Barratt London

NIMR, Mill Hill

Air Quality Monitoring Report 2

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1.0 Introduction

An air quality monitoring survey is being undertaken to determine levels of PM_{10}, $PM_{2.5}$ and PM_1 experienced as a result of the works undertaken at two locations at the former NIMR site, Mill Hill, Barnet: Phase 1 Monitoring Location 1A and Phase 1 Monitoring Location 1B. The monitoring locations are displayed in Figure 1. The purpose of this report is to review these levels against criteria determined from appropriate guidance to minimise disruption to nearby sensitive receptors as a result of the works.

This report relates to measurements made between 1st February 2018 and 1st April 2018.

2.0 Policy and Legislative Context

2.1 Documents Consulted

The following documents were consulted during the undertaking of this assessment:

Legislation and Best Practice Guidance

- The Air Quality Standards (Amendment) Regulations 2016;
- The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2007;
- The Environment Act, 1995;
- Local Air Quality Management Technical Guidance LAQM.TG(16), DEFRA, 2016;
- Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites, IAQM, 2012.

2.2 Air Quality Legislative Framework

European Legislation

European air quality legislation is consolidated under Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidates previous legislation which was designed to deal with specific pollutants in a consistent manner and provides new air quality objectives for fine particulates, and includes:

- **Directive 1999/30/EC** – the First Air Quality "Daughter" Directive – sets ambient air limit values for nitrogen dioxide and oxides of nitrogen, sulphur dioxide, lead and particulate matter;
- **Directive 2000/69/EC** – the Second Air Quality "Daughter" Directive – sets ambient air limit values for benzene and carbon monoxide; and,
- **Directive 2002/3/EC** – the Third Air Quality "Daughter" Directive – seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

The fourth daughter Directive was not included within the consolidation and is described as:

- **Directive 2004/107/EC** – sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

UK Legislation

The Air Quality Standards (Amendments) Regulations 2016 seek to simplify air quality regulation and provide a new transposition of the Air Quality Framework Directive, First, Second and Third Daughter Directives and also transpose the Fourth Daughter Directive within the UK. The Air Quality Limit Values are transposed into the updated Regulations as Air Quality Standards, with attainment dates in line with the European Directives. SI 2010 No. 1001, Part 7 Regulation 31 extends powers, under Section

85(5) of the Environment Act (1995), for the Secretary of State to give directions to Local Authorities (LAs) for the implementation of these Directives.

The UK Air Quality Strategy is the method for implementation of the air quality limit values in England, Scotland, Wales and Northern Ireland and provides a framework for improving air quality and protecting human health from the effects of pollution.

For each nominated pollutant, the Air Quality Strategy sets clear, measurable, outdoor air quality standards and target dates by which these must be achieved; the combined standard and target date is referred to as the Air Quality Objective (AQO) for that pollutant. Adopted national standards are based on the recommendations of the Expert Panel on Air Quality Standards (EPAQS) and have been translated into a set of Statutory Objectives within the Air Quality (England) Regulations (2000) SI 928, and subsequent amendments.

The AQOs for pollutants included within the Air Quality Strategy and assessed as part of the scope of this report are presented in Table 2.1 along with European Commission (EC) Directive Limits and World Health Organisation (WHO) Guidelines.

Table 2.1 Air Quality Standards, Objectives, Limit and Target Values

Pollutant	Applies	Objective	Concentration Measured as[10]	Date to be achieved and maintained thereafter	European Obligations	Date to be achieved and maintained thereafter	New or existing
PM_{10}	UK	50µg/m^3 by end of 2004 (max 35 exceedances a year)	24-hour mean	1st January 2005	50µg/m^3 by end of 2004 (max 35 exceedances a year)	1st January 2005	Retain Existing
	UK	40µg/m^3 by end of 2004	Annual mean	1st January 2005	40µg/m^3	1st January 2005	
$PM_{2.5}$	UK	25µg/m3	Annual Mean	31st December 2010	25µg/m3	1st January 2010	Retain Existing

There are currently no UK or EU objectives for PM_1.

3.0 Assessment Criteria

3.1 Background Concentrations

Background concentrations as used within the prediction calculations were referenced from the UK National Air Quality Information Archive database based on the National Grid Co-ordinates of 1 x 1 km grid squares nearest to the development site. In November 2017, DEFRA issued revised 2015 based background maps for PM_{10} and $PM_{2.5}$ which incorporate updates to the input data used for modelling. 2018 background maps have been utilised to assess the significance of monitored levels. The updated mapped background concentrations used in the assessment are summarised in Table 3.1.

Table 3.1 Published Background Air Quality Levels (µg/m^3)

UK NGR(m)		2018	
X	Y	PM_{10}	$PM_{2.5}$
522500	192500	14.4	9.5
523500	192500	14.3	9.4
522500	193500	14.1	9.3
523500	193500	13.9	9.2

London Air's annual mean pollution map uses a detailed model to show a prediction of PM_{10} and $PM_{2.5}$ annual averages across the whole of Greater London. The latest accurate model is available for the year of 2013. The detailed annual mean pollution maps are displayed in Figures 3.1 and Figure 3.2.

Figure 3.1 Modelled Annual Mean PM_{10} Air Pollution (based on measurements made during 2013)

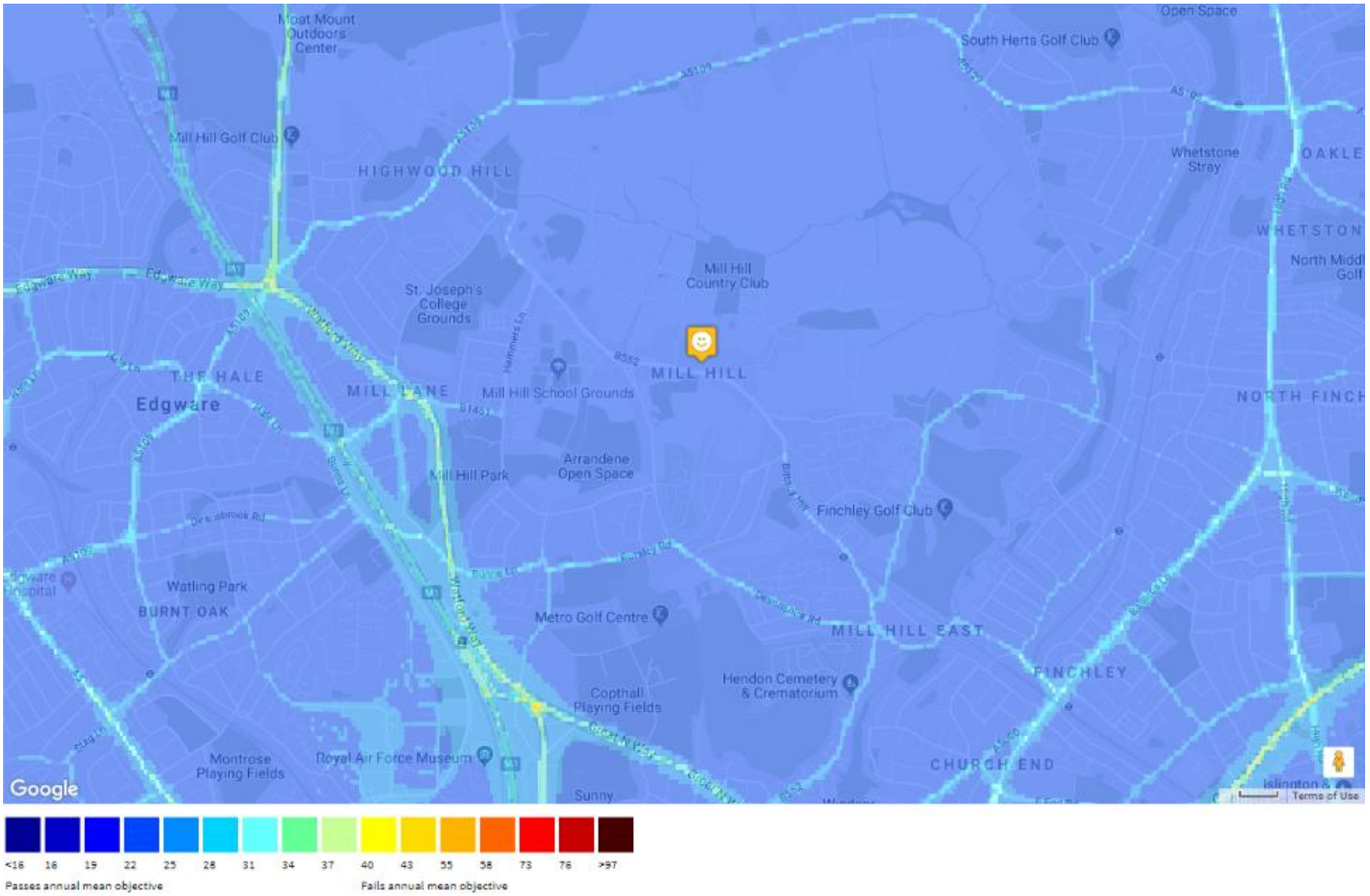
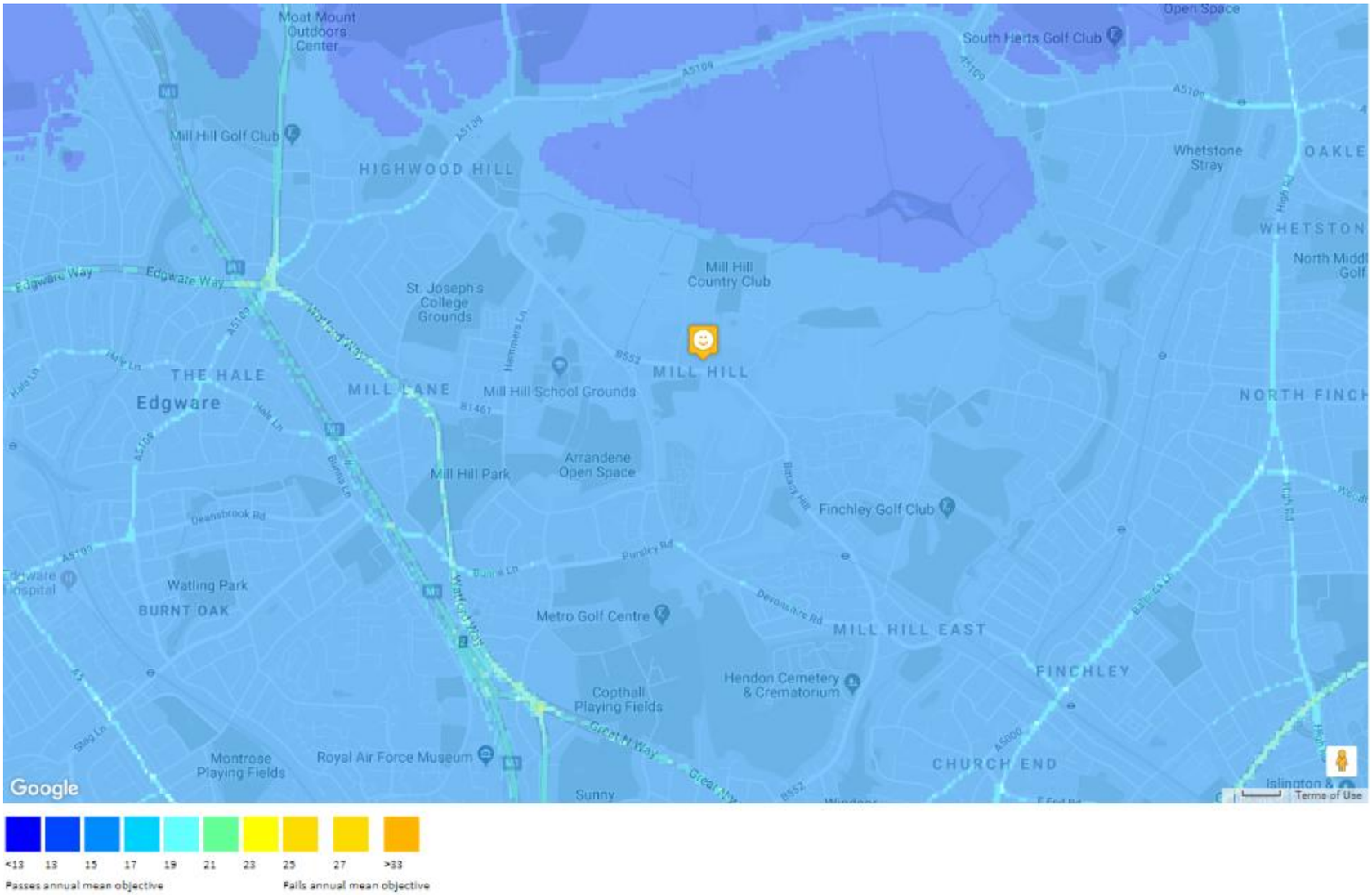


Figure 3.2 Modelled Annual Mean $PM_{2.5}$ Air Pollution (based on measurements made during 2013)



3.2 Pollutant Sources

The main emissions during demolition are likely to be dust and particulate matter generated during earth moving (particularly during dry months) or from demolition materials. The main potential effects of dust and particulate matter are:

- Visual - dust plume, reduced visibility, coating and soiling of surfaces leading to annoyance, loss of amenity, the need to clean surfaces;
- Physical and/or chemical contamination and corrosion of artefacts;
- Coating of vegetation and soil contamination; and,
- Health effects due to inhalation e.g. asthma or irritation of the eyes.

A number of other factors such as the amount of precipitation and other meteorological conditions will also greatly influence the amount of particulate matter generated.

Demolition activities can give rise to short-term elevated dust/PM_{10} concentrations in neighbouring areas. This may arise from vehicle movements, soiling of the public highway, demolition or windblown stockpiles.

3.3 Particulate Matter

The UK Air Quality Standards seek to control the health implications of respirable PM_{10} and $PM_{2.5}$. However, the majority of particles released from construction will be greater than this in size.

Demolition works on site have the potential to elevate localised PM_{10} and $PM_{2.5}$ concentrations in the area. On this basis, mitigation measures should still be taken to minimise these emissions as part of good site practice.

Particulate matter is made up of a collection of solid and/or liquids materials of various sizes. The particles are released into the atmosphere by numerous sources with the major sources being created by road transport. Emissions of dust can also generate high concentrations of particulate matter.

Particulate matter requires monitoring due to the impacts on human health that large amount of exposure can cause.

3.4 Criteria

An assessment using the traffic light approach based on sections 5.3.2 and the IAQM document 'Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites (2012) is considered appropriate and is proposed in Table 3.2 below. Given the proximity (within 7m) of nearby receptors and the possibility for exposure to PM_{10} the following criteria is proposed.

Table 3.2 Traffic Light Criteria

Alert level	Time Period	Maximum Permissible 15 minute average (µg/m^3)
Red (*at this level all works to cease immediately, investigate cause of exceedance and use alternative methods where appropriate*)	15-minute average	>250
Amber (*continual monitoring and investigation of alternative methods where appropriate*)	Two consecutive 15-minute averages	>80
Green (early warning/*no action required*)	15-minute average	>80

The below criteria have been adopted for $PM_{2.5}$ levels at the boundary of the site.

Table 3.3 $PM_{2.5}$ Level Criteria – Levels at Boundary

Monitoring Levels	Time Period	$PM_{2.5}$ exceedance limits at monitoring locations
Red (*at this level all works to cease immediately, investigate cause of exceedance and use alternative methods*)	15-minute average	>48µg/m^3
Amber (*continual monitoring and investigation of alternative methods where appropriate*)	Two consecutive 15-minute averages	Between 48 µg/m^3 and 40 µg/m^3
Green (*no action required*)	15-minute average	<38 µg/m^3

4.0 Particulate Matter Survey

4.1 Air Quality Monitoring Methodology

Particulate Matter monitoring was undertaken at each of the monitoring locations as identified in Figure 1. Particulate Matter monitoring was undertaken using two AQ Mesh Pods which are small battery operated monitoring devices. These devices record levels of PM_{10}, $PM_{2.5}$ and PM_1 constantly in 15 minute intervals.

The monitored results were compared to both urban background and roadside monitored values of PM_{10} and $PM_{2.5}$ monitored by London Air (www.londonair.org.uk). The urban background values were monitored at the Kensington & Chelsea – North Ken (FIDAS) AURN.

Detailed results of exceedances of the 'red' limit are outlined in Appendix A.

4.1.1 Particulate Matter Results

The results of the Particulate Matter Monitoring Survey are presented in the tables below.

Phase 1 Monitoring Location 1A Results

Table 4.1 Monitoring Results 24 hour averages

Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	PM_1 (µg/m³)
February 2018			
01/02/2018	7.05	1.82	0.47
02/02/2018	8.54	2.65	0.88
03/02/2018	10.41	5.29	2.48
04/02/2018	6.47	2.64	1.08
05/02/2018	8.78	3.51	1.54
06/02/2018	14.29	7.90	3.54
07/02/2018	9.38	3.65	1.40
08/02/2018	18.18	4.84	1.88
09/02/2018	5.98	1.72	0.58
10/02/2018	8.97	3.22	1.25
11/02/2018	3.75	1.01	0.29
12/02/2018	7.60	2.26	0.78
13/02/2018	8.55	3.70	1.47
14/02/2018	11.80	4.24	1.62
15/02/2018	62.74	9.28	2.09
16/02/2018	13.21	3.46	1.06
17/02/2018	16.73	5.46	2.06
18/02/2018	13.92	6.05	2.71
19/02/2018	48.10	17.09	5.32
20/02/2018	10.04	4.42	1.63
21/02/2018	37.05	19.06	7.29
22/02/2018	18.93	10.33	4.54

Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	PM_1 (µg/m³)
23/02/2018	16.72	8.97	3.97
24/02/2018	19.33	10.63	4.83
25/02/2018	9.26	4.11	1.91
26/02/2018	6.07	2.47	1.18
27/02/2018	6.92	3.22	1.55
28/02/2018	16.53	10.56	5.42

Table 4.2 and Figure 4.1 below show the monitored PM_{10} on the site compared to the closest Urban Background and Roadside monitoring stations operated by the council so as to assess whether the PM_{10} on site is being distributed in a pattern similar to the local area and to identify any anomalous results.

Table 4.2 PM_{10} 24-hour monitoring results compared with background levels

Date	Average 24 hr Period PM_{10} Monitored (µg/m³) on site	Average 24 hr Period PM_{10} Monitored at Urban Background AURN
01/02/2018	7.05	10.30
02/02/2018	8.54	13.37
03/02/2018	10.41	11.68
04/02/2018	6.47	8.00
05/02/2018	8.78	12.60
06/02/2018	14.29	19.55
07/02/2018	9.38	16.37
08/02/2018	18.18	14.87
09/02/2018	5.98	9.89
10/02/2018	8.97	7.17
11/02/2018	3.75	4.70
12/02/2018	7.60	9.82
13/02/2018	8.55	8.65
14/02/2018	11.80	9.57
15/02/2018	62.74	12.53
16/02/2018	13.21	14.02
17/02/2018	16.73	16.51
18/02/2018	13.92	13.59
19/02/2018	48.10	16.28
20/02/2018	10.04	11.04
21/02/2018	37.05	37.27
22/02/2018	18.93	26.85
23/02/2018	16.72	25.31
24/02/2018	19.33	28.42
25/02/2018	9.26	15.14
26/02/2018	6.07	11.12
27/02/2018	6.92	10.99
28/02/2018	16.53	19.69
March 2018		
01/03/2018	33.21	40.37
02/03/2018	56.16	45.99
03/03/2018	453.76	67.67
04/03/2018	71.85	18.71
05/03/2018	13.90	13.16

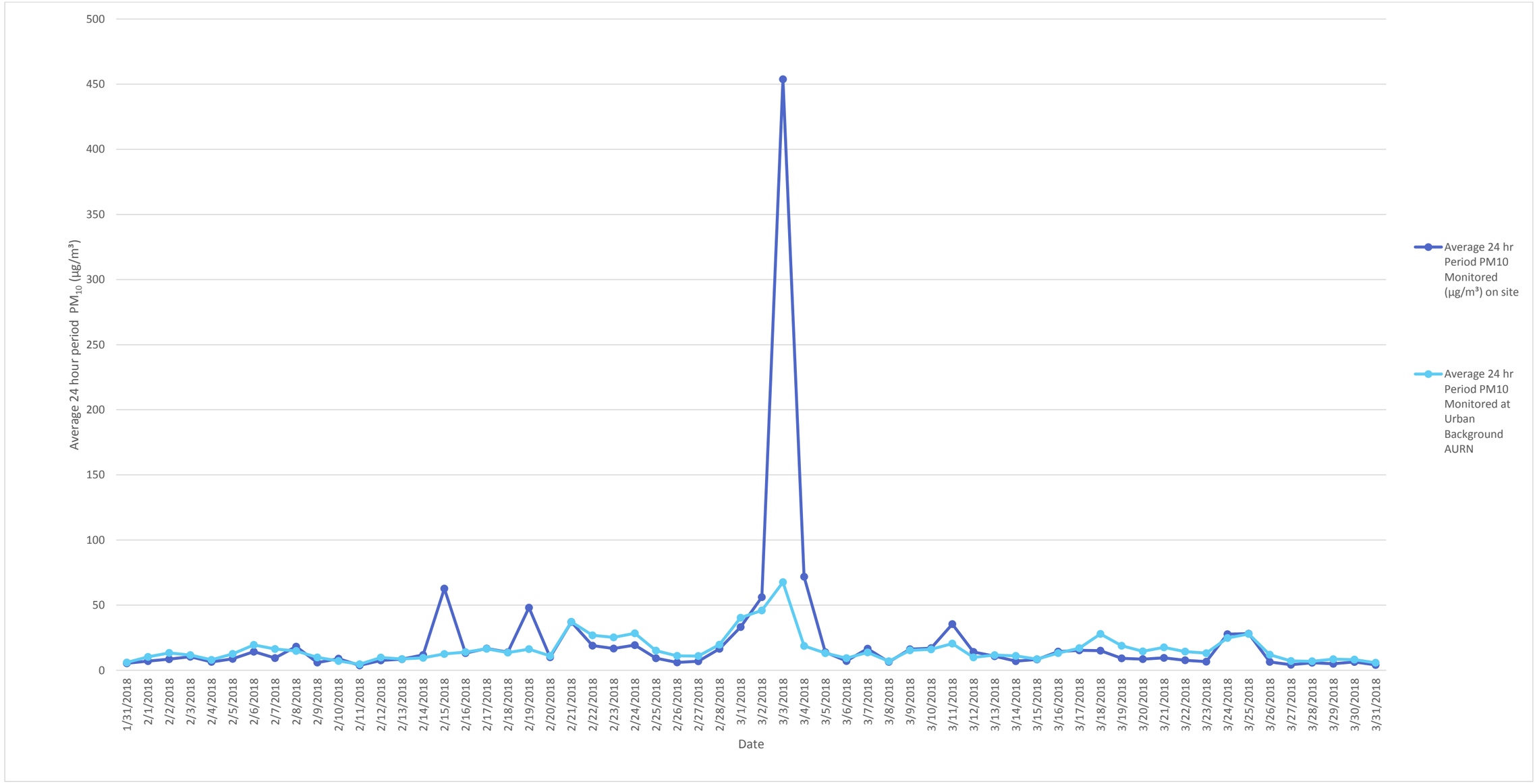
Date	Average 24 hr Period PM_{10} Monitored (µg/m³) on site	Average 24 hr Period PM_{10} Monitored at Urban Background AURN
06/03/2018	7.12	9.34
07/03/2018	16.61	13.74
08/03/2018	6.46	6.98
09/03/2018	16.17	15.37
10/03/2018	17.04	16.06
11/03/2018	35.48	20.53
12/03/2018	14.11	9.91
13/03/2018	10.82	11.68
14/03/2018	7.02	11.08
15/03/2018	8.34	8.59
16/03/2018	14.37	13.23
17/03/2018	15.35	17.03
18/03/2018	15.09	27.96
19/03/2018	9.20	18.85
20/03/2018	8.61	14.54
21/03/2018	9.54	17.63
22/03/2018	7.73	14.40
23/03/2018	6.63	13.15
24/03/2018	27.75	24.83
25/03/2018	28.11	27.96
26/03/2018	6.46	12.01
27/03/2018	4.25	7.16
28/03/2018	5.80	6.96
29/03/2018	5.01	8.54
30/03/2018	6.38	8.25
31/03/2018	4.10	5.83

Table 4.3 Exceedances of Traffic Light Criteria for PM10

Date	Exceedance of 'Green' Criteria	Exceedance of 'Amber' Criteria	Exceedance of 'Red' Criteria
February 2018			
01/02/2018	0	0	0
02/02/2018	0	0	0
03/02/2018	0	0	0
04/02/2018	0	0	0
05/02/2018	0	0	0
06/02/2018	0	0	0
07/02/2018	0	0	0
08/02/2018	2	0	1
09/02/2018	0	0	0
10/02/2018	0	0	0
11/02/2018	0	0	0
12/02/2018	0	0	0
13/02/2018	0	0	0
14/02/2018	0	0	0
15/02/2018	12*	10*	6*
16/02/2018	0	0	0
17/02/2018	0	0	0
18/02/2018	0	0	0

Date	Exceedance of 'Green' Criteria	Exceedance of 'Amber' Criteria	Exceedance of 'Red' Criteria
19/02/2018	13 (7*)	12 (6*)	1*
20/02/2018	1*	0	0
21/02/2018	7 (2*)	6 (1*)	0
22/02/2018	0	0	0
23/02/2018	0	0	0
24/02/2018	0	0	0
25/02/2018	0	0	0
26/02/2018	0	0	0
27/02/2018	0	0	0
28/02/2018	0	0	0
March 2018			
01/03/2018	0	0	0
02/03/2018	24 (20*)	23 (3*)	0
03/03/2018	96 (32*)	95 (32*)	52 (25*)
04/03/2018	35 (28*)	34 (27*)	0
05/03/2018	0	0	0
06/03/2018	0	0	0
07/03/2018	2	0	0
08/03/2018	0	0	0
09/03/2018	0	0	0
10/03/2018	0	0	0
11/03/2018	2*	0	0
12/03/2018	0	0	0
13/03/2018	0	0	0
14/03/2018	0	0	0
15/03/2018	0	0	0
16/03/2018	1	0	0
17/03/2018	0	0	0
18/03/2018	0	0	0
19/03/2018	0	0	0
20/03/2018	1	0	0
21/03/2018	0	0	0
22/03/2018	0	0	0
23/03/2018	0	0	0
24/03/2018	0	0	0
25/03/2018	0	0	0
26/03/2018	1	0	0
27/03/2018	0	0	0
28/03/2018	0	0	0
29/03/2018	0	0	0
30/03/2018	0	0	0
31/03/2018	0	0	0
*recorded outside working hours			

Figure 4.1 Comparison of On Site Monitored PM_{10} at Phase 1 Monitoring Location 1A and Off Site Monitoring



As shown above, monitoring trends on site generally match trends at surrounding background monitoring sites.

Table 4.4 $PM_{2.5}$ Results 24-hour monitoring results compared with background levels

Date	Average 24 hr Period $PM_{2.5}$ Monitored ($\mu g/m^3$) on site	Average 24 hr Period $PM_{2.5}$ Monitored at Urban Background AURN
01/02/2018	1.82	4.68
02/02/2018	2.65	7.13
03/02/2018	5.29	9.00
04/02/2018	2.64	5.68
05/02/2018	3.51	8.15
06/02/2018	7.90	14.31
07/02/2018	3.65	8.65
08/02/2018	4.84	9.00
09/02/2018	1.72	4.21
10/02/2018	3.22	4.30
11/02/2018	1.01	2.53
12/02/2018	2.26	4.71
13/02/2018	3.70	5.03
14/02/2018	4.24	6.23
15/02/2018	9.28	6.32
16/02/2018	3.46	7.08
17/02/2018	5.46	10.65
18/02/2018	6.05	10.35
19/02/2018	17.09	12.14
20/02/2018	4.42	5.87
21/02/2018	19.06	30.68
22/02/2018	10.33	20.86
23/02/2018	8.97	17.58
24/02/2018	10.63	19.82
25/02/2018	4.11	8.96
26/02/2018	2.47	5.79
27/02/2018	3.22	6.07
28/02/2018	10.56	14.85
March 2018		
01/03/2018	19.06	28.00
02/03/2018	31.84	35.77
03/03/2018	106.52	58.26
04/03/2018	27.10	14.71
05/03/2018	4.74	7.98
06/03/2018	3.73	6.13
07/03/2018	5.95	9.22
08/03/2018	1.71	3.39
09/03/2018	7.32	9.28
10/03/2018	6.05	10.37
11/03/2018	10.82	14.26
12/03/2018	6.46	6.20
13/03/2018	5.50	7.59
14/03/2018	2.62	6.65
15/03/2018	4.09	5.29

Date	Average 24 hr Period $PM_{2.5}$ Monitored (µg/m³) on site	Average 24 hr Period $PM_{2.5}$ Monitored at Urban Background AURN
16/03/2018	4.43	7.55
17/03/2018	8.33	12.31
18/03/2018	8.75	17.71
19/03/2018	4.17	10.37
20/03/2018	2.65	6.79
21/03/2018	4.72	10.80
22/03/2018	3.18	8.25
23/03/2018	2.13	6.49
24/03/2018	17.41	20.70
25/03/2018	16.17	23.28
26/03/2018	2.26	6.54
27/03/2018	2.36	4.04
28/03/2018	2.57	4.19
29/03/2018	2.26	5.25
30/03/2018	3.77	No data available
31/03/2018	3.09	No data Available

Table 4.5 Comparison of Weather Conditions and average levels of PM_{10} and $PM_{2.5}$

Date	Wind Directions	Wind Speed (km/h)	Weather Conditions	Average 24 hr Period PM_{10} Monitored (µg/m³) on site	Average 24 hr Period $PM_{2.5}$ Monitored (µg/m³) on site
February 2018					
01/02/2018	West	18	Cloudy	7.05	1.82
02/02/2018	North-west	14	Overcast	8.54	2.65
03/02/2018	Variable	7	Light Rain	10.41	5.29
04/02/2018	North-east	13	Mostly Cloudy	6.47	2.64
05/02/2018	North-east	11	Mostly Cloudy	8.78	3.51
06/02/2018	North	9	Light Snow	14.29	7.90
07/02/2018	West	8	Cloudy	9.38	3.65
08/02/2018	South-west	11	Mostly Cloudy	18.18	4.84
09/02/2018	West	18	Mostly Cloudy	5.98	1.72
10/02/2018	South-west	14	Rain	8.97	3.22
11/02/2018	West	25	Light Rain	3.75	1.01
12/02/2018	West	15	Scattered Clouds	7.60	2.26
13/02/2018	South	18	Rain	8.55	3.70
14/02/2018	South	14	Light Rain	11.80	4.24
15/02/2018	South-west	16	Partly Cloudy	62.74	9.28
16/02/2018	South	10	Unknown	13.21	3.46
17/02/2018	Variable	6	Cloudy	16.73	5.46
18/02/2018	South-east	8	Mostly Cloudy	13.92	6.05
19/02/2018	West	9	Light Rain	48.10	17.09
20/02/2018	North	13	Partly Cloudy	10.04	4.42
21/02/2018	North-east	9	Haze	37.05	19.06
22/02/2018	North-east	12	Mostly Cloudy	18.93	10.33
23/02/2018	East	12	Light Haze	16.72	8.97
24/02/2018	North-east	14	Mostly Cloudy	19.33	10.63
25/02/2018	North-east	17	Unknown	9.26	4.11

Date	Wind Directions	Wind Speed (km/h)	Weather Conditions	Average 24 hr Period PM_{10} Monitored ($\mu g/m^3$) on site	Average 24 hr Period $PM_{2.5}$ Monitored ($\mu g/m^3$) on site
26/02/2018	North-east	16	Light Rain	6.07	2.47
27/02/2018	Variable	9	Light Rain	6.92	3.22
28/02/2018	North-east	13	Snow Showers/Light Haze	16.53	10.56
March 2018					
01/03/2018	East-northeast	25	Light Snow	33.21	19.06
02/03/2018	North-east	26	Light Snow / Haze / Mist	56.16	31.84
03/03/2018	North-east	16	Haze / Fog / Mist	453.76	106.52
04/03/2018	South-east	11	Mist	71.85	27.10
05/03/2018	South-east	14	Rain / Mist	13.90	4.74
06/03/2018	South-west	12	Overcast	7.12	3.73
07/03/2018	West	9	Light Haze	16.61	5.95
08/03/2018	South-west	21	Mostly Cloudy	6.46	1.71
09/03/2018	South-east	10	Light Rain	16.17	7.32
10/03/2018	South	13	Light Haze	17.04	6.05
11/03/2018	East	8	Mist	35.48	10.82
12/03/2018	Variable	11	Light Rain	14.11	6.46
13/03/2018	West	12	Cloudy	10.82	5.50
14/03/2018	South-east	16	Cloudy	7.02	2.62
15/03/2018	South-east	18	Light Rain	8.34	4.09
16/03/2018	Variable	13	Mostly Cloudy	14.37	4.43
17/03/2018	North-east	21	Snow	15.35	8.33
18/03/2018	North-east	19	Snow	15.09	8.75
19/03/2018	North-east	18	Mostly Cloudy	9.20	4.17
20/03/2018	North	11	Mostly Cloudy	8.61	2.65
21/03/2018	West	10	Haze	9.54	4.72
22/03/2018	West	16	Overcast	7.73	3.18
23/03/2018	South-west	20	Overcast	6.63	2.13
24/03/2018	East	8	Mist / Haze	27.75	17.41
25/03/2018	North	7	Haze	28.11	16.17
26/03/2018	North-west	6	Unknown	6.46	2.26
27/03/2018	South-west	14	Rain	4.25	2.36
28/03/2018	West	11	Rain	5.80	2.57
29/03/2018	South	12	Unknown	5.01	2.26
30/03/2018	East	11	Light Rain	6.38	3.77
31/03/2018	South-west	13	Overcast	4.10	3.09

Phase 1 Monitoring Location 1B Results

Table 4.6 Monitoring Results 24-hour averages

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	PM_1 ($\mu g/m^3$)
February 2018			
01/02/2018	7.43	2.85	1.37
02/02/2018	9.27	4.20	2.25
03/02/2018	13.09	8.80	5.19
04/02/2018	8.39	4.76	2.64

Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	PM_1 (µg/m³)
05/02/2018	9.23	6.08	3.56
06/02/2018	19.04	14.41	8.25
07/02/2018	11.30	7.09	3.78
08/02/2018	12.24	7.68	4.64
09/02/2018	7.47	3.97	2.48
10/02/2018	10.12	5.68	3.33
11/02/2018	4.62	2.44	1.52
12/02/2018	9.93	5.50	3.07
13/02/2018	10.29	6.29	3.58
14/02/2018	15.41	8.75	5.07
15/02/2018	35.58	7.30	2.48
16/02/2018	11.78	4.73	2.35
17/02/2018	17.72	8.52	4.59
18/02/2018	18.86	11.30	6.52
19/02/2018	44.12	19.64	7.71
20/02/2018	13.36	7.41	3.57
21/02/2018	47.73	30.90	14.34
22/02/2018	27.46	18.42	10.04
23/02/2018	22.79	15.43	8.36
24/02/2018	22.32	16.02	9.11
25/02/2018	10.08	6.45	3.88
26/02/2018	12.46	6.54	4.05
27/02/2018	10.49	6.86	4.35
28/02/2018	20.25	15.94	10.34
March 2018			
01/03/2018	34.35	25.24	15.11
02/03/2018	43.67	29.82	16.36
03/03/2018	65.16	40.14	18.52
04/03/2018	17.55	12.96	7.25
05/03/2018	10.35	5.06	3.21
06/03/2018	5.05	3.86	2.65
07/03/2018	6.88	5.67	3.84
08/03/2018	2.73	1.89	1.41
09/03/2018	6.68	5.07	3.29
10/03/2018	6.69	4.52	2.81
11/03/2018	9.82	6.50	3.70
12/03/2018	6.67	5.27	3.38
13/03/2018	7.67	6.40	4.16
14/03/2018	4.48	2.69	1.68
15/03/2018	4.54	3.39	2.23
16/03/2018	4.29	2.65	1.57
17/03/2018	11.03	9.22	6.18
18/03/2018	16.30	13.74	8.79
19/03/2018	17.99	4.21	2.40
20/03/2018	29.90	2.79	1.12
21/03/2018	10.09	3.76	2.37
22/03/2018	7.48	3.10	2.14
23/03/2018	4.38	1.34	0.84

Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	PM_1 (µg/m³)
24/03/2018	12.16	9.61	5.55
25/03/2018	11.73	8.58	4.87
26/03/2018	3.82	1.99	1.30
27/03/2018	3.31	2.52	1.73
28/03/2018	4.56	3.34	2.20
29/03/2018	3.64	2.91	1.99
30/03/2018	6.57	5.80	4.07
31/03/2018	4.83	4.35	3.09

Table 4.7 and Figure 4.2 below show the monitored PM_{10} on the site compared to the closest Urban Background and Roadside monitoring stations operated by the council so as to assess whether the PM_{10} on site is being distributed in a pattern similar to the local area and to identify any anomalous results.

Table 4.7 PM_{10} 24-hour monitoring results compared with background levels

Date	Average 24 hr Period PM_{10} Monitored (µg/m³) on site	Average 24 hr Period PM_{10} Monitored at Urban Background AURN
01/02/2018	7.43	10.30
02/02/2018	9.27	13.37
03/02/2018	13.09	11.68
04/02/2018	8.39	8.00
05/02/2018	9.23	12.60
06/02/2018	19.04	19.55
07/02/2018	11.30	16.37
08/02/2018	12.24	14.87
09/02/2018	7.47	9.89
10/02/2018	10.12	7.17
11/02/2018	4.62	4.70
12/02/2018	9.93	9.82
13/02/2018	10.29	8.65
14/02/2018	15.41	9.57
15/02/2018	35.58	12.53
16/02/2018	11.78	14.02
17/02/2018	17.72	16.51
18/02/2018	18.86	13.59
19/02/2018	44.12	16.28
20/02/2018	13.36	11.04
21/02/2018	47.73	37.27
22/02/2018	27.46	26.85
23/02/2018	22.79	25.31
24/02/2018	22.32	28.42
25/02/2018	10.08	15.14
26/02/2018	12.46	11.12
27/02/2018	10.49	10.99
28/02/2018	20.25	19.69
March 2018		
01/03/2018	34.35	40.37
02/03/2018	43.67	45.99

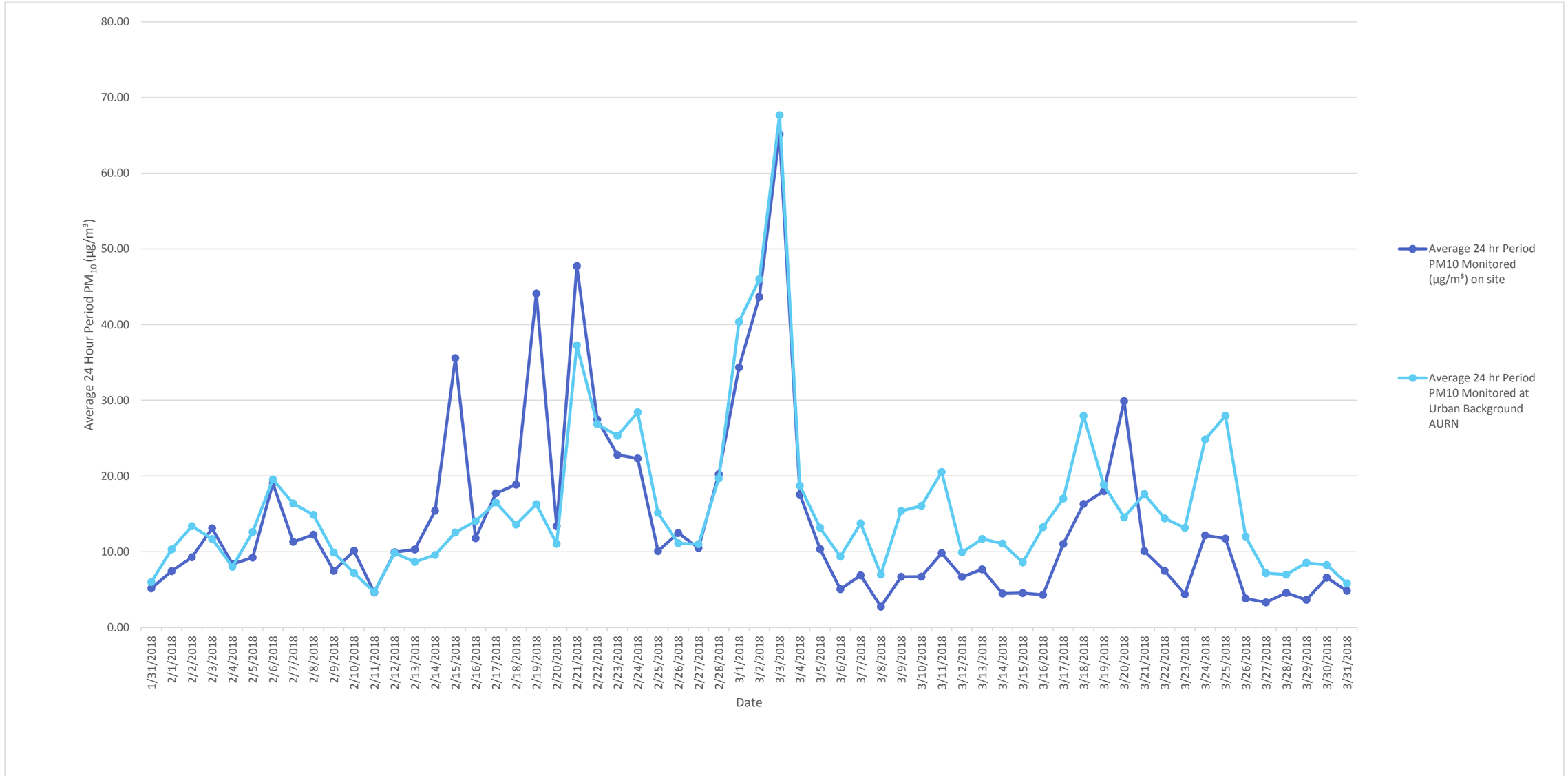
Date	Average 24 hr Period PM_{10} Monitored (µg/m³) on site	Average 24 hr Period PM_{10} Monitored at Urban Background AURN
03/03/2018	65.16	67.67
04/03/2018	17.55	18.71
05/03/2018	10.35	13.16
06/03/2018	5.05	9.34
07/03/2018	6.88	13.74
08/03/2018	2.73	6.98
09/03/2018	6.68	15.37
10/03/2018	6.69	16.06
11/03/2018	9.82	20.53
12/03/2018	6.67	9.91
13/03/2018	7.67	11.68
14/03/2018	4.48	11.08
15/03/2018	4.54	8.59
16/03/2018	4.29	13.23
17/03/2018	11.03	17.03
18/03/2018	16.30	27.96
19/03/2018	17.99	18.85
20/03/2018	29.90	14.54
21/03/2018	10.09	17.63
22/03/2018	7.48	14.40
23/03/2018	4.38	13.15
24/03/2018	12.16	24.83
25/03/2018	11.73	27.96
26/03/2018	3.82	12.01
27/03/2018	3.31	7.16
28/03/2018	4.56	6.96
29/03/2018	3.64	8.54
30/03/2018	6.57	8.25
31/03/2018	4.83	5.83

Table 4.8 Exceedances of Traffic Light Criteria for PM_{10}

Date	Exceedance of 'Green' Criteria	Exceedance of 'Amber' Criteria	Exceedance of 'Red' Criteria
February 2018			
01/02/2018	0	0	0
02/02/2018	0	0	0
03/02/2018	0	0	0
04/02/2018	0	0	0
05/02/2018	0	0	0
06/02/2018	0	0	0
07/02/2018	0	0	0
08/02/2018	0	0	0
09/02/2018	0	0	0
10/02/2018	0	0	0
11/02/2018	0	0	0
12/02/2018	0	0	0
13/02/2018	0	0	0
14/02/2018	0	0	0

Date	Exceedance of 'Green' Criteria	Exceedance of 'Amber' Criteria	Exceedance of 'Red' Criteria
15/02/2018	11*	9*	4*
16/02/2018	0	0	0
17/02/2018	0	0	0
18/02/2018	0	0	0
19/02/2018	12 (6*)	10 (4*)	0
20/02/2018	2*	1*	0
21/02/2018	11 (3*)	10 (2*)	0
22/02/2018	0	0	0
23/02/2018	0	0	0
24/02/2018	0	0	0
25/02/2018	0	0	0
26/02/2018	1	0	0
27/02/2018	0	0	0
28/02/2018	0	0	0
March 2018			
01/03/2018	0	0	0
02/03/2018	5	1	0
03/03/2018	19*	11*	0
04/03/2018	0	0	0
05/03/2018	2	0	0
06/03/2018	0	0	0
07/03/2018	0	0	0
08/03/2018	0	0	0
09/03/2018	0	0	0
10/03/2018	0	0	0
11/03/2018	0	0	0
12/03/2018	0	0	0
13/03/2018	0	0	0
14/03/2018	0	0	0
15/03/2018	0	0	0
16/03/2018	0	0	0
17/03/2018	0	0	0
18/03/2018	0	0	0
19/03/2018	2	0	0
20/03/2018	11	8	2
21/03/2018	1	0	0
22/03/2018	0	0	0
23/03/2018	0	0	0
24/03/2018	0	0	0
25/03/2018	0	0	0
26/03/2018	0	0	0
27/03/2018	0	0	0
28/03/2018	0	0	0
29/03/2018	0	0	0
30/03/2018	0	0	0
31/03/2018	0	0	0
*recorded outside working hours			

Figure 4.2 Comparison of On Site Monitored PM_{10} at Phase 1 Monitoring Location 1B Results and Off Site Monitoring



As shown above, monitoring trends on site generally match trends at surrounding background monitoring sites.

Table 4.9 $PM_{2.5}$ Results 24-hour monitoring results compared with background levels

Date	Average 24 hr Period $PM_{2.5}$ Monitored (µg/m³) on site	Average 24 hr Period $PM_{2.5}$ Monitored at Urban Background AURN (µg/m³)
01/02/2018	2.85	4.68
02/02/2018	4.20	7.13
03/02/2018	8.80	9.00
04/02/2018	4.76	5.68
05/02/2018	6.08	8.15
06/02/2018	14.41	14.31
07/02/2018	7.09	8.65
08/02/2018	7.68	9.00
09/02/2018	3.97	4.21
10/02/2018	5.68	4.30
11/02/2018	2.44	2.53
12/02/2018	5.50	4.71
13/02/2018	6.29	5.03
14/02/2018	8.75	6.23
15/02/2018	7.30	6.32
16/02/2018	4.73	7.08
17/02/2018	8.52	10.65
18/02/2018	11.30	10.35
19/02/2018	19.64	12.14
20/02/2018	7.41	5.87
21/02/2018	30.90	30.68
22/02/2018	18.42	20.86
23/02/2018	15.43	17.58
24/02/2018	16.02	19.82
25/02/2018	6.45	8.96
26/02/2018	6.54	5.79
27/02/2018	6.86	6.07
28/02/2018	15.94	14.85
01/03/2018	25.24	28.00
02/03/2018	29.82	35.77
03/03/2018	40.14	58.26
04/03/2018	12.96	14.71
05/03/2018	5.06	7.98
06/03/2018	3.86	6.13
07/03/2018	5.67	9.22
08/03/2018	1.89	3.39
09/03/2018	5.07	9.28
10/03/2018	4.52	10.37
11/03/2018	6.50	14.26
12/03/2018	5.27	6.20
13/03/2018	6.40	7.59
14/03/2018	2.69	6.65
15/03/2018	3.39	5.29
16/03/2018	2.65	7.55
17/03/2018	9.22	12.31
18/03/2018	13.74	17.71

Date	Average 24 hr Period $PM_{2.5}$ Monitored (µg/m³) on site	Average 24 hr Period $PM_{2.5}$ Monitored at Urban Background AURN (µg/m³)
19/03/2018	4.21	10.37
20/03/2018	2.79	6.79
21/03/2018	3.76	10.80
22/03/2018	3.10	8.25
23/03/2018	1.34	6.49
24/03/2018	9.61	20.70
25/03/2018	8.58	23.28
26/03/2018	1.99	6.54
27/03/2018	2.52	4.04
28/03/2018	3.34	4.19
29/03/2018	2.91	5.25
30/03/2018	5.80	No data available
31/03/2018	4.35	No data available

Table 4.10 Comparison of Weather Conditions and average levels of PM_{10} and $PM_{2.5}$

Date	Wind Directions	Wind Speed (km/h)	Weather Conditions	Average 24 hr Period PM_{10} Monitored (µg/m³) on site	Average 24 hr Period $PM_{2.5}$ Monitored (µg/m³) on site
February 2018					
01/02/2018	West	18	Cloudy	7.43	2.85
02/02/2018	North-west	14	Overcast	9.27	4.20
03/02/2018	Variable	7	Light Rain	13.09	8.80
04/02/2018	North-east	13	Mostly Cloudy	8.39	4.76
05/02/2018	North-east	11	Mostly Cloudy	9.23	6.08
06/02/2018	North	9	Light Snow	19.04	14.41
07/02/2018	West	8	Cloudy	11.30	7.09
08/02/2018	South-west	11	Mostly Cloudy	12.24	7.68
09/02/2018	West	18	Mostly Cloudy	7.47	3.97
10/02/2018	South-west	14	Rain	10.12	5.68
11/02/2018	West	25	Light Rain	4.62	2.44
12/02/2018	West	15	Scattered Clouds	9.93	5.50
13/02/2018	South	18	Rain	10.29	6.29
14/02/2018	South	14	Light Rain	15.41	8.75
15/02/2018	South-west	16	Partly Cloudy	35.58	7.30
16/02/2018	South	10	Unknown	11.78	4.73
17/02/2018	Variable	6	Cloudy	17.72	8.52
18/02/2018	South-east	8	Mostly Cloudy	18.86	11.30
19/02/2018	West	9	Light Rain	44.12	19.64
20/02/2018	North	13	Partly Cloudy	13.36	7.41
21/02/2018	North-east	9	Haze	47.73	30.90
22/02/2018	North-east	12	Mostly Cloudy	27.46	18.42
23/02/2018	East	12	Light Haze	22.79	15.43
24/02/2018	North-east	14	Mostly Cloudy	22.32	16.02
25/02/2018	North-east	17	Unknown	10.08	6.45
26/02/2018	North-east	16	Light Rain	12.46	6.54
27/02/2018	Variable	9	Light Rain	10.49	6.86
28/02/2018	North-east	13	Snow Showers/Light Haze	20.25	15.94
March 2018					
01/03/2018	East-northeast	25	Light Snow	34.35	25.24
02/03/2018	North-east	26	Light Snow / Haze / Mist	43.67	29.82

Date	Wind Directions	Wind Speed (km/h)	Weather Conditions	Average 24 hr Period PM_{10} Monitored ($\mu g/m^3$) on site	Average 24 hr Period $PM_{2.5}$ Monitored ($\mu g/m^3$) on site
03/03/2018	North-east	16	Haze / Fog / Mist	65.16	40.14
04/03/2018	South-east	11	Mist	17.55	12.96
05/03/2018	South-east	14	Rain / Mist	10.35	5.06
06/03/2018	South-west	12	Overcast	5.05	3.86
07/03/2018	West	9	Light Haze	6.88	5.67
08/03/2018	South-west	21	Mostly Cloudy	2.73	1.89
09/03/2018	South-east	10	Light Rain	6.68	5.07
10/03/2018	South	13	Light Haze	6.69	4.52
11/03/2018	East	8	Mist	9.82	6.50
12/03/2018	Variable	11	Light Rain	6.67	5.27
13/03/2018	West	12	Cloudy	7.67	6.40
14/03/2018	South-east	16	Cloudy	4.48	2.69
15/03/2018	South-east	18	Light Rain	4.54	3.39
16/03/2018	Variable	13	Mostly Cloudy	4.29	2.65
17/03/2018	North-east	21	Snow	11.03	9.22
18/03/2018	North-east	19	Snow	16.30	13.74
19/03/2018	North-east	18	Mostly Cloudy	17.99	4.21
20/03/2018	North	11	Mostly Cloudy	29.90	2.79
21/03/2018	West	10	Haze	10.09	3.76
22/03/2018	West	16	Overcast	7.48	3.10
23/03/2018	South-west	20	Overcast	4.38	1.34
24/03/2018	East	8	Mist / Haze	12.16	9.61
25/03/2018	North	7	Haze	11.73	8.58
26/03/2018	North-west	6	Unknown	3.82	1.99
27/03/2018	South-west	14	Rain	3.31	2.52
28/03/2018	West	11	Rain	4.56	3.34
29/03/2018	South	12	Unknown	3.64	2.91
30/03/2018	East	11	Light Rain	6.57	5.80
31/03/2018	South-west	13	Overcast	4.83	4.35

5.0 Discussion and Summary

The monitoring results for the second month at the former NIMR site, Mill Hill, Barnet Phase 1 Monitoring Location 1A shows 52 exceedances of the 'red' criteria. 25 of these 'red' exceedances are monitored outside of working hours and are unlikely to be a result of site operations. A review of site activities at this time period and location will be conducted.

The monitoring results for the second month at the former NIMR site, Mill Hill, Barnet Phase 1 Monitoring Location 1B shows two 'red' exceedances on the 20th March 2018 monitored within working hours for two 15-minute intervals. A review of site activities at this time period and location will be conducted.

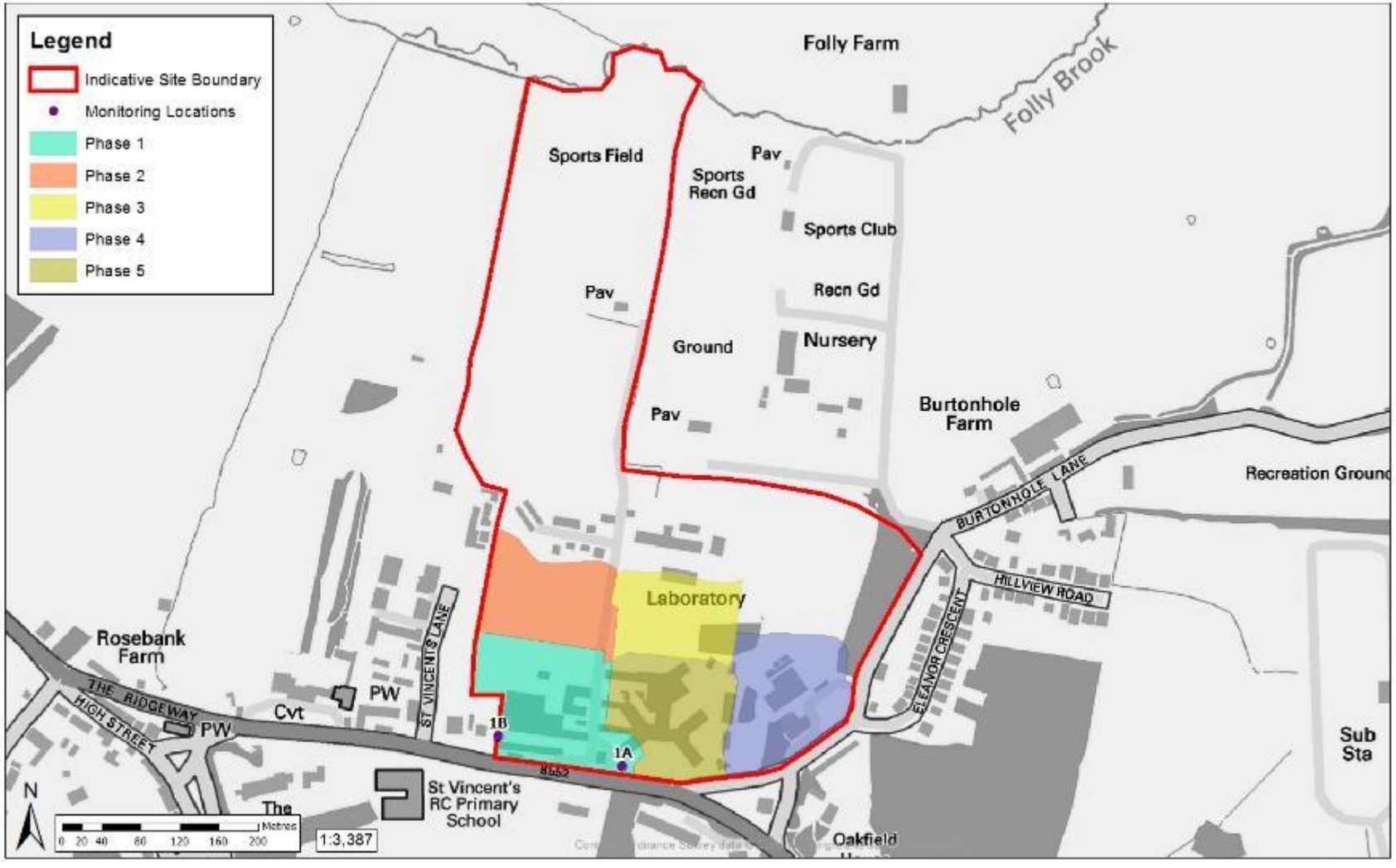
On the 3rd March 2018, 'red' and 'amber' exceedances monitored at Location 1A during the course of the day reflect the high background concentrations. Following a review of weather conditions, these exceedances are likely due to the snowy, misty and foggy weather conditions affecting the laser during this period.

To ensure the effects from the demolition are monitored sufficiently we will continue to monitor the levels of PM_{10} and $PM_{2.5}$ using the AQ Mesh monitors. This will be cross checked with the demolition schedule to identify whether the works are the main contributing factor.

WYG will continue to monitor and will make the client aware of any further exceedances and the activities which are being undertaken which result in exceedances of the 'red' limit will be reported and reviewed. Additionally, an alert system has been set up which sends e-mail notifications when the 'amber' criteria is triggered which is sent to both WYG and on site operatives.

Figures

Figure 1 Monitoring Locations



Appendix A Red Limit Exceedances

Red Limit Exceedances

An assessment using the traffic light approach based on sections 5.3.2 and the IAQM document 'Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites (2012) was conducted for the site. The in detail results with the date, time and recorded PM_{10} levels over 250 are outlined in Table A1 and A2. These are regarded as "red" level.

Table A1 Date and Times of PM_{10} Red Limit Exceedances at Phase 1 Monitoring Location 1A

Date	Time	PM_{10} (µg/m³)	Recorded Weather Conditions
08/02/2018	13:45	489.38	Overcast
15/02/2018	02:30	266.12	Mist
	02:45	537.68	
	03:15	616.07	
	03:30	862.47	
	03:45	1343.72	
	04:00	305.01	
19/02/2018	06:45	279.74	Light Drizzle
03/03/2018	00:15	250.07	Snow on the ground/ Overcast
	00:30	313.06	
	00:45	402.85	
	01:00	556.98	Snow on the ground/ Mist
	01:15	675.95	Snow on the ground/ Overcast
	01:30	731.23	
	01:45	932.66	
	02:00	902.44	Snow on the ground/ Unknown Precipitation
	02:15	1020.86	Snow on the ground/ Light Rain
	02:30	1211.06	
	02:45	1078.57	Snow on the ground/ Overcast
	03:00	1151.15	
	03:15	1133.59	Snow on the ground/ Fog
	03:30	1238.68	
	03:45	1332.47	Snow on the ground/ Overcast
	04:00	1263.56	Snow on the ground/ Mist
	04:15	979.60	Snow on the ground/ Overcast
	04:30	978.77	
	04:45	1089.20	
	05:00	1244.54	Snow on the ground/ Mist
	05:15	1269.18	Snow on the ground/ Fog
	05:30	1551.82	
	05:45	1433.73	
	06:00	1393.23	
	06:15	1315.65	Snow on the ground/ Overcast
	06:30	1273.75	
	06:45	960.09	Snow on the ground/ Mist
	07:00	635.47	
	07:15	864.31	Snow on the ground/ Overcast
	07:30	710.29	
	07:45	559.47	
	08:00	393.52	Snow on the ground/ Mist
	08:15	398.69	
	08:30	362.05	Snow on the ground/ Overcast

Date	Time	PM_{10} (µg/m³)	Recorded Weather Conditions
	08:45	339.27	
	09:00	363.71	Snow on the ground/ Mist
	09:15	291.41	
	09:30	297.61	Snow on the ground/ Overcast
	09:45	258.17	
	19:45	263.36	Snow on the ground/ Light Drizzle
	20:00	303.08	Snow on the ground/ Unknown Precipitation
	20:15	310.88	Snow on the ground/ Light Rain
	20:30	304.61	
	20:45	296.96	
	21:00	305.43	
	21:15	308.60	
	21:30	298.28	
	21:45	283.86	
	22:00	278.22	Snow on the ground/ Partly Cloudy
	22:15	272.44	
	22:30	256.84	
	22:45	271.31	

Table A2 Date and Times of PM10 Red Limit Exceedances at Phase 1 Monitoring Location 1B

Date	Time	PM_{10} (µg/m³)	Recorded Weather Conditions
15/02/2018	02:45	251.62	Mist
	03:15	344.45	
	03:30	266.17	
	03:45	317.72	
20/03/2018	12:30	294.83	Mostly Cloudy
	14:00	357.94	