



SUMMARY MONITORING REPORT

December 2023

DATE:	02 February 2024	CONFIDENTIALITY:	Restricted
SUBJECT:	Monthly Air Quality Monitoring Report – December 2023		
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INTRODUCTION

WSP has been commissioned by NHS Wales to undertake air quality monitoring to meet Cardiff Councils (CC) Pre-commencement planning condition 11 in relation to the Temporary Construction Access Route for the Construction of the Approved Velindre Cancer Centre, Whitchurch Hospital, Park Road, Whitchurch, Cardiff, CF14 7XB.

Condition 11 (CC Reference: 20/01110/MJR) states that:

“Prior to commencement of the development hereby approved details of an air monitoring unit and its location shall be submitted to and approved in writing with the Local Planning Authority. The monitoring unit shall be implemented in accordance with the approved details and remain operational until cessation of the development. Data from the air monitoring unit shall be provided to the Local Planning Authority on request.

Reason: To monitor air quality in accordance with Policy EN13 of the adopted Cardiff Local Plan (2006-2026).’

During construction works there is the potential for air quality impacts from the generation of dust and particulate matter, which could lead to dust soiling and human health impacts at relevant sensitive receptors. There is also the potential for increases in pollutant emissions from construction vehicles using the local road network.

In order to discharge the pre-commencement planning condition 11, on behalf of NHS Wales, WSP is carrying out monitoring in the study area using Zephyr and DM11 Pro continuous monitors. The air quality monitoring within the study area is being undertaken to ensure that dust and vehicle exhaust emissions from construction traffic are monitored and effectively managed. This report provides a summary of the monitoring data for December 2023.

Concentrations of particulate matter (PM₁₀ and PM_{2.5}) and Nitrogen Dioxide (NO₂) are being continuously monitored at four locations within the study area (See Figure 1). There are two monitors continuously sampling for NO₂, PM₁₀ and PM_{2.5} (Zephyr monitors) located close to the Hollybush Estate site and close to the construction site entrance. There are also dedicated PM₁₀ and PM_{2.5} monitors (DM11 Pro) located outside 19 Park Road and at a location On-site.

The Zephyrs and DM11 Pro monitors are able to detect localised pollution events and fluctuations in the concentrations and can send alerts to the project team when concentrations go above a certain threshold. The Zephyr continuous monitoring devices are supplied by Earthsense and the DM11 Pros by Air Quality Monitors, data from each of the monitors is uploaded onto a cloud system/website where it can be viewed and downloaded by specific individuals.

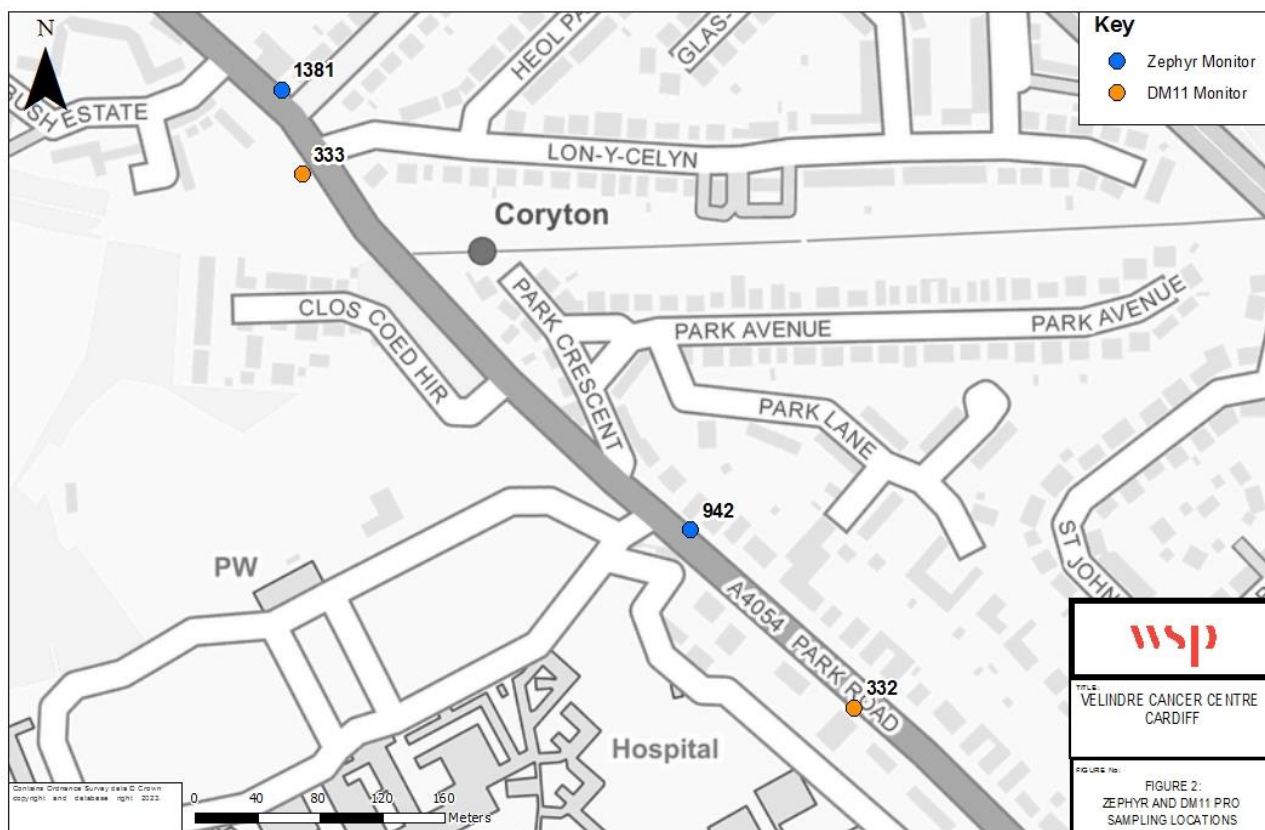


Figure 1 Air Quality Monitoring Locations

AIR QUALITY OBJECTIVES AND STANDARDS

The Government's policy on air quality within the UK is set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS)¹. The AQS provides a framework for reducing air pollution in the UK with the aim of meeting the requirements of European Union legislation².

The air quality standards are levels recommended by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO) with regards to current scientific knowledge about the effects of each pollutant on health and the environment.

The air quality objectives are policy-based targets set by the Government, which take into account economic efficiency, practicability, technical feasibility and timescale. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance, i.e., a limited number of permitted exceedances of the standard over a given period.

The relevant standards and objectives for this monitoring programme are given in Table 1.

¹ Department for Environment, Food and Rural Affairs (Defra) and the Devolved Administrations (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2)

² The UK formally left the EU on 31st January 2020 and new air quality legislation for the UK will be brought forward in due course. The Air Quality (Miscellaneous Amendment and Revocation of Retained Direct EU Legislation) (EU Exit) Regulations 2018 (SI 2018/1407) (see Regulation 5) makes changes to retained direct EU legislation relating to air quality, to ensure that it continues to operate effectively.

Table 1 – Relevant Air Quality Objectives and Standards

Pollutant	Concentration ($\mu\text{g}/\text{m}^3$)	Duration	Exceedances permitted per 12-month period
Nitrogen Dioxide	200	1-hour mean	18
	40	Annual mean	-
Particulate matter (PM_{10})	40	Annual mean	-
	50	24-hour mean	35
Particulate matter ($\text{PM}_{2.5}$) *	20	Annual mean	-

* Local Authorities are required to work towards reducing emissions/concentrations of particulate matter within their administrative area, however, there is no statutory objective given in the AQS for $\text{PM}_{2.5}$ at this time, only a framework.

The UK Government published its Environmental Targets (Fine Particulate Matter) (England) Regulations on 30th January 2023³. The regulations include a long-term target annual mean $\text{PM}_{2.5}$ concentration of $10\mu\text{g}/\text{m}^3$ and an exposure reduction target of 35% when compared to 2018 levels, both to be met by 2040. There is also an interim $\text{PM}_{2.5}$ target, which is to be met by the end of January 2028, of $12\mu\text{g}/\text{m}^3$ as an annual mean concentration and a 22% reduction in exposure when compared to 2018 levels.

DEFRA AIR QUALITY INDEX

Defra's Air Quality Index⁴ provides a useful indication of the levels of air pollution. The index is divided into four bands (low, moderate, high, very high), and the index is numbered from 1 to 10 within these bands (Figure 2). The bandings are based on hourly/24-hour mean concentrations depending on the pollutant.

Nitrogen Dioxide Based on the hourly mean concentration.										
Index	1	2	3	4	5	6	7	8	9	10
Band	Low	Low	Low	Moderate	Moderate	Moderate	High	High	High	Very High
$\mu\text{g}/\text{m}^3$	0-67	68-134	135-200	201-267	268-334	335-400	401-467	468-534	535-600	601 or more

PM_{10} Particles Based on the daily mean concentration for historical data, latest 24 hour running mean for the current day.										
Index	1	2	3	4	5	6	7	8	9	10
Band	Low	Low	Low	Moderate	Moderate	Moderate	High	High	High	Very High
$\mu\text{g}/\text{m}^3$	0-16	17-33	34-50	51-58	59-66	67-75	76-83	84-91	92-100	101 or more

$\text{PM}_{2.5}$ Particles Based on the daily mean concentration for historical data, latest 24 hour running mean for the current day.										
Index	1	2	3	4	5	6	7	8	9	10
Band	Low	Low	Low	Moderate	Moderate	Moderate	High	High	High	Very High
$\mu\text{g}/\text{m}^3$	0-11	12-23	24-35	36-41	42-47	48-53	54-58	59-64	65-70	71 or more

Figure 2 – Defra Air Quality Index

³ Environmental Targets (Fine Particulate Matter) (England) Regulations 2023

⁴ <https://uk-air.defra.gov.uk/air-pollution/daq>

MONITORING RESULTS

Zephyr Continuous Monitors

Data Capture

During the month of December, 56% data capture was recorded at the Hollybush Inn (Z1381), and 94% data capture was recorded at Park Road (Z942) Zephyrs. Power at the Z1381 Zephyr continued to drop out due to insufficient charging from the solar panel. The current solar panel has been reviewed and is at the optimum position for sunlight capture and therefore it may be necessary to take down and re-charge this monitor at a mains source periodically going forward. The data at the Z1381 has been excluded from this report as it is not considered reliable.

Nitrogen Dioxide

Figure 3 shows the monitored hourly average concentrations for the period 1st to 31st December 2023 and a summary of the monitored concentrations for this period are provided in

Table .

The average hourly NO₂ concentrations across the monitoring period at the park road site were well below the air quality objective of 40µg/m³, with no exceedances of the one-hour mean objective (200µg/m³). There were peaks in the data around the 20th December, similar peaks were not shown in monitored concentrations at those analysers operated by Cardiff Council which suggests these peaks are localised rather than regional.

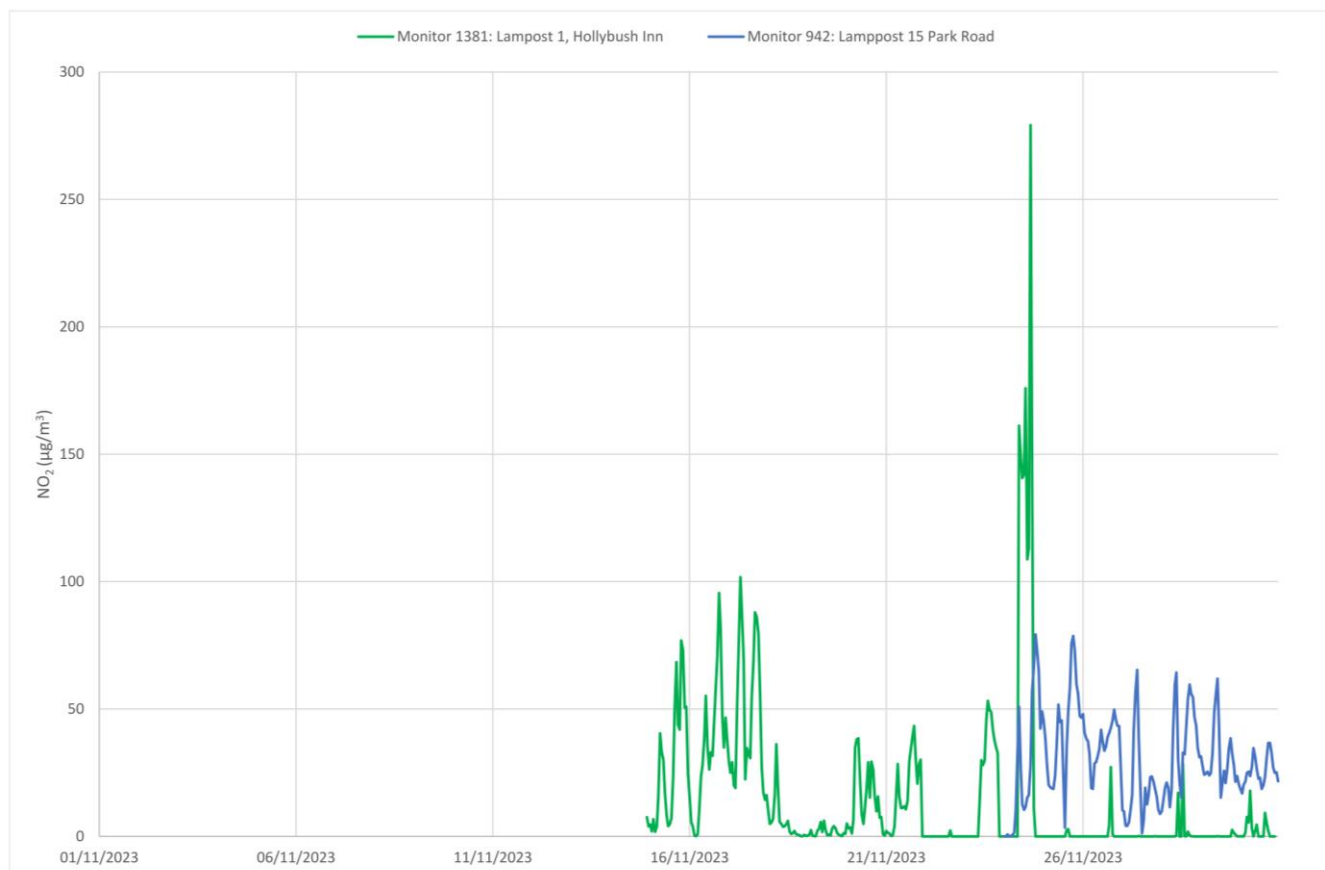


Figure 3 – Monitored Zephyr NO₂ Hourly Concentrations (µg/m³)

Table 2 – NO₂ Concentrations, 1st to 31st December 2023

Monitor	Location	NO ₂ Concentration Summary (µg/m ³)	
		Average	Hourly Maximum
Z942	Lamppost 15, Park Road	21.1	139.6

Particulate Matter (PM₁₀ and PM_{2.5})

Figure 4 and Figure 5 show the hourly average monitored concentrations from 1st to 31st December 2023 and a summary of the monitored concentrations for this period are provided in Table 3.

Average hourly concentrations of PM₁₀ and PM_{2.5} were below the respective annual mean objectives of 40µg/m³ and 20µg/m³ during the monitoring period. In addition, there were no 24-hour mean concentrations above the 24-hour mean air quality objective of 50µg/m³.

There were several peaks in PM₁₀ and PM_{2.5} monitored, however, these were over for a short period of time. Similar peaks were not shown in monitored concentrations at those analysers operated by Cardiff Council which suggests these peaks are localised rather than regional.

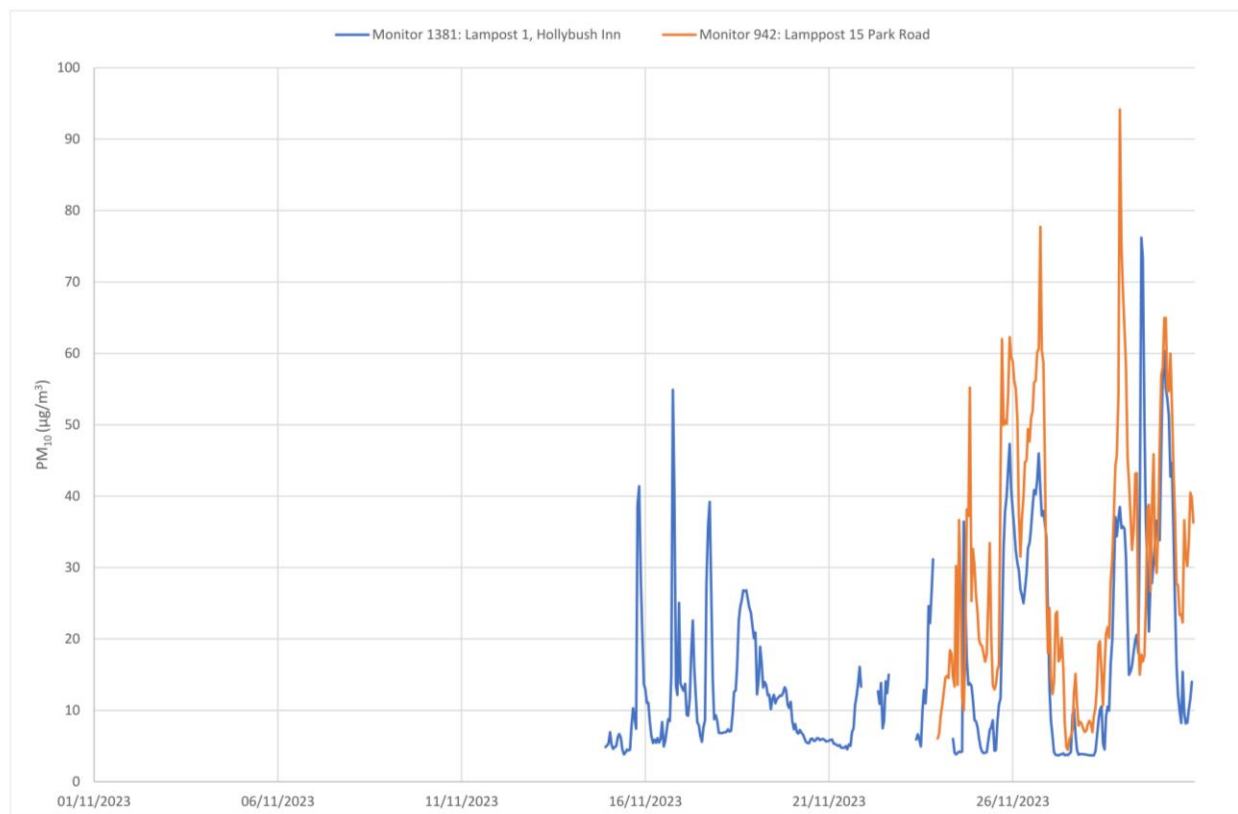


Figure 4 – Monitored Zephyr PM₁₀ Hourly Concentrations (µg/m³)

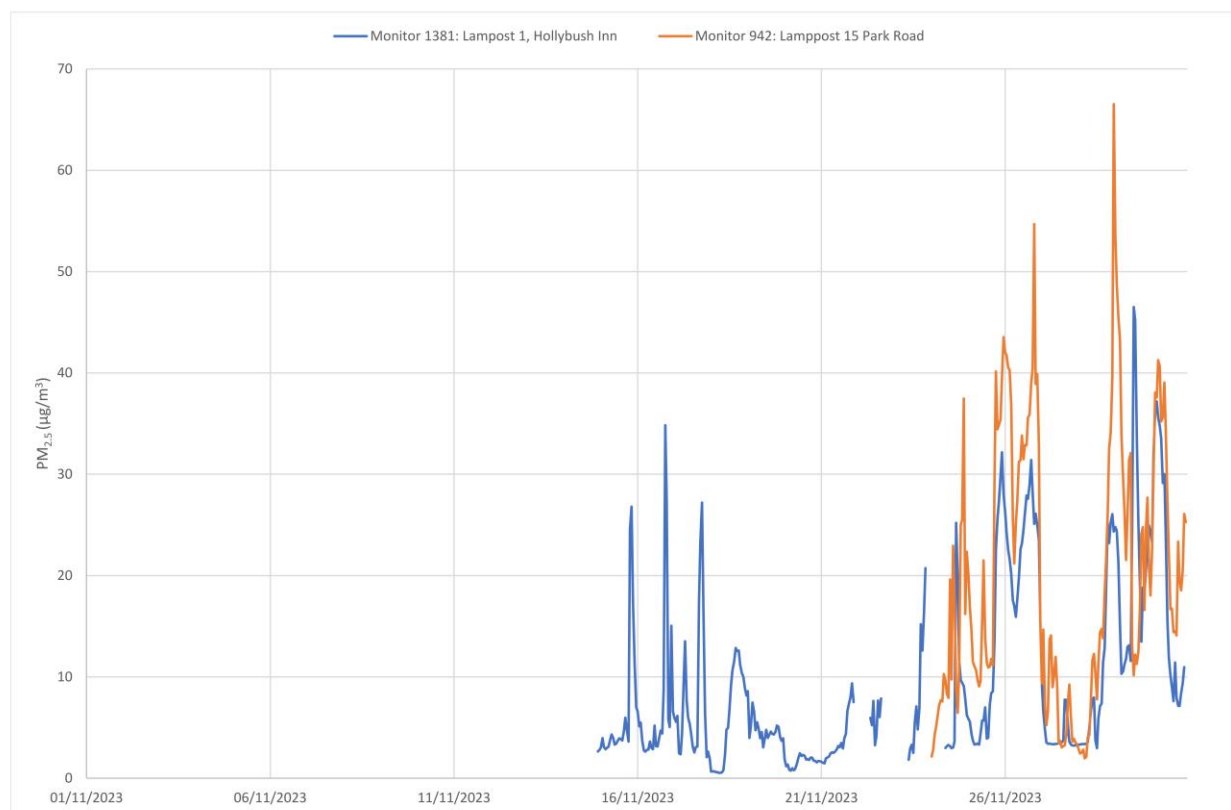


Figure 5 – Monitored Zephyr PM_{2.5} Hourly Concentrations (µg/m³)

Table 3 – PM₁₀ and PM_{2.5} Concentrations Recorded by Zephyr Monitors, 1st to 31st December 2023

Monitor	Location	PM ₁₀ Concentrations (µg/m ³)			PM _{2.5} Concentrations (µg/m ³)	
		Average	Maximum Hourly	Maximum 24-hour mean	Average	Maximum Hourly
Z942	Lampost 15, Park Road	18.0	163.4	59.6	10.0	124.0
*Note that background colour applied is based on bandings which are classed for a 24-hour running mean PM concentration not an hourly concentration.						

DM11 Pro Continuous Monitors

Data Capture

The On-site DM11 monitor was located close to the construction site entrance, however, the required power supply was removed on the 12th October and no suitable replacement power supply was available. An alternative location with adequate power and site suitability is still currently being explored.

Concentrations at the Park Road monitor continued and recorded 100% data capture for December.

Particulate Matter (PM₁₀ and PM_{2.5})

Figure show the hourly average PM₁₀ and PM_{2.5} concentrations monitored at the DM11 Pro continuous monitor located at Park Road. A summary of the monitored concentrations is provided in **Table 4**.

Average hourly concentrations of PM₁₀ and PM_{2.5} were below the respective annual mean objectives of 40µg/m³ and 20µg/m³ during the monitoring period. In addition, there were no 24-hour mean concentrations above 50µg/m³.

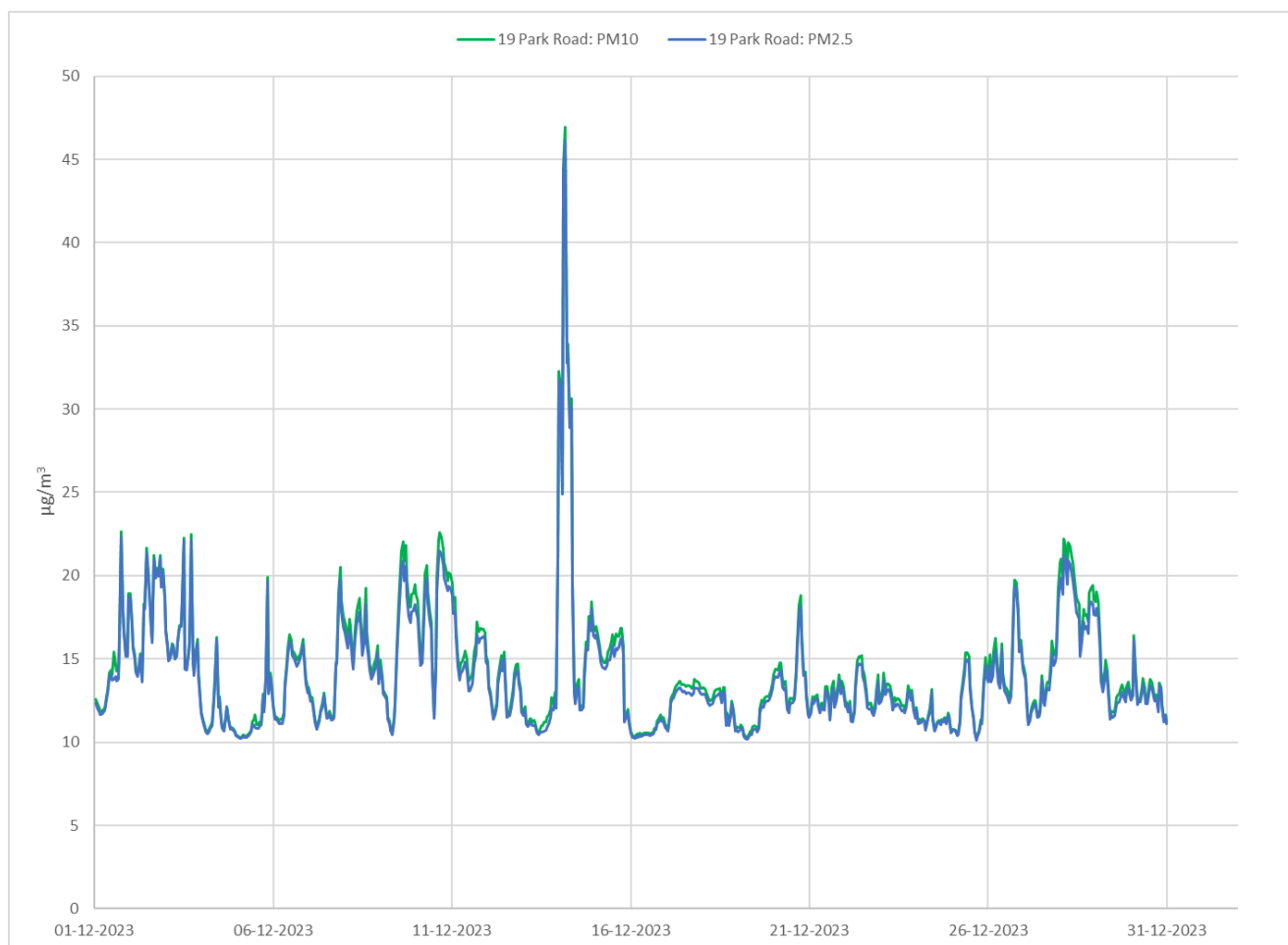


Figure 6 – Monitored DM11 PM₁₀ and PM_{2.5} Concentrations 19 Park Road (µg/m³)

Table 4 – PM₁₀ and PM_{2.5} Concentrations, 1st to 31st December 2023

Monitor	Location	PM ₁₀ Concentrations (µg/m ³)			PM _{2.5} Concentrations (µg/m ³)	
		Average	Maximum Hourly	Maximum 24-hour mean	Average	Maximum Hourly
332	19 Park Road	14.3	47.0	21.6	13.9	46.1

*Note that background colour applied is based on bandings which are classed for a 24-hour running mean PM concentration not an hourly concentration.

Zephyr Co-Location Study

As highlighted in the October monitoring report, on the 10th of October both Zephyr monitors were placed at the continuous monitor located on Park Street in Bridgend to enable of co-location study to take place. This co-location study next to a Defra/Devolved Administrations reference instrument allows an understanding on how the Zephyr monitors are performing.

The co-location occurred from 10th October to 6th November and a summary of the average monitored NO₂ and PM₁₀ concentrations during this time is provided in **Error! Reference source not found.** and shown in **Error! Reference source not found.** and **Error! Reference source not found.**

The co-location exercise showed that monitored NO₂ concentrations at the Z1381 Zephyr followed a similar trend to the Park Street Bridgend continuous monitor, with some off-set and higher peaks in concentrations across the period at Z1381 resulting in the higher period average. The Z942 Zephyr monitor consistently measured higher than the Park Street Bridgend during the co-location period. This was reported to Earthsense and it was advised that the sensor on the Z942 Zephyr be replaced. This was undertaken before the Zephyr was re-instated back at 19 Park Road.

The magnitude of monitored PM₁₀ concentrations at both Zephyrs (Z1381 and Z942) were lower than those detected at the Bridgend continuous monitor. As a result it was found that a post monitoring adjustment factor of 2.00 was required to bring the Zephyr data and the reference data to an acceptable agreement of magnitude. Therefore, a post monitoring adjustment factor of 2.00 has been applied to both PM₁₀ and PM_{2.5} data post-monitoring. In addition, data logging of Zephyr data was found to be -01:00hrs for device 982 and -2.00hrs for device 1381. This has had no impact upon the concentration data detected, though has been adjusted in the temporal plots within this report.

It is recommended that if monitoring is to continue another co-location exercise should be completed in 12 months time.