# SUMMARY MONITORING REPORT NOVEMBER AND DECEMBER 2022

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|---|---|---|---|
| **DATE:** | 10 February 2023 | **CONFIDENTIALITY:** | Restricted |
| **SUBJECT:** | Monthly Air Quality Monitoring Report – November and December 2022 | | |
| **PROJECT:** | NVCC TCAR | **AUTHOR:** | Caroline Odbert |
| **CHECKED:** | Peter Walsh | **APPROVED:** | Peter Walsh |

## 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 November and December 2022.

Concentrations of particulate matter ($PM_{10}$ and $PM_{2.5}$) and Nitrogen Dioxide ($NO_2$) are being continuously monitored at four locations within the study area (See Figure 1). There are two monitors continuously sampling for $NO_2$, $PM_{10}$ and $PM_{2.5}$ (Zephyr monitors) located close to the Hollybush Estate site and close to the construction site entrance. There are also dedicated $PM_{10}$ and $PM_{2.5}$ monitors (DM11 Pro) located outside 19 Park Road and at a location on-site[1].

There were several issues with the Zephyr monitor located close to the Hollybush Estate site in both November and December. This resulted in the monitor being sent back to the supplier to be serviced and re-calibrated. Once returned from the supplier and put back in place, it was apparent that the monitor was still not operating correctly and unfortunately, it had to be returned to the supplier for a second time for further investigation. Therefore, there is no data presented for the Zephyr at Hollybush Estate within this summary monitoring report.

[1] DM11 333 was installed on 24th November 2022.

The Zephyrs and DM11 Pro 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 is can be viewed and downloaded by specific individuals.

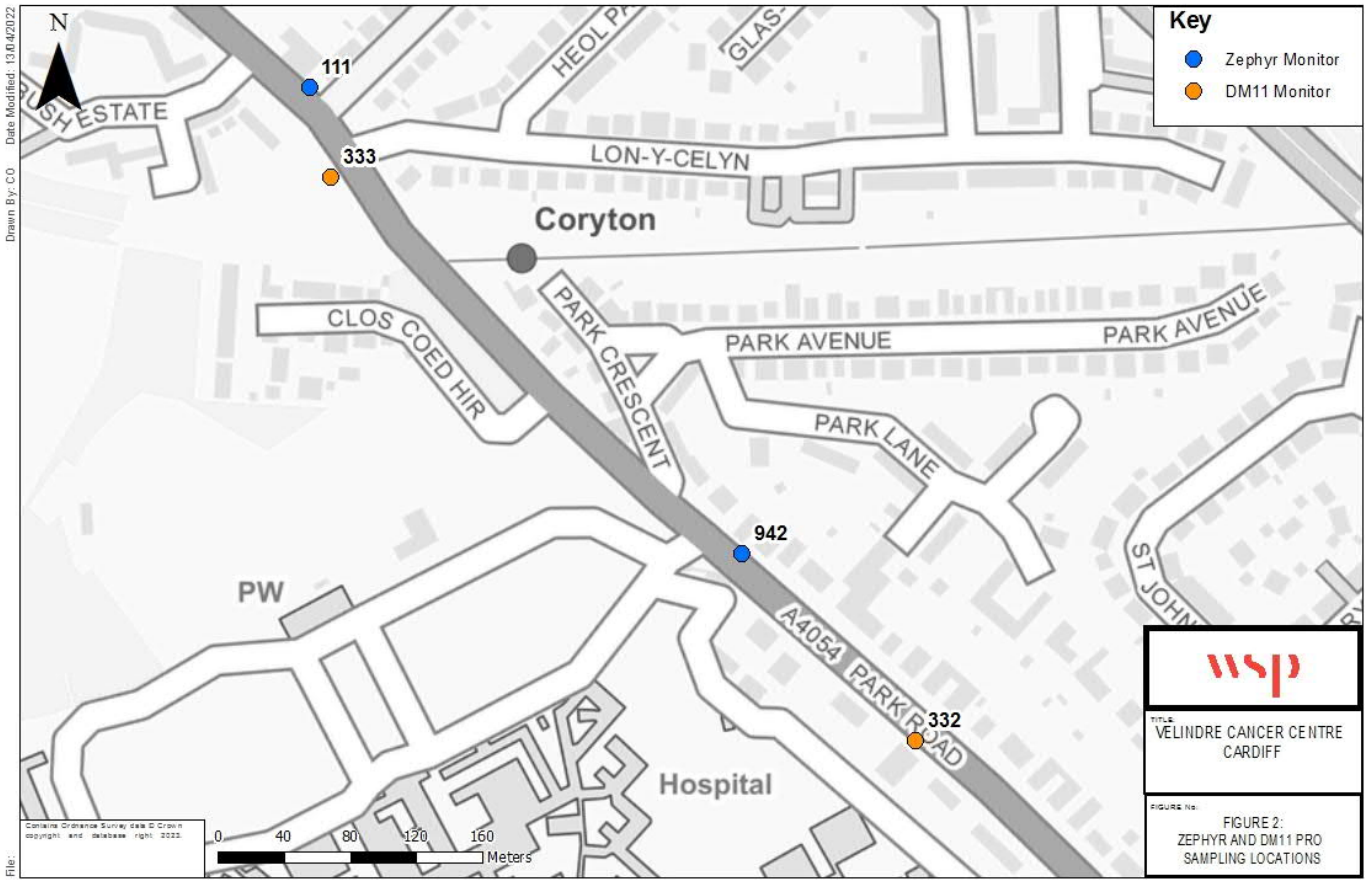


*Figure 1 Air Quality Monitoring Locations*

## 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)[2]. The AQS provides a framework for reducing air pollution in the UK with the aim of meeting the requirements of European Union legislation[3].

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.

[2] 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)

[3] 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 (µg/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 ($PM_{2.5}$) * | 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 $PM_{2.5}$ at this time, only a framework.

## DEFRA AIR QUALITY INDEX

Defra's Air Quality Index[4] 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 |
| µg/m³ | 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 |
| µg/m³ | 0-16 | 17-33 | 34-50 | 51-58 | 59-66 | 67-75 | 76-83 | 84-91 | 92-100 | 101 or more |

**$PM_{2.5}$ 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 |
| µgm$^{-3}$ | 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*

[4] https://uk-air.defra.gov.uk/air-pollution/daqi

# MONITORING RESULTS

## Zephyr Continuous Monitors

### Nitrogen Dioxide

Concentrations of $NO_2$ were monitored at the Zephyr continuous monitor located on Park Road over the period 1st November to 4th December 2022[5] (Figure 3), a summary of the monitored concentrations is provided in Table 2.

The Park Road monitor had 100% data capture during the month of November but only 12% data capture for the month of December due to instrument failure. As mentioned above, there were on-going issues with the Zephyr monitor located at Hollybush Inn which meant that no suitable data was available for the period 1st November to 31st December 2022.

Average hourly $NO_2$ concentrations across the monitoring period at the Park Road monitoring site were well below the air quality objective of 40µg/m$^3$ and there were no exceedances of the one-hour objective (200µg/m$^3$).

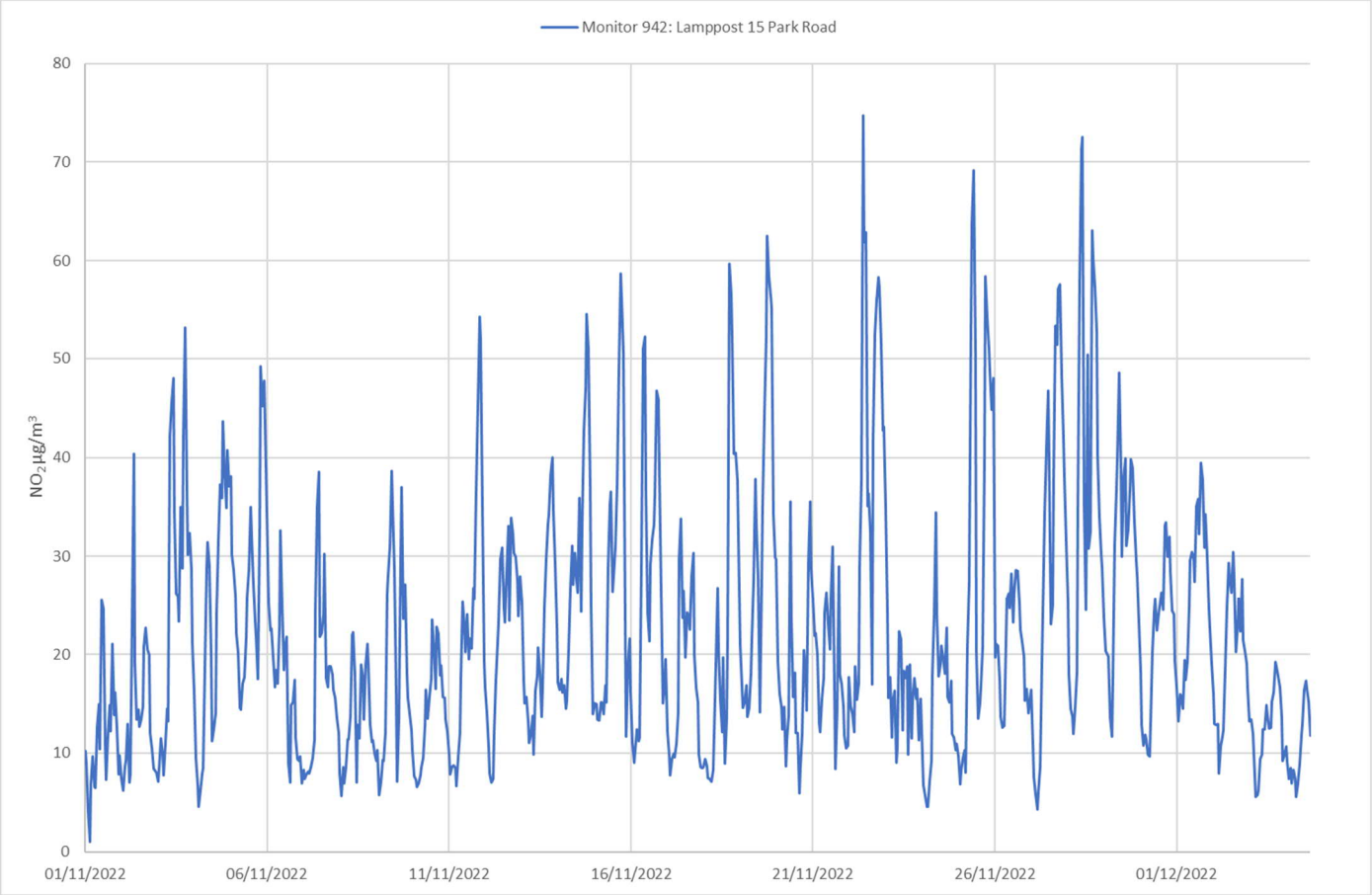


*Figure 3 – Monitored Zephyr $NO_2$ Hourly Concentrations (µg/m$^3$)*

**Table 2 – $NO_2$ Concentrations, October 2022**

| Monitor | Location | $NO_2$ Concentration Summary (µg/m$^3$) | | | |
|---|---|---|---|---|---|
| | | Average | | Hourly Maximum | |
| | | November | December | November | December |
| 942 | Lamppost 15, Park Road | 22.8 | 17.7 | 74.8 | 39.4 |

[5] It was not possible to access the site until January 2023 due to both restrictions to access and then the Christmas break. The sensor was taken down on Friday 13th January in order to investigate the issue.

## Particulate Matter ($PM_{10}$ and $PM_{2.5}$)

Concentrations of both $PM_{10}$ and $PM_{2.5}$ were monitored at the 15 Park Road Zephyr continuous monitor over the period 1st November to 4th December 2022 (Figure 4 and Figure 5), a summary of the monitored concentrations is provided in Table 3 and Table 4. Again, the Park Road monitor had 100% data capture during the month of November but only 12% data capture for the month of December due to instrument failure.

Average hourly concentrations of $PM_{10}$ and $PM_{2.5}$ at both the Zephyr continuous monitors were below the respective annual mean objectives of 40µg/m$^3$ and 20µg/m$^3$ during the monitoring period. In addition, there were no 24-hour mean concentrations above the 24-hour mean air quality objective of 50µg/m$^3$. There was a peak in data (both $PM_{10}$ and $PM_{2.5}$) at the 15 Park Road monitor on the 5th November 2022 at 9pm, as the 5th November is bonfire night, and therefore the peak in data is most likely associated with an increase in fireworks at this time.

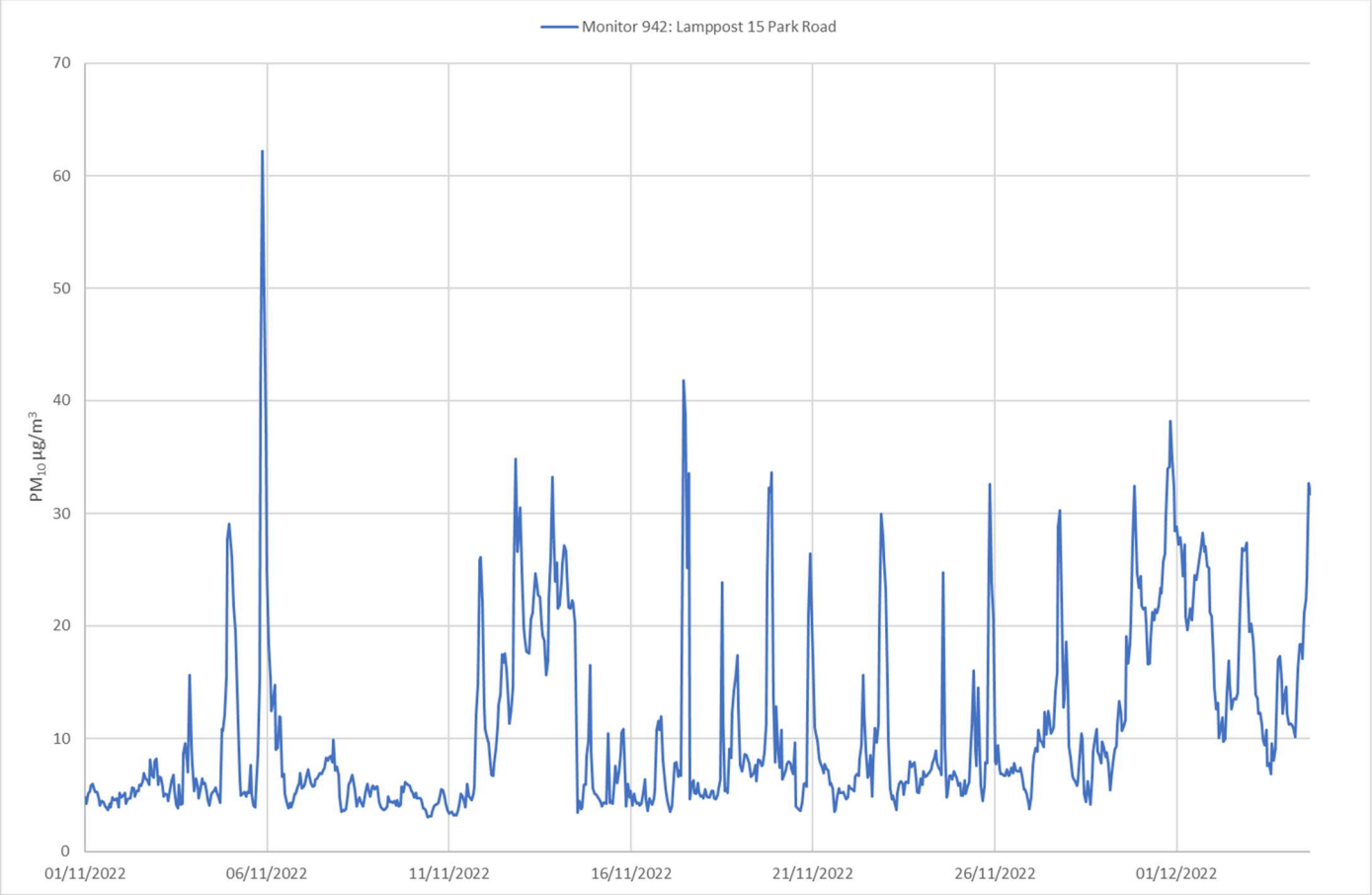


*Figure 4 – Monitored Zephyr Hourly $PM_{10}$ Concentrations (µg/m$^3$)*

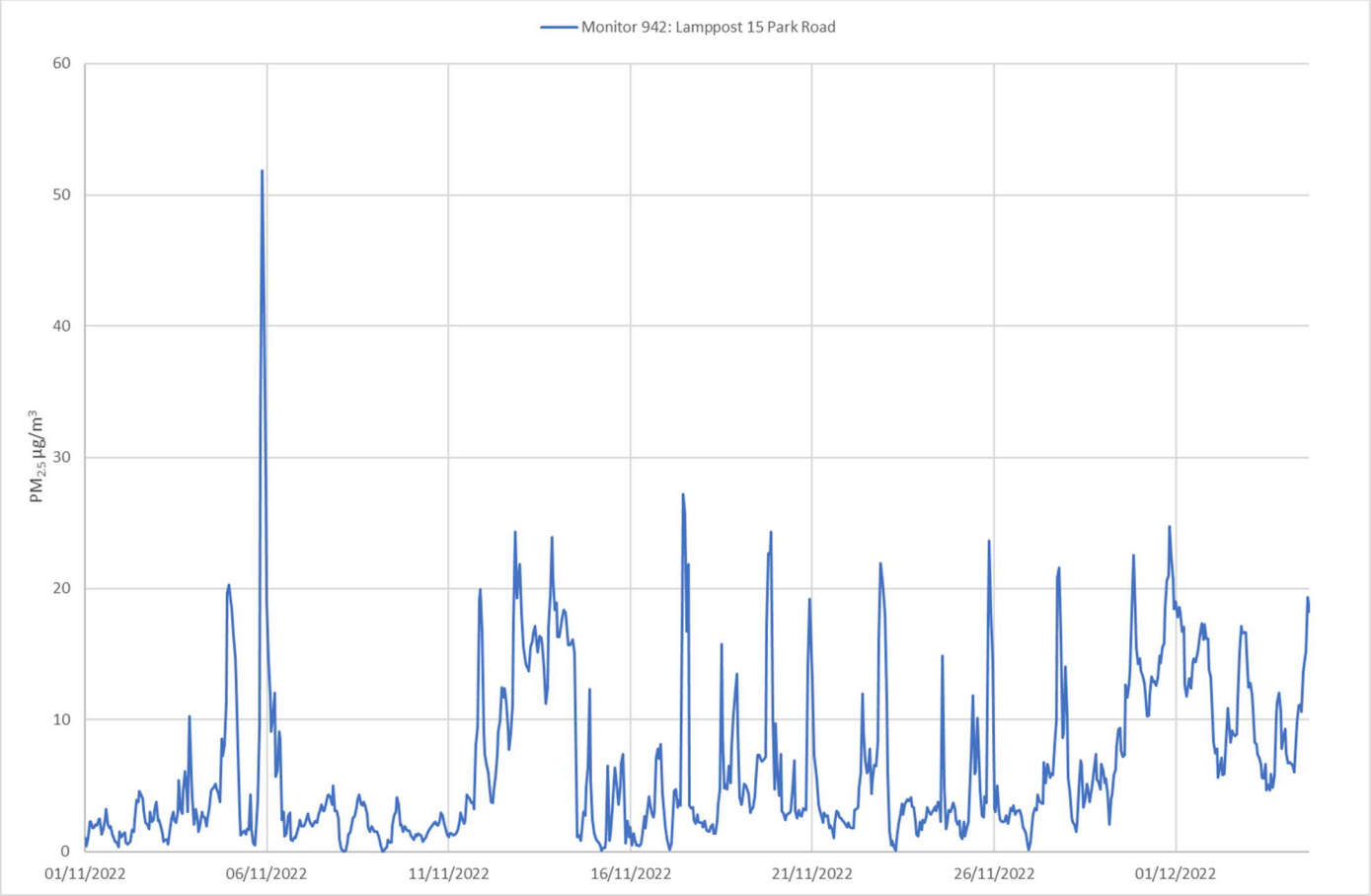


*Figure 5 – Monitored Zephyr Hourly $PM_{2.5}$ Concentrations (µg/m³)*

**Table 3 – $PM_{10}$ and $PM_{2.5}$ Concentrations Recorded by Zephyr Monitors, November 2022**

| Monitor | Location | $PM_{10}$ Concentrations (µg/m³) | | | $PM_{2.5}$ Concentrations (µg/m³) | |
|---|---|---|---|---|---|---|
| | | Average | Maximum Hourly | Maximum 24-hour mean | Average | Maximum Hourly |
| 942 | Lamppost 15, Park Road | 9.9 | 62.2 | 24.9 | 5.9 | 51.8 |

**Table 4 – $PM_{10}$ and $PM_{2.5}$ Concentrations Recorded by Zephyr Monitors, December 2022[6]**

| Monitor | Location | $PM_{10}$ Concentrations (µg/m³) | | | $PM_{2.5}$ Concentrations (µg/m³) | |
|---|---|---|---|---|---|---|
| | | Average | Maximum Hourly | Maximum 24-hour mean | Average | Maximum Hourly |
| 942 | Lamppost 15, Park Road | 17.9 | 32.7 | 24.6 | 19.4 | 11.1 |

[6] Data capture was only 12% and therefore monitoring results are presented for info only and should be viewed with caution.

## DM11 Pro Continuous Monitor

### Particulate Matter ($PM_{10}$ and $PM_{2.5}$)

Figure 6 and Figure 7, shows the $PM_{10}$ and $PM_{2.5}$ data monitored at the DM11 Pro continuous monitors for the Park Road and the on-site monitor, respectively. A summary of the monitored concentrations is provided in Table 5 (November) and Table 6 (December).

The DM11 continuous monitor located on Park Road had 100% data capture during the monitoring period. The monitor located on-site began monitoring on the 24th November, since this time it has had 100% data capture. Average hourly concentrations of $PM_{10}$ and $PM_{2.5}$ are below the respective annual mean objectives of 40µg/m$^3$ and 20µg/m$^3$ during the monitoring period. In addition, there were no 24-hour mean concentrations above 50µg/m$^3$.

A peak in both $PM_{10}$ and $PM_{2.5}$ concentrations at the Park Road site occurred on the 5th November at 9pm, again this is most likely due to fireworks being let off on bonfire night. A peak in $PM_{10}$ concentrations occurred on the 6th December at 11am at the on-site monitor, however, a similar peak was not recorded in the $PM_{2.5}$ data. This implies that the peak relates to an invalid reading by the DM11 monitor, especially as monitored concentrations fell again immediately after.

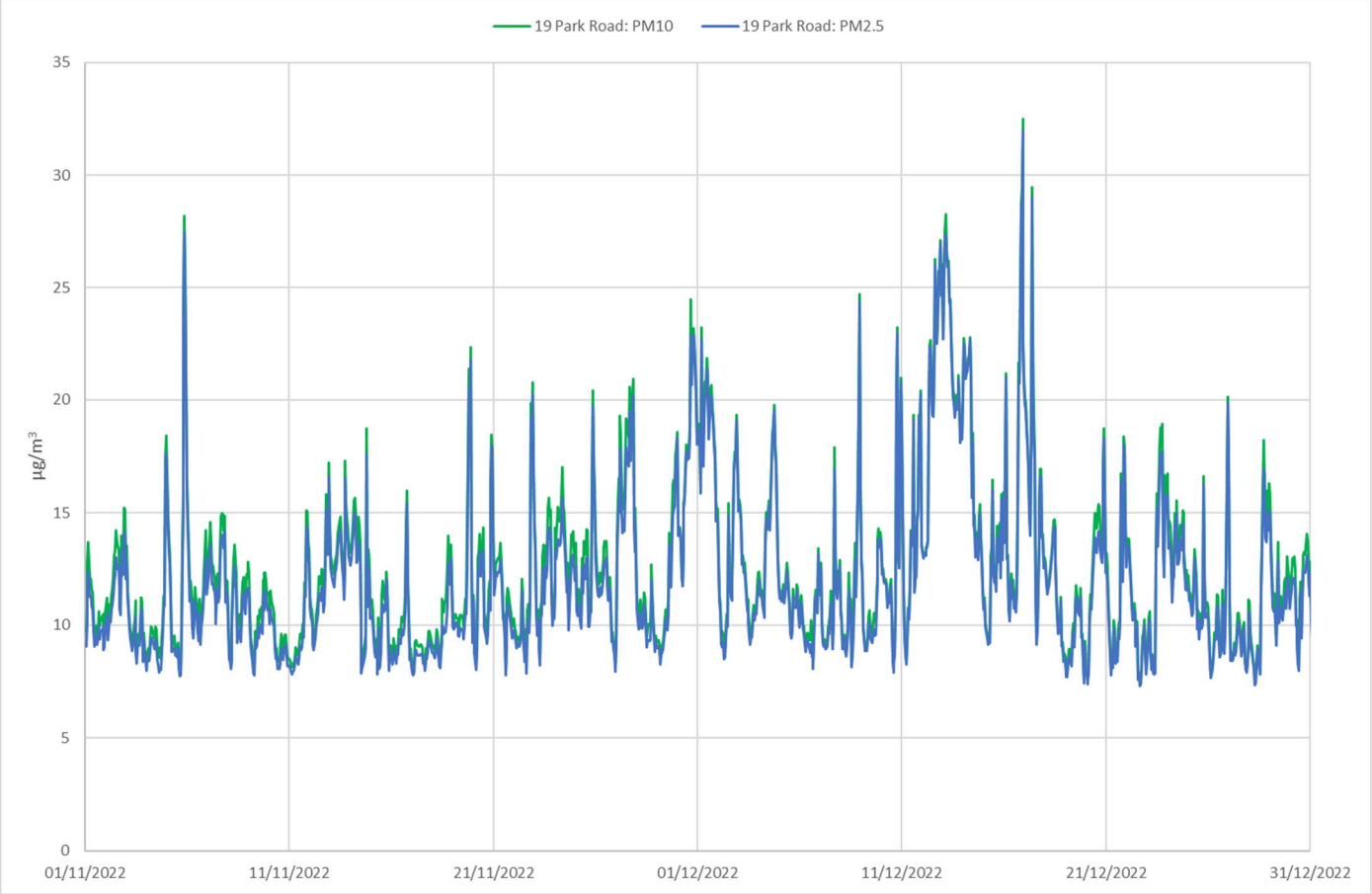


*Figure 6 – Monitored DM11 $PM_{10}$ and $PM_{2.5}$ Concentrations 19 Park Road (µg/m$^3$)*

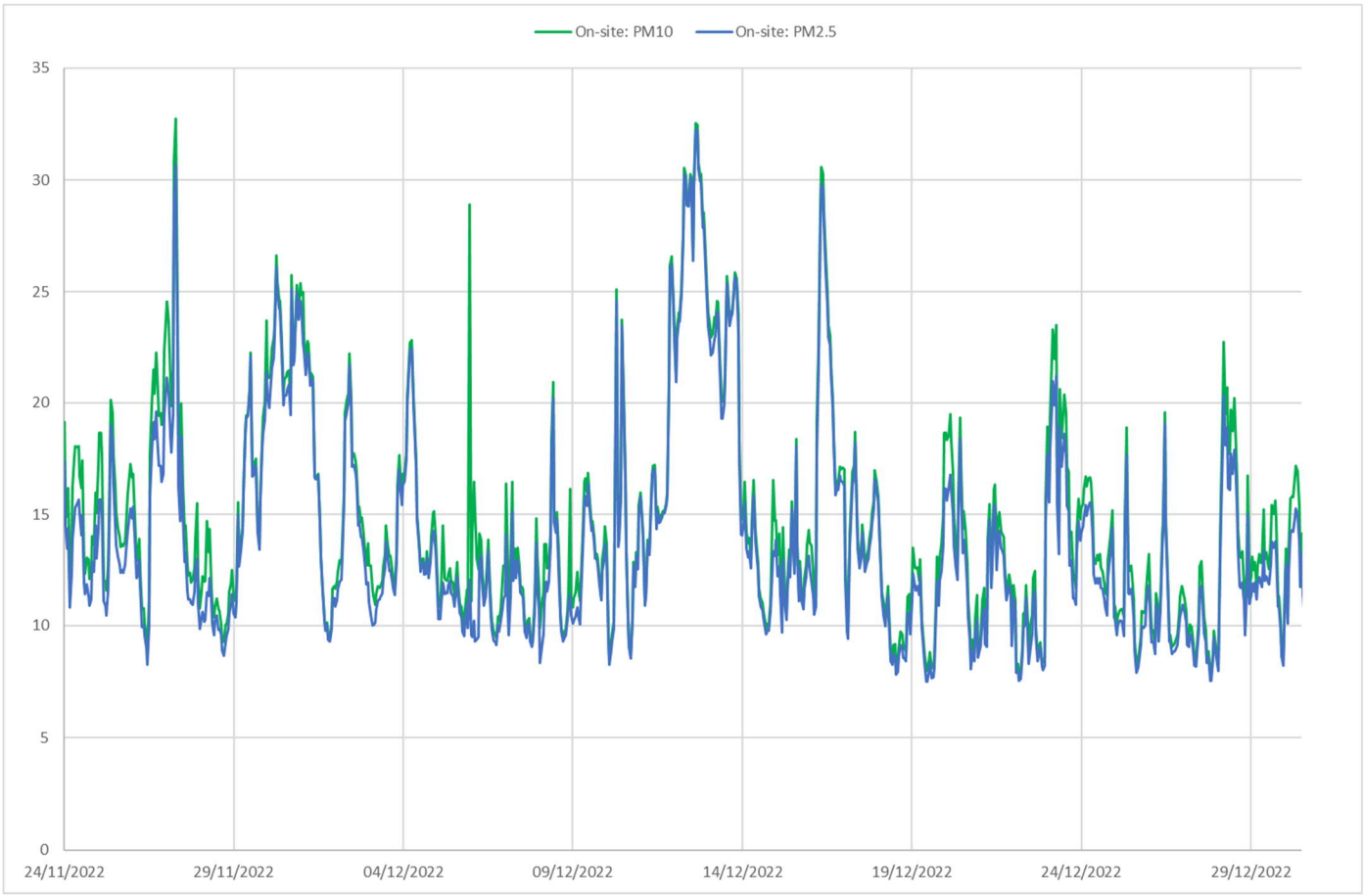


*Figure 7 – Monitored DM11 $PM_{10}$ and $PM_{2.5}$ Concentrations On-site (µg/m$^3$)*

**Table 5 – $PM_{10}$ and $PM_{2.5}$ Concentrations, November 2022**

| 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 | 11.9 | 28.2 | 17.8 | 11.3 | 27.5 |
| 333 | On-Site | 16.1 | 32.7 | 21.5 | 14.8 | 30.7 |

**Table 6 – $PM_{10}$ and $PM_{2.5}$ Concentrations, December 2022**

| 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 | 13.1 | 32.5 | 22.3 | 12.7 | 32.0 |
| 333 | On-Site | 14.4 | 32.5 | 25.6 | 13.7 | 32.2 |