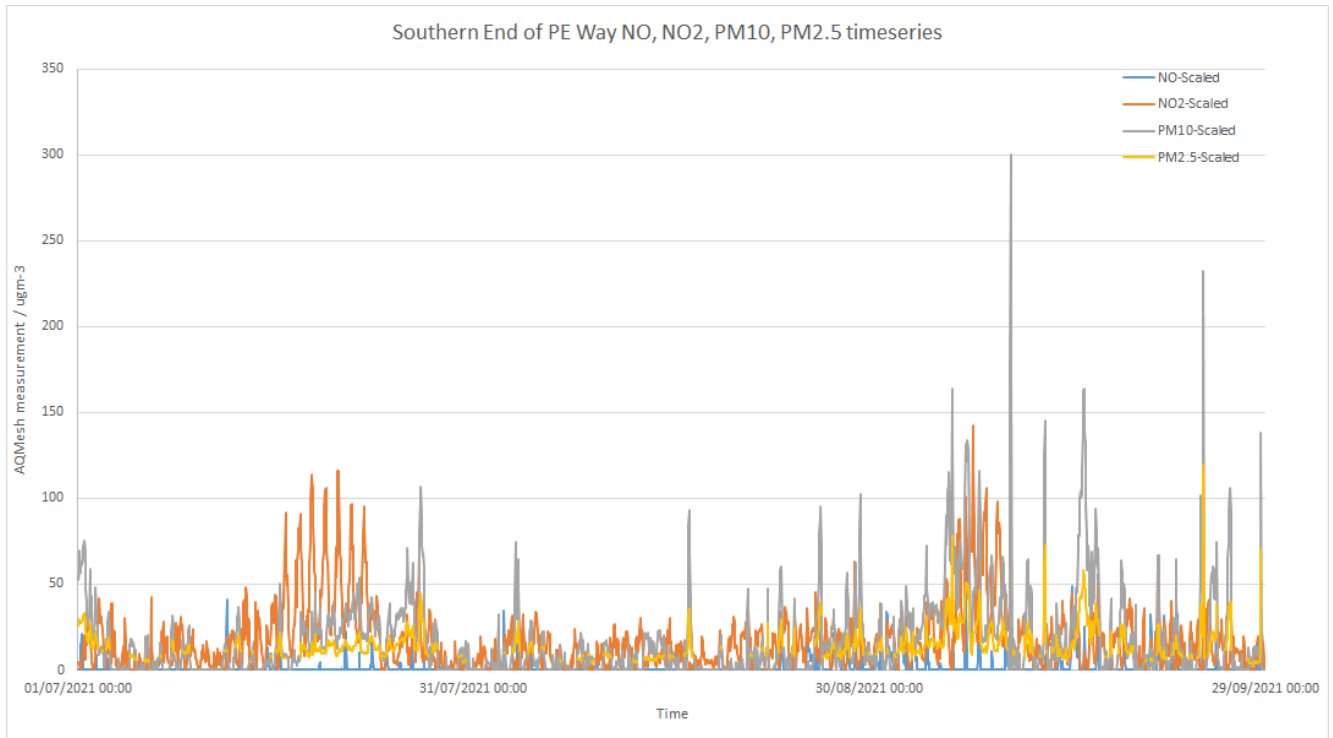
(Min, Max & Median based on daily data)

Note: There is no PM data for AQMesh 780150 located at Gloucester road reference station since 31/05/2021.

Exceedance count	July exceedance count	August exceedance count	September exceedance count	Quarterly exceedance count	UK AQ Objective
NO ₂ hourly mean	0	0	0	0	Hourly mean, 200 µg m ⁻³ not to be exceeded more than 18 times a year
PM ₁₀ daily mean	0	0	0	0	24 hour mean, 50 µg m ⁻³ not to be exceeded more than 35 times a year

Annual exceedance	Q1 up to date average	Q2 up to date average	Q3 up to date average	Exceeded annual limit?	UK AQ Objective
NO2 annual mean (up to date)	22.91	16.73	22.37	No	Annual mean limit 40 $\mu\text{g m}^{-3}$
PM10 annual mean (up to date)	16.20	17.56	none	No	Annual mean limit 40 $\mu\text{g m}^{-3}$
PM2.5 annual mean (up to date)	12.84	11.47	none	No	Annual mean limit 25 $\mu\text{g m}^{-3}$

Southern End of PE Way AQMesh - Data Summary



(Graph shows hourly averaged data)

Note: The following tables exclude data measured during the co-location period.

NO valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100%	100%	100%	None
Max	55.90	48.40	106.80	$\mu\text{g m}^{-3}$
Min	0.00	0.00	0.00	$\mu\text{g m}^{-3}$
Median	0.00	0.00	0.00	$\mu\text{g m}^{-3}$
Monthly mean	0.97	1.85	3.54	$\mu\text{g m}^{-3}$
NO invalid data status flag				
	None	None	None	

(Min, Max & Median based on 15 minute data)

NO₂ valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100%	100%	100%	None
Max	115.80	63.00	142.10	µg m ⁻³
Min	0.00	0.00	0.00	µg m ⁻³
Median	13.15	9.70	14.35	µg m ⁻³
Monthly mean	19.86	11.25	19.19	µg m ⁻³
NO₂ invalid data status flag				
	None	None	None	

(Min, Max & Median based on hourly data)

PM₁₀ valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100%	100%	100.00%	None
Max	52.19	29.37	83.78	µg m ⁻³
Min	0.00	0.00	0.00	µg m ⁻³
Median	7.53	5.23	20.97	µg m ⁻³
Monthly mean	14.06	8.61	27.45	µg m ⁻³
PM₁₀ invalid data status flag				
	None	None	None	

(Min, Max & Median based on daily data)

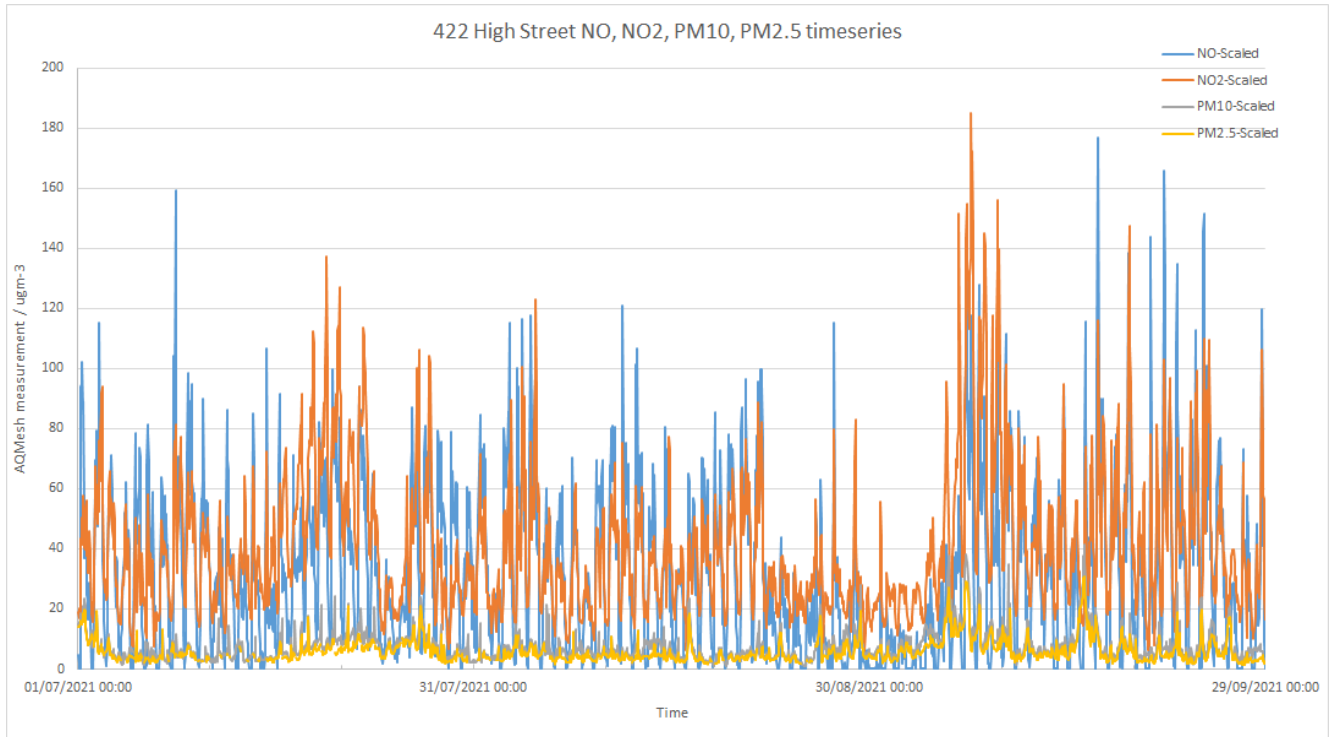
PM _{2.5} valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	38.71%	16.13%	43.33%	None
Max	24.93	14.69	33.49	µg m ⁻³
Min	11.59	6.54	9.07	µg m ⁻³
Median	13.86	12.26	19.88	µg m ⁻³
Monthly mean	15.20	11.61	19.97	µg m ⁻³
PM _{2.5} invalid data status flag				
	PM25 Greater Than PM10	Deliquescence, PM25 Greater Than PM10	Deliquescence, PM25 Greater Than PM10	

(Min, Max & Median based on daily data)

Exceedance count	July exceedance count	August exceedance count	September exceedance count	Quarterly exceedance count	UK AQ Objective
NO2 hourly mean	0	0	0	0	Hourly mean, 200 µg m ⁻³ not to be exceeded more than 18 times a year
PM10 daily mean	1	0	3	4	24 hour mean, 50 µg m ⁻³ not to be exceeded more than 35 times a year

Annual exceedance	Q1 up to date average	Q2 up to date average	Q3 up to date average	Exceeded annual limit?	UK AQ Objective
NO2 annual mean (up to date)	29.26	10.52	16.77	No	Annual mean limit 40 µg m ⁻³
PM10 annual mean (up to date)	39.48	11.19	16.71	No	Annual mean limit 40 µg m ⁻³
PM2.5 annual mean (up to date)	16.98	8.53	15.59	No	Annual mean limit 25 µg m ⁻³

422 High Street AQMesh - Data Summary



(Graph shows hourly averaged data)

Note: The following tables exclude data measured during the co-location period.

NO valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100.00%	100.00%	100.00%	None
Max	435.40	242.90	215.80	$\mu\text{g m}^{-3}$
Min	0.00	0.00	0.00	$\mu\text{g m}^{-3}$
Median	31.40	21.45	26.50	$\mu\text{g m}^{-3}$
Monthly mean	35.59	29.12	34.45	$\mu\text{g m}^{-3}$
NO invalid data status flag				
	None	None	None	

(Min, Max & Median based on 15 minute data)

NO₂ valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100.00%	100.00%	100.00%	None
Max	137.20	123.00	184.90	µg m ⁻³
Min	6.90	4.60	6.30	µg m ⁻³
Median	37.55	28.25	37.85	µg m ⁻³
Monthly mean	42.21	32.59	45.91	µg m ⁻³
NO₂ invalid data status flag				
	None	None	None	

(Min, Max & Median based on hourly data)

PM₁₀ valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	100.00%	100.00%	100.00%	None
Max	14.82	9.71	21.24	µg m ⁻³
Min	3.34	3.33	4.42	µg m ⁻³
Median	5.78	5.75	7.73	µg m ⁻³
Monthly mean	7.02	5.98	9.33	µg m ⁻³
PM₁₀ invalid data status flag				
	None	None	None	

(Min, Max & Median based on daily data)

PM _{2.5} valid data	July Scaled data	August Scaled data	September Scaled data	Unit
Valid data rate	67.74%	90.32%	100.00%	None
Max	13.48	7.34	17.15	µg m ⁻³
Min	3.22	2.72	2.52	µg m ⁻³
Median	6.35	4.54	6.03	µg m ⁻³
Monthly mean	6.82	4.67	7.11	µg m ⁻³
PM_{2.5} invalid data status flag				
	Deliquescence, PM25 Greater Than PM10	Deliquescence, PM25 Greater Than PM10	None	

(Min, Max & Median based on daily data)

Exceedance count	July exceedance count	August exceedance count	September exceedance count	Quarterly exceedance count	UK AQ Objective
NO₂ hourly mean	0	0	0	0	Hourly mean, 200 µg m ⁻³ not to be exceeded more than 18 times a year
PM₁₀ daily mean	0	0	0	0	24 hour mean, 50 µg m ⁻³ not to be exceeded more than 35 times a year

Annual exceedance	Q1 up to date average	Q2 up to date average	Q3 up to date average	Exceeded annual limit?	UK AQ Objective
NO2 annual mean (up to date)	33.96	31.04	40.24	No	Annual mean limit 40 µg m ⁻³
PM10 annual mean (up to date)	17.08	7.25	7.44	No	Annual mean limit 40 µg m ⁻³
PM2.5 annual mean (up to date)	9.85	4.99	6.20	No	Annual mean limit 25 µg m ⁻³

AQMesh Location Changes

Below is a list of all AQMesh devices with the physical location for each device before and after their co-location study. This report includes one contiguous data set for each Cheltenham site location.

Location	AQMesh device Unique ID	Q3 Running time
College Rd	788150	01/07/2021 - 30/09/2021
Gloucester Rd School	1931150	01/07/2021 - 30/09/2021
Berkley Place	807150	01/07/2021 - 30/09/2021
Winchcombe Street (Fairview)	872150	01/07/2021 - 30/09/2021
Northern End of PE Way	1373150	01/07/2021 - 30/09/2021
Gloucester Rd / PE Way Roundabout	845150	01/07/2021 - 30/09/2021
Reference Station - Gloucester Rd	780150	01/07/2021 - 30/09/2021
Southern End of PE Way	2102150	01/07/2021 - 30/09/2021
422 High Street	796150	01/07/2021 - 30/09/2021