Bonne Mares Ltd

195-197 City Road, Cardiff

Air Quality Assessment

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1	22nd October 2018	First Issue
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Executive Summary

WYG have conducted an air quality assessment for the proposed purpose-built student accommodation(PBSA) development at 195-197 City Road, Cardiff.

The potential effects during the construction phase include fugitive dust emissions from site activities, such as demolition, earthworks, construction and trackout. The impacts during the operational phase take into account the exhaust emissions from additional road traffic generated due to the proposed development.

During the construction phase, it is anticipated that dust sensitive receptors will potentially experience increased levels of dust and particulate matter before using any mitigation and control measures. However, these are predicted to be short-term and temporary impacts. Throughout this period, the potential impacts from construction on air quality will be managed through site-specific mitigation measures detailed within this assessment. With these mitigation measures in place, the effects from the construction phase are not predicted to be significant.

The assessment of the significance of the effects associated with both the committed and proposed developments with respect to NO_2, PM_{10} and $PM_{2.5}$ exposure is determined to be 'negligible' for all existing receptors.

Following the adoption of the recommended mitigation measures during the construction phase, the development is not considered to be contrary to any of the national, regional or local planning policies.

Based on the assessment undertaken and data, methodology and assumptions used within this assessment it is concluded that the site is suitable for the proposed redevelopment.

1. Introduction

Bonne Mares Ltd has commissioned WYG to prepare an Air Quality Assessment for the proposed purpose-built student accommodation (PBSA) development at 195-197 City Road, Cardiff.

1.1 Site Location and Context

The proposed site is located at approximately 318788, 177556 in Cardiff. The site is bounded to the north, south and east by commercial properties, and to the west by residential properties. The location of the site is shown in Figure 1.

The following assessment stages have been undertaken as part of this assessment:

- Baseline evaluation;
- Assessment of potential air quality impacts during the construction phase;
- Assessment of potential air quality impacts during the operational phase; and,
- Identification of mitigation measures (as required).

The results of the assessment are detailed in the following sections of this report.

The construction phase assessment considers the potential effects of dust and particulate emissions from site activities and materials movement based on a qualitative risk assessment method based on the Institute of Air Quality Management's (IAQM) 'Guidance on the Assessment of Dust from Demolition and Construction' document, published in 2014.

The assessment of the potential air quality impacts that are associated with the operational phase has focused on the predicted impact of changes in ambient nitrogen dioxide (NO_2) and particulate matter with an aerodynamic diameter of less than 10 µm (PM_{10}) and less than 2.5 µm ($PM_{2.5}$) as a result of the development at key local receptor locations. The changes have been referenced to EU air quality limits and UK air quality objectives and the magnitude and significance of the changes have been referenced to non-statutory guidance issued by Environmental Protection UK (EPUK).

2. Policy and Legislative Context

2.1 Documents Consulted

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

Legislation and Best Practice Guidance

- Planning Policy Wales, (Edition 9), November 2016;
- The Air Quality Standards (Wales) Regulations, 2007;
- The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2007;
- The Environment Act, 1995;
- Local Air Quality Management Technical Guidance LAQM.TG16, Defra, 2018;
- Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1, HA 207/07 - Air Quality, Highways Agency, 2007;
- Land-Use Planning & Development Control: Planning for Air Quality, EPUK & IAQM, 2017; and,
- Guidance on the Assessment of Dust from Demolition and Construction, IAQM, 2014.

Websites Consulted

- Google maps (maps.google.co.uk);
- The UK National Air Quality Archive (www.airquality.co.uk);
- Department for Transport Matrix (www.dft.go.uk/matrix);
- emapsite.com; and,
- Multi-Agency Geographic Information for the Countryside (http://magic.defra.gov.uk/).

Site Specific Reference Documents

- 2018 Air Quality Annual Status Report for Cardiff Council; and,
- Cardiff Local Development Plan 2006 – 2026 (Adopted January 2016).

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. The consolidated Directives include:

- **Directive 1999/30/EC** – the First Air Quality "Daughter" Directive – sets ambient air limit values for NO_2 and oxides of nitrogen, sulphur dioxide, lead and PM_{10};
- **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 (Wales) Regulations (2007) seek to simplify air quality regulation and provide a new transposition of the Air Quality Framework Directive, First, Second and Third Daughter Directives and transpose the Fourth Daughter Directive within the UK. The Air Quality Limit Values are transposed into the updated Regulations as Air Quality Standards for Wales, with attainment dates in line with the European Directives and, 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 (Wales) Regulations (2007), 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/m^3	Annual Mean	31st December 2010	25µg/m^3	1st January 2010	Retain Existing
NO_2	UK	200µg/m^3 not to be exceeded more than 18 times a year	1-Hour Mean	31st December 2005	200µg/m^3 not to be exceeded more than 18 times a year	1st January 2010	Retain Existing
	UK	40µg/m^3	Annual Mean	31st December 2005	40µg/m^3	1st January 2010	

Within the context of this assessment, the annual mean objectives are those against which facades of residential receptors will be assessed and the short-term objectives apply to all other receptor locations, where people may be exposed over a short duration, both residential and non-residential such as using gardens, balconies, walking along streets, using playgrounds, footpaths or external areas of employment uses.

Local Air Quality Management

Under Section 82 of the Environment Act (1995) (Part IV) Local Authorities (LAs) are required to periodically review and assess air quality within their area of jurisdiction under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves assessing present and likely future air quality against the AQOs. If it is predicted that levels at the façade of buildings where members of the public are regularly present (normally residential properties) are likely to be exceeded, the LA is required to declare an Air Quality Management Area (AQMA). For each AQMA the LA is required to produce an Air Quality Action Plan (AQAP), the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

2.3 Planning and Policy Guidance

National Policy

Planning Policy Wales (PPW) outlines the policies and guidance for development within Wales. In the PPW, Chapter 13 sets out the development management and ways of improving air quality in Wales, stating that:

> *'Development plans are important vehicles for the promotion of environmental protection and should enable consideration of the effects which proposed developments, and transport demand associated with them, may have on air or water quality and the effects which air or water quality may have on proposed developments. Local planning authorities should take account of such quality objectives when preparing development plans and should work closely with pollution control authorities in the preparation of these plans and when determining planning applications.*
>
> *Development plans should include strategic policies on the location of potentially polluting developments and should set out criteria by which applications for such developments will be determined, but they should not exclude provision for such projects or prohibit all applications to set them up. Plans may set out policies and proposals to ensure that incompatible uses of land are separated, in order to avoid potential conflict between different types of development. They should make realistic provision for the types of industry or facility that may be detrimental to amenity or conservation interests, or a potential source of pollution, ensuring resilience to climate change.*
>
> *The potential for pollution affecting the use of land will be a material consideration in deciding whether to grant planning permission. Material considerations in determining applications for potentially polluting development are likely to include:*
>
> *• location, taking into account such considerations as the reasons for selecting the chosen site itself;*
>
> *• impact on health and amenity;*
>
> *• the risk and impact of potential pollution from the development, insofar as this might have an effect on the use of other land and the surrounding environment (the environmental regulatory regime may well have an interest in these issues, particularly if the development would impact on an Air Quality Management Area or a SAC);*
>
> *• prevention of nuisance;*
>
> *• impact on the road and other transport networks, and in particular on traffic generation; and*

• the need, where relevant, and feasibility of restoring the land (and water resources) to standards sufficient for an appropriate after use. (Powers under the Pollution Prevention and Control Act 1999 require an operator to return a site to a satisfactory state on surrender of an Integrated Pollution Prevention and Control Permit).'

Local Policy

Cardiff Council adopted their Local Development Plan in January 2016. This outlines the Council's broad planning strategy. Following a review of policies within the local development plan, the following statements were identified as being relevant to the proposed development from an air quality perspective:

"KP 18: Natural Resources;

In the interests of the long-term sustainable development of Cardiff, development proposals must take full account of the need to minimise impacts on the city's natural resources and minimise pollution, in particular the following elements:

i. Protecting the best and most versatile agricultural land;
ii. Protecting the quality and quantity of water resources, including underground surface and coastal waters;
iii. Minimising air pollution from industrial, domestic and road transportation sources and managing air quality; and,
iv. Remediating land contamination through the redevelopment of contaminated sites."

3. Assessment Methodology

The potential environmental effects of the operational phase of the proposed development are identified as far as current knowledge of the site and development is known. The significance of potential environmental effects is assessed according to the latest guidance produced by EPUK and IAQM in January 2017.

The methodology used to determine the potential air quality effects of the construction phase of the proposed development has been derived from the IAQM 'Guidance on the Assessment of the Impacts of Dust from Demolition and Construction' document and is summarised in Section 5.

3.1 Determining Significance of the Air Quality Effects

The significance of the effects during the operational phase of the development is based on the latest guidance produced by EPUK and IAQM in January 2017. The EPUK/IAQM guidance provides a basis for a consistent approach that could be used by all parties associated with the planning process to professionally judge the overall significance of the air quality effects based on severity of air quality impacts.

The following rationale is used in determining the severity of the air quality effects at individual receptors:

1. The change in concentration of air pollutants, air quality effects, are quantified and evaluated in the context of AQOs. The effects are provided as a percentage of the Air Quality Assessment Level (AQAL), which may be an AQO, EU limit or target value, or a Natural Resources Wales Assessment Level (NRWAL)';
2. The absolute concentrations are also considered in terms of the AQAL and are divided into categories for long term concentration. The categories are based on the sensitivity of the individual receptor in terms of harm potential. The degree of harm potential to change increases as absolute concentrations are close to or above the AQAL;
3. Severity of the effect is described as qualitative descriptors; negligible, slight, moderate or substantial, by taking into account in combination the harm potential and air quality effect. This means that a small increase at a receptor which is already close to or above the AQAL will have higher severity compared to a relatively large change at a receptor which is significantly below the AQAL;
4. The effects can be adverse when pollutant concentrations increase or beneficial when concentrations decrease as a result of development;
5. The judgement of overall significance of the effects is then based on severity of effects on all the individual receptors considered; and,
6. Where a development is not resulting in any change in emissions itself, the significance of effect is based on the effect of surrounding sources on new residents or users of the development, i.e., will they be exposed to levels above the AQAL.

Table 3.1 Significance of Effects Matrix

Long term average concentration at receptor in assessment year	% Change in concentration relative to AQAL			
	1	2-5	6-10	>10
≤75% of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109 of AQAL	Moderate	Moderate	Substantial	Substantial
≥110 of AQAL	Moderate	Substantial	Substantial	Substantial

In accordance with explanation note 2 of Table 6.3 of the EPUK & IAQM guidance. The Table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5%, will be described as 'Negligible'.

4. Baseline Conditions

4.1 Air Quality Review

This section provides a review of the existing air quality in the vicinity of the proposed development site in order to provide a benchmark against which to assess potential air quality impacts of the proposed development. Baseline air quality in the vicinity of the proposed development site has been defined from a number of sources, as described in the following sections.

Local Air Quality Management (LAQM)

As required under section 82 of the Environment Act 1995, Cardiff Council (CC) have conducted an ongoing exercise to review and assess air quality within its area of jurisdiction. The assessments have indicated that concentrations of NO_2 are above the relevant AQOs at a number of locations of relevant public exposure within the Council. CC has designated four Air Quality Management Areas (AQMAs) that are described below:

- Ely Bridge AQMA: A number of residential premises along the A48 Cowbridge Road West, Western Avenue and A4119 through Llandaff Village Cardiff Road;
- Stephenson Court AQMA: From NE and NW boundaries of Stephenson Court, NW boundary of Burgess Court, NW and SW boundaries of Four Elms Court, SW corner of Four Elms Court south across Newport road to the junction with Orbit street, West across Newport Road to the SE corner of Stephenson Court;
- Llandaff AQMA: Centre on Cardiff Road through Llandaff village; and,
- Cardiff City Centre AQMA: Former St Mary Street AQMA with the addition of Westgate Street in Cardiff City Centre.

The Stephenson Court AQMA is situated 720 m south east of the proposed site boundary.

Air Quality Monitoring

Monitoring of air quality within CC is conducted through both continuous and non-continuous monitoring methods. These have been reviewed in order to provide an indication of existing air quality in the area surrounding the proposed development site.

Continuous Monitoring

CC operated one automatic monitoring stations during 2017. This automatic monitoring station is located approximately 1 km south-west of the proposed development site. The most recently available automatic monitoring data available is from 2017 which is presented in Table 4.1.

Table 4.1 Monitored Annual Mean NO_2 Concentrations

Site ID	Location	Site Type	Distance to Kerb (m)	Inlet Height (m)	NO_2 Annual Mean Concentration 2017 (µg/m^3)
CC AURN	Cardiff Centre AURN	Urban Background	200	N/A	20.0

As indicated in Table 4.1, the automatic monitoring station measured NO_2 concentrations below the relevant AQO (40 µg/m^3 annual mean) in 2017.

Non - Continuous Monitoring

CC operated a network of passive diffusion tubes during 2017. The closest diffusion tube monitoring location is approximately 220 m north from the proposed site boundary.

On request, diffusion tube monitoring data for 2017 has been provided by CC. The 2017 diffusion tube data from CC is presented in Table 4.2.

Table 4.2 Monitored Annual Mean NO_2 Concentrations

Site ID	Location	Site Type	Distance to Kerb (m)	Inlet Height (m)	NO_2 Annual Mean Concentration 2017 (µg/m^3)
44	City Road	Kerbside	1.0	3.00	31.5
45	Mackintosh Palace	Kerbside	1.0	3.50	35.5
81*	Stephenson Court	Roadside	5.0	2.00	35.9
129*	Stephenson Court 2	Roadside	4.0	1.20	30.8
130*	Burgess Court	Roadside	5.0	2.00	38.5
131*	Dragon Court	Roadside	5.0	1.75	41.7
180	Fitzalan Court, Newport Road	Kerbside	0.4	1.80	49.1
181	Windsor House, Windsor Lane	Kerbside	0.5	2.00	40.5
182	Admiral House, Newport Road	Roadside	3.2	1.50	33.5
183	Station Terrace	Kerbside	0.5	2.00	31.2
*Located within Stephenson Court AQMA					

As indicated in Table 4.2, all diffusion tubes except 131, 180 and 181 were below the relevant AQO (40 µg/m^3 annual mean) in 2017.

4.2 Meteorology

Meteorological conditions have significant influence over air pollutant concentrations and dispersion. Pollutant levels can vary significantly from hour to hour as well as day to day, thus any air quality predictions need to be based on detailed meteorological data. The ADMS model calculates the dispersion of pollutants on an hourly basis using a year of local metrological data. The meteorological data used in the assessment is derived from 2017 Cardiff Meteorological Station. This is the nearest meteorological station which is considered

representative of the development site, with all the complete parameters necessary for the ADMS model. Reference should be made to Figure 2 for an illustration of the prevalent wind conditions at the Cardiff Meteorological Station site.

4.3 Emission Sources

A desktop assessment has identified that traffic movements are likely to be the most significant local source of pollutants affecting the site and its surroundings. The principal traffic derived pollutants likely to impact local receptors are NO_2, PM_{10} and $PM_{2.5}$.

The assessment has therefore modelled all roads within the immediate vicinity of the proposed development site which are considered likely to experience significant changes in traffic flow as a result of the proposed development. Reference should be made to Figure 1 for a graphical representation of the traffic data utilised within the ADMS Roads 4.1 model.

It should be noted that the pollutant contribution of minor roads and rail sources that are not included within the dispersion model is considered to be accounted for via the use of background air quality levels.

4.4 Sensitive Receptors

Receptors that are considered as part of the air quality assessment are primarily those existing receptors that are situated along routes predicted to experience significant changes in traffic flow as a result of the proposed development.

Table 4.3 Modelled Existing Sensitive Receptor Locations

Discrete Sensitive Receptor		Receptor Height (m)
R1	57 City Road	1.5
R2	7 Mackintosh Place	1.5
R3	Albany Primary School	1.5
R4	1 Crwys Road	1.5
R5	Cardiff Sixth Form College	1.5
R6	Tredegarvill CW Primary School	1.5
R7	Cardiff University McKenzie House	1.5
R8	Cardiff Royal Infirmary	1.5
R9	St Peters RC Primary School	1.5
R10	Clifton House	1.5

4.5 Ecological Receptors

Air quality impacts associated with the proposed re-development have the potential to impact on receptors of ecological sensitivity within the vicinity of the site. The Conservation of Habitats and Species Regulations

(2017) require competent authorities to review planning applications and consents that have the potential to impact on European designated sites (e.g. Special Protection Areas).

A study was undertaken to identify any statutory designated sites of ecological or nature conservation importance within the extents of the dispersion modelling assessment. This was completed using the Multi-Agency Geographic Information for the Countryside (MAGIC) web-based interactive mapping service, which draws together information on key environmental schemes and designations. Following a search within a 1 km radius of the site boundary, no ecologically sensitive receptors were identified.

5. Assessment of Air Quality Impacts - Construction Phase

5.1 Pollutant Sources

The main emissions during construction are likely to be dust and particulate matter generated during earth moving (particularly during dry months) or from construction 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.

Construction 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.

5.2 Particulate Matter (PM_{10})

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

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

5.3 Dust

Particles greater than 10µm are likely to settle out relatively quickly and may cause annoyance due to their soiling capability. There are no formal standards or criteria for nuisance caused by deposited particles, however, a deposition rate of 200mg/m^2/day is often presented as a threshold for serious nuisance though this is usually only applied to long term exposure as people are generally more tolerant of dust for a short or defined period. Significant nuisance is likely when the dust coverage of surfaces is visible in contrast with adjacent clean areas, especially when it happens regularly. Severe dust nuisance occurs when the dust is perceptible without a clean reference surface.

Construction activities have the potential to suspend dust, which could result in annoyance of residents surrounding the site. Measures will be taken to minimise the emissions of dust as part of good site practice. Recommended mitigation measures proportionate to the risk associated with the development and based on best practice guidance are discussed in the following sections.

5.4 Methodology

The construction phase assessment utilises the IAQM Guidance on the Assessment of Dust from Demolition and Construction document published in February 2014.

Four construction processes are considered; these are demolition, earthworks, construction and trackout. For each of these phases, the significance of the potential dust impacts is derived following the determination of a dust emission magnitude and the distance of activities to the nearest sensitive receptor, therefore assessing worst case impacts. A full explanation of the methodology is contained in Appendix A.

5.5 Assessment Results

Based on the methodology detailed in Appendix A, the scale of the anticipated works has determined the potential dust emission magnitude for each process, as presented in the Table 5.1 below.

Table 5.1 Dust Emission Magnitude

Construction Process	Dust Emission Magnitude
Demolition	Medium
Earthworks	Small
Construction	Medium
Trackout	Medium

The sensitivity of the surrounding area to each construction process has been determined following stage 2B of the IAQM guidance. The assessment has determined the area sensitivities as shown in the Table 5.2.

Table 5.2 Sensitivity of the Area

Source	Area Sensitivity		
	Dust Soiling	Health Effects of PM_{10}	Ecological
Demolition	High	Low	N/A
Earthworks	High	Low	N/A
Construction	High	Low	N/A
Trackout	High	Low	N/A

The dust emission magnitude determined in Table 5.1 has been combined with the sensitivity of the area determined in Table 5.2, to determine the risk of impacts prior to the implementation of appropriate mitigation measures. The potential impact significance of dust emissions associated with the construction phase, without mitigation, is presented below.

Table 5.3 Impact Significance of Construction Activities without Mitigation

Source	Summary Risk of Impacts Prior to Mitigation		
	Dust Soiling	Health Effects of PM_{10}	Ecological
Demolition	Medium	Low	N/A
Earthworks	Low	Negligible	N/A
Construction	Medium	Low	N/A
Trackout	Medium	Low	N/A

Appropriate mitigation measures are detailed and presented in Section 7. Following the adoption of these measures, the subsequent impact significance of the construction phase is not predicted to be significant.

6. Assessment of Air Quality Impacts - Operational Phase

In the context of the proposed development, transportation is identified as the dominant emission source that is likely to cause potential risk of exposure of air pollutants at receptors.

The operational phase assessment therefore consists of the quantified predictions of the change in NO_2, PM_{10} and $PM_{2.5}$ for the operational phase of the development due to changes in traffic movement. Predictions of air quality at the site have been undertaken for the operational phase of the development using ADMS Roads.

The operational phase assessment has been undertaken with an assumed worst-case operational opening year of 2019. The assessment scenarios are therefore:

- 2017 Baseline = Existing baseline conditions;
- 2019 "Do Minimum" = Baseline conditions + committed development; and
- 2019 "Do Something" = Baseline conditions + committed development + associated development flows.

6.1 Existing and Predicted Traffic Flows

Baseline 2017 traffic data and projected 2019 'do minimum' and 'do something' traffic data have been obtained for the operational phase assessment in the form of Annual Average Daily Traffic figures (AADT).

All data for the Baseline 2017 scenario were downloaded from the Department for Transport website.

To calculate the 2019 'do minimum' traffic data for all links, a TEMPRO factor of 1.01 was applied to the Baseline 2017 data.

As there are no traffic flows associated with the proposed development, the 'do something' flows are the same as the 'do minimum' flows.

It is assumed the average vehicle speeds on the local road network in an opening year of 2019 will be broadly the same as the ones in 2017. Where unavailable, traffic speeds have been estimated based on-site observations and national speed limits.

Emission factors for the 2017 baseline and 2019 projected 'do minimum' and 'do something' scenarios have been calculated using the Emission Factor Toolkit Version 8.0.1 (December 2017).

A 50m 20km/hr slow down phase is included on each link at every junction and roundabout within the assessment. All of the roads within the dispersion model are illustrated in Figure 1. Detailed traffic figures are provided in the Table 6.1.

Table 6.1 Traffic Data

Link	Speed (km/h)	2016 Baseline		2019			
				Do Minimum		Do Something	
		AADT	HGV %	AADT	%HGV	AADT	%HGV
City Road	48	16,207	0.60	16,369	0.60	16,369	0.60
Crwys Road	48	16,207	0.60	16,369	0.60	16,369	0.60
Mackintosh Place	48	16,207	0.60	16,369	0.60	16,369	0.60
Albany Road	48	16,207	0.60	16,369	0.60	16,369	0.60
A4161 Dumfries Place	48	23,707	1.27	23,944	1.27	23,944	1.27
A4161 Newport Road	48	23,775	1.93	24,013	1.93	24,013	1.93
B4487 Broadway	48	7,000	0.51	7,070	0.51	7,070	0.51
Fitzalan Place	48	28,564	1.12	28,850	1.12	28,850	1.12

6.2 Background Concentrations

Defra Published Background Concentrations for 2017

Background concentrations below were obtained 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 nitrogen oxide (NO_X), NO_2, PM_{10} and $PM_{2.5}$ which incorporate updates to the input data used for modelling. The mapped background concentrations are summarised in Table 6.2.

Table 6.2 Published Background Air Quality Levels (µg/m³)

Receptor Location	2017			
	NO_2	NO_x	PM_{10}	$PM_{2.5}$
Diffusion Tube Monitoring Locations				
44	22.65	33.34	18.80	13.01
45	21.31	31.04	17.86	12.18
81	27.33	42.54	17.20	11.50
129	27.33	42.54	17.20	11.50
130	27.33	42.54	17.20	11.50
131	27.33	42.54	17.20	11.50
180	26.07	39.62	18.66	12.47
181	26.07	39.62	18.66	12.47
182	27.33	42.54	17.20	11.50
Modelled Receptor Locations				
R1	22.65	33.34	18.80	13.01
R2	21.31	31.04	17.86	12.18
R3	21.31	31.04	17.86	12.18
R4	21.31	31.04	17.86	12.18
R5	26.07	39.62	18.66	12.47
R6	27.33	42.54	17.20	11.50
R7	27.33	42.54	17.20	11.50
R8	27.33	42.54	17.20	11.50

Receptor Location	2017			
	NO_2	NO_x	PM_{10}	$PM_{2.5}$
R9	22.65	33.34	18.80	13.01
R10	22.65	33.34	18.80	13.01
PR1	21.31	31.04	17.86	12.18
PR2	21.31	31.04	17.86	12.18
PR3	21.31	31.04	17.86	12.18
PR4	21.31	31.04	17.86	12.18
PR5	21.31	31.04	17.86	12.18
PR6	21.31	31.04	17.86	12.18
PR7	21.31	31.04	17.86	12.18
PR8	21.31	31.04	17.86	12.18

Local Authority Monitoring Background

As the Defra background maps have predicted unrepresentatively low NO_2 and NO_x background concentrations at the closest monitoring locations, background NO_x and NO_2 concentrations have been considered individually across the model area for receptors where similar background contributions are expected based on the LA monitored NO_2 at diffusion tubes shown in Table 6.3. As these diffusion tubes monitor roadside NO_2, to determine the likely background NO_2 for each area, the unadjusted baseline ADMS model output NO_2 for each monitoring location has been subtracted from the monitored NO_2. A review of the potential background contributions (monitored results less modelled traffic contribution) in each area has been undertaken to determine the most appropriate background levels (accounting for variation in monitored levels due to micro-siting and local non-traffic sources).

Table 6.3 Roadside Modelled Contribution at Tubes

Tube	Monitored NO_2 ($\mu g/m^3$)	Modelled Traffic Contribution NO_2 ($\mu g/m^3$)	Non-Traffic NO_2 ($\mu g/m^3$)
44	31.50	2.25	29.25
45	35.50	4.21	31.29
81	35.90	4.05	31.85
129	30.80	3.23	27.57
130	38.50	3.36	35.14
131	41.70	3.45	38.25
180	49.10	5.94	43.16
181	40.50	2.80	37.70
182	33.50	5.05	28.45

To calculate the background NO_x for each location, the following guidance has been utilised.

As the Environment Agency Air Quality Modelling and Assessment Unit (AQMAU) Document states that the *Case Specific Scenarios* approach should be used within an assessment.

"*Operators are asked to justify their use of percentages lower than 35%, for short-term and 70% for long-term in their application reports.*"

For the long-term:

- NO_x to NO_2 = 70%
- NO_2/NO_x = 70%
- Therefore, $NO_x = NO_2/0.7 = 1.43$

Therefore, for locations where background monitoring data is considered more representative, a factor of 1.43 has been applied to the NO_2 to produce the NO_x value.

The background concentrations outlined below in Table 6.4 have been utilised in the model verification, and the main body of the operational phase modelling assessment.

Table 6.4 Background Concentrations Used

Receptor location	Background Source	Background Concentration Utilised	
		NO_2	NO_x
Monitoring Locations			
44	Model Contribution	29	42
45	Model Contribution	31	45
81	Model Contribution	32	46
129	Model Contribution	28	40
130	Model Contribution	35	50
131	Model Contribution	38	55
180	Model Contribution	43	62
181	Model Contribution	38	54
182	Model Contribution	28	41
Receptor Locations			
R1	44	29	42
R2	45	31	45
R3	45	31	45
R4	45	31	45
R5	180	43	62
R6	182	28	41
R7	182	28	41
R8	130	35	50
R9	81	32	46
R10	81	32	46
PR1	44	29	42
PR2	44	29	42
PR3	44	29	42
PR4	44	29	42
PR5	44	29	42
PR6	44	29	42
PR7	44	29	42
PR8	44	29	42

6.3 Model Verification

Model verification involves the comparison of modelled data to monitored data in order to gain the best possible representation of current pollutant concentrations for the assessment years. The verification process is in general accordance with that contained in Section 7 of the TG16 guidance note and uses the most recently available diffusion tube monitoring data to best represent this.

The verification process consists of using the monitoring data and the published background air quality data in the UK National Air Quality Information Archive to calculate the road traffic contribution of NO_X at the monitoring locations. Outputs from the ADMS Roads model are provided as predicted road traffic contribution NO_X emissions. These are converted into predicted roadside contribution NO_2 exposure at the relevant receptor locations based on the updated approach to deriving NO_2 from NO_X for road traffic sources published in Local Air Quality Management TG16. The calculation was derived using the NO_X to NO_2 worksheet in the online LAQM tools website hosted by Defra. Table 6.5 summarises the final model/monitored data correlation following the application of the model correction factor.

Table 6.5 Comparison of Roadside Modelling & Monitoring Results for NO_2

Tube location	NO_2 µg/m^3		
	Monitored NO_2	Modelled NO_2	Difference (%)
44	31.50	31.38	-0.37
45	35.50	35.39	-0.31
81	35.90	36.20	0.84
129	30.80	31.43	2.05
130	38.50	38.44	-0.15
131	41.70	41.49	-0.50
180	49.10	48.81	-0.60
181	40.50	40.84	0.85
182	33.50	33.31	-0.57

The final model produced data at the monitoring locations to within 10% of the monitoring results, as the requirement by TG16 guidance.

The final verification model correlation coefficient (representing the model uncertainty) is 0.99[1]. This figure demonstrates that the model predictions were in line with the road traffic emissions at the monitoring locations.

[1] This was achieved by applying a model correction factor of 1.47 to roadside predicted NO_X concentrations before converting to NO_2

6.4 Summary of Model Inputs

Table 6.6 Summary of ADMS Roads Model Inputs

Parameter	Description	Input Value
Chemistry	A facility within ADMS-Roads to calculate the chemical reactions in the atmosphere between Nitric Oxide (NO), NO_2, Ozone (O_3) and Volatile organic compounds (VOCs).	No atmospheric chemistry parameters included
Meteorology	Representative meteorological data from a local source	**Cardiff Meteorological Station**, hourly sequential data
Surface Roughness	A setting to define the surface roughness of the model area based upon its location.	**1m** representing a typical surface roughness for **Cities, Woodlands**.
Latitude	Allows the location of the model area to be set	United Kingdom = **51.49**
Monin-Obukhov Length	This allows a measure of the stability of the atmosphere within the model area to be specified depending upon its character.	Cities and Large Towns = **30m.**
Elevation of Road	Allows the height of the road link above ground level to be specified.	All road links were set at ground level = **0m**.
Road Width	Allows the width of the road link to be specified.	Road width used depended on data obtained from OS map data for the specific road link
Topography	This enables complex terrain data to be included within the model in order to account for turbulence and plume spread effects of topography	No topographical information used
Time Varied Emissions	This enables daily, weekly or monthly variations in emissions to be applied to road sources	No time varied emissions used
Road Type	Allows the effect of different types of roads to be assessed.	**Urban (Not London)** settings were used for the relevant links
Road Speeds	Enables individual road speeds to be added for each road link	Based on national speed limits
Canyon Height	Allows the model to take account turbulent flow patterns occurring inside a street with relatively tall buildings on both sides, known as a "street canyon".	8m canyon on City Road
Road Source Emissions	Road source emission rates are calculated from traffic flow data using the in-built EFT database of traffic emission factors.	The **EFT** Version **8.0.1 (December 2017)** dataset was used.
Year	Predicted EFT emissions rates depend on the year of emission.	**2017** data for verification and baseline operational phase assessment **2019** data for the operational phase assessment.

6.5 ADMS Modelling Results

Traffic Assessment

The ADMS Model has predicted concentrations of NO_2, PM_{10} and $PM_{2.5}$ at relevant receptor locations adjacent to roads likely to be affected by the development, as summarised in the following tables. Only receptors close to roads where there is predicted to be a change in emissions have been assessed.

Assessment Scenario

For the operational year of 2019, assessment of the effects of emissions from the proposed traffic associated with the scheme, has been undertaken using the Emissions Factor Toolkit (EFT) 2019 emissions rates which take into account of the rate of reduction in emission from road vehicles into the future with the following factors

- 2017 Baseline = Existing baseline conditions;

- 2019 "Do Minimum" = Baseline conditions + committed development; and,
- 2019 "Do Something" = Baseline conditions + committed development + development flows.

An additional theoretical scenario has also been undertaken using emission factors from 2017 for the 'do minimum' and 'do something' for the operational year of 2019, based on a recent appeal decision that favoured the uncertainty of emissions forecasts. It should be noted that this is a theoretical scenario which assumes that the government (Defra) predictions for reduction in emissions over the forthcoming years will not occur. However, this should not be considered as a 'more correct' scenario in accordance with the 2010 note [http://laqm.defra.gov.uk/laqm-faqs/faq5.html] which confirms that: *'There is no evidence to suggest that background concentrations associated with the other (non-traffic) source contributions should not behave as forecast. This disparity in the historical data highlights the uncertainty of future year projections of both NO_x and NO_2, but at this stage there is no robust evidence upon which to base any revised road traffic emissions projections.'*

- 2019 'Do Minimum' Theoretical Scenario = Baseline + (**using 2017 traffic emission factors**); and
- 2019 'Do Something' Theoretical Scenario = Baseline + Proposed development (**using 2017 traffic emission factors**).

The additional theoretical scenario results are presented in Appendix B.

Nitrogen Dioxide

Table 6.7 presents a summary of the predicted change in NO_2 concentrations at relevant receptor locations, due to changes in traffic flow associated with the development, based on modelled 'do minimum' and 'do something' scenarios.

Table 6.7 Predicted Annual Average Concentrations of NO_2 at Receptor Locations

Receptor		NO_2 (µg/m^3)			
		Baseline 2017	Do Minimum 2019	Do Something 2019	Development Contribution
R1	57 City Road	31.76	31.50	31.50	0.00
R2	7 Mackintosh Place	37.25	36.67	36.67	0.00
R3	Albany Primary School	34.83	34.47	34.47	0.00
R4	1 Crwys Road	35.43	35.02	35.02	0.00
R5	Cardiff Sixth Form College	47.84	47.35	47.35	0.00
R6	Tredegarvill CW Primary School	30.67	30.39	30.39	0.00
R7	Cardiff University McKenzie House	30.85	30.56	30.56	0.00
R8	Cardiff Royal Infirmary	41.06	40.42	40.42	0.00
R9	St Peters RC Primary School	33.70	33.51	33.51	0.00
R10	Clifton House	34.96	34.66	34.66	0.00
PR1	Proposed Receptor	-	-	31.45	-
PR2	Proposed Receptor	-	-	31.29	-
PR3	Proposed Receptor	-	-	30.25	-
PR4	Proposed Receptor	-	-	29.91	-

Receptor		NO_2 (µg/m³)			
		Baseline 2017	Do Minimum 2019	Do Something 2019	Development Contribution
PR5	Proposed Receptor	-	-	29.82	-
PR6	Proposed Receptor	-	-	29.78	-
PR7	Proposed Receptor	-	-	29.95	-
PR8	Proposed Receptor	-	-	30.82	-
Annual Mean AQO not to be exceeded: 40 µg/m³					

All modelled receptors except R5 and R8 are predicted to be below the AQO for NO_2 in both the 'do minimum' and 'do something' scenarios. Receptor R8 is located within the Stephenson Court AQMA, and receptor R5 is located near monitoring location 180 which has monitored NO_2 concentrations in exceedance of the AQO for NO_2. Therefore, these locations are expected to exceed the AQO in all scenarios.

As indicated in Table 6.7, as there are no vehicle trips associated with the proposed development, there is no predicted increase in the annual average exposure to NO_2 at any existing receptor.

All existing and proposed receptors predict NO_2 concentrations of below 60 µg/m³ in all scenarios. Therefore, it is unlikely for any exceedances of the short-term NO_2 AQO to occur as outlined in LAQM TG16 technical guidance.

The significance of changes in traffic flow associated with the development with respect to annual mean NO_2 exposure has been assessed with reference to the criteria in Section 3. The outcomes of the assessment are summarised in Table 6.8.

Table 6.8 Significance of Effects at Key Receptors (NO_2)

NO_2 Significance Effects at Key Receptors					
Receptor	Change Due to Development (DS-DM) (µg/m³)	Change Due to Development (% of AQO)	% Change in Concentration Relative to AQAL	% Annual Mean Concentration in Assessment Year	Significance
R1	0.00	0.00	0%	76-94% of AQAL	Negligible
R2	0.00	0.00	0%	76-94% of AQAL	Negligible
R3	0.00	0.00	0%	76-94% of AQAL	Negligible
R4	0.00	0.00	0%	76-94% of AQAL	Negligible
R5	0.00	0.00	0%	≥110 of AQAL	Negligible
R6	0.00	0.00	0%	76-94% of AQAL	Negligible
R7	0.00	0.00	0%	76-94% of AQAL	Negligible
R8	0.00	0.00	0%	95-102% of AQAL	Negligible
R9	0.00	0.00	0%	76-94% of AQAL	Negligible
R10	0.00	0.00	0%	76-94% of AQAL	Negligible
+0% means a change of <0.5% as per explanatory note 2 of table 6.3 of the EPUK IAQM Guidance.					

The significance of the effects of changes in traffic flow as a result of the proposed development, with respect to NO_2 exposure for existing receptors, is determined to be 'negligible' at all receptors, based on the methodology outlined in section 3.

Particulate Matter (PM_{10})

Table 6.9 presents a summary of the predicted change in annual mean PM_{10} concentrations at relevant receptor locations, due to changes in traffic flow associated with the development, based on modelled 'do minimum' and 'do something' scenarios.

Table 6.9 Predicted Annual Average Concentrations of PM_{10} at Receptor Locations

Receptor		PM_{10} (µg/m³)			
		Baseline 2017	Do Minimum 2019	Do Something 2019	Development Contribution
R1	57 City Road	19.31	19.29	19.29	0.00
R2	7 Mackintosh Place	18.87	18.84	18.84	0.00
R3	Albany Primary School	18.58	18.56	18.56	0.00
R4	1 Crwys Road	18.65	18.63	18.63	0.00
R5	Cardiff Sixth Form College	19.45	19.42	19.42	0.00
R6	Tredegarvill CW Primary School	17.64	17.63	17.63	0.00
R7	Cardiff University McKenzie House	17.69	17.68	17.68	0.00
R8	Cardiff Royal Infirmary	18.35	18.31	18.31	0.00
R9	St Peters RC Primary School	19.07	19.07	19.07	0.00
R10	Clifton House	19.34	19.32	19.32	0.00
PR1	Proposed Receptor	-	-	18.34	-
PR2	Proposed Receptor	-	-	18.31	-
PR3	Proposed Receptor	-	-	18.10	-
PR4	Proposed Receptor	-	-	18.03	-
PR5	Proposed Receptor	-	-	18.02	-
PR6	Proposed Receptor	-	-	18.01	-
PR7	Proposed Receptor	-	-	18.04	-
PR8	Proposed Receptor	-	-	18.21	-
Annual Mean AQO not to be exceeded: 40 µg/m³					

As indicated in Table 6.9, all modelled receptor locations are predicted to be below the AQO for PM_{10} in both the 'do minimum' and 'do something' scenarios.

As there are no vehicle trips associated with the proposed development, there is no predicted increase in the annual average exposure to PM_{10} at any existing receptor as a result of the proposed development.

The significance of changes in traffic flow associated with the development with respect to annual mean PM_{10} exposure has been assessed with reference to the criteria in section 3. The outcomes of the assessment are summarised in Table 6.10.

Table 6.10 Significance of Effects at Key Receptors (PM_{10})

PM_{10} Significance Effects at Key Receptors					
Receptor	Change Due to Development (DS-DM) (µg/m³)	Change Due to Development (% of AQO)	% Change in Concentration Relative to AQAL	% Annual Mean Concentration in Assessment Year	Significance
R1	0.00	0.00	0%	≤75% of AQAL	Negligible
R2	0.00	0.00	0%	≤75% of AQAL	Negligible
R3	0.00	0.00	0%	≤75% of AQAL	Negligible
R4	0.00	0.00	0%	≤75% of AQAL	Negligible
R5	0.00	0.00	0%	≤75% of AQAL	Negligible
R6	0.00	0.00	0%	≤75% of AQAL	Negligible
R7	0.00	0.00	0%	≤75% of AQAL	Negligible
R8	0.00	0.00	0%	≤75% of AQAL	Negligible
R9	0.00	0.00	0%	≤75% of AQAL	Negligible
R10	0.00	0.00	0%	≤75% of AQAL	Negligible
+0% means a change of <0.5% as per explanatory note 2 of table 6.3 of the EPUK IAQM Guidance.					

The significance of the effects of changes in traffic as a result of the proposed development, with respect to annual mean PM_{10} exposure, for existing receptors, is determined to be 'negligible' based on the methodology outlined in section 3.

Particulate Matter ($PM_{2.5}$)

Table 6.11 presents a summary of the predicted change in annual mean $PM_{2.5}$ concentrations at relevant receptor locations, due to changes in traffic flow associated with the development, based on modelled 'do minimum' and 'do something' scenarios.

Table 6.11 Predicted Annual Average Concentrations of $PM_{2.5}$ at Receptor Locations

Receptor		$PM_{2.5}$ (µg/m³)			
		Baseline 2017	Do Minimum 2019	Do Something 2019	Development Contribution
R1	57 City Road	13.31	13.30	13.30	0.00
R2	7 Mackintosh Place	12.77	12.74	12.74	0.00
R3	Albany Primary School	12.59	12.57	12.57	0.00
R4	1 Crwys Road	12.64	12.62	12.62	0.00
R5	Cardiff Sixth Form College	12.94	12.91	12.91	0.00
R6	Tredegarvill CW Primary School	11.76	11.74	11.74	0.00
R7	Cardiff University McKenzie House	11.79	11.77	11.77	0.00
R8	Cardiff Royal Infirmary	12.17	12.13	12.13	0.00
R9	St Peters RC Primary School	13.18	13.17	13.17	0.00
R10	Clifton House	13.33	13.31	13.31	0.00
PR1	Proposed Receptor	-	-	12.45	-
PR2	Proposed Receptor	-	-	12.43	-
PR3	Proposed Receptor	-	-	12.31	-
PR4	Proposed Receptor	-	-	12.27	-
PR5	Proposed Receptor	-	-	12.26	-
PR6	Proposed Receptor	-	-	12.26	-

Receptor		$PM_{2.5}$ (µg/m³)			
		Baseline 2017	Do Minimum 2019	Do Something 2019	Development Contribution
PR7	Proposed Receptor	-	-	12.28	-
PR8	Proposed Receptor	-	-	12.38	-
Annual Mean AQO not to be exceeded: 25 µg/m³					

As indicated in Table 6.11, all modelled receptor locations are predicted to be below the AQO for $PM_{2.5}$ in both the 'do minimum' and 'do something' scenarios.

As there are no vehicle trips associated with the proposed development, there is no predicted increase in the annual average exposure to $PM_{2.5}$ at any existing receptor as a result of the proposed development.

The significance of changes in traffic flow associated with the development with respect to annual mean $PM_{2.5}$ exposure has been assessed with reference to the criteria in section 3. The outcomes of the assessment are summarised in Table 6.12.

Table 6.12 Significance of Effects at Key Receptors ($PM_{2.5}$)

$PM_{2.5}$ Significance Effects at Key Receptors					
Receptor	Change Due to Development (DS-DM) (µg/m³)	Change Due to Development (% of AQO)	% Change in Concentration Relative to AQAL	% Annual Mean Concentration in Assessment Year	Significance
R1	0.00	0.00	0%	≤75% of AQAL	Negligible
R2	0.00	0.00	0%	≤75% of AQAL	Negligible
R3	0.00	0.00	0%	≤75% of AQAL	Negligible
R4	0.00	0.00	0%	≤75% of AQAL	Negligible
R5	0.00	0.00	0%	≤75% of AQAL	Negligible
R6	0.00	0.00	0%	≤75% of AQAL	Negligible
R7	0.00	0.00	0%	≤75% of AQAL	Negligible
R8	0.00	0.00	0%	≤75% of AQAL	Negligible
R9	0.00	0.00	0%	≤75% of AQAL	Negligible
R10	0.00	0.00	0%	≤75% of AQAL	Negligible
[+]0% means a change of <0.5% as per explanatory note 2 of table 6.3 of the EPUK IAQM Guidance.					

The significance of the effects of changes in traffic as a result of the proposed development, with respect to annual mean $PM_{2.5}$ exposure, for existing residential receptors, is determined to be 'negligible' based on the methodology outlined in section 3.

7. Mitigation

7.1 Construction Phase

The dust risk categories have been determined in Section 5 for each of the four construction activities. The assessment has determined that the potential impact significance of dust emissions associated with the construction phase of the proposed development is 'medium risk' at the worst affected receptors.

Using the methodology described in Appendix A, appropriate site-specific mitigation measures associated with the determined level of risk can be found in Section 8.2 of the IAQM Guidance on the Assessment of Dust from Demolition and Construction. The mitigation measures have been divided into general measures applicable to all sites and measures applicable specifically to demolition, earthworks, construction and trackout.

The mitigation measures for the proposed development are detailed in Table 7.1 and will be implemented throughout the duration of the construction phase.

Table 7.1 Construction Phase Mitigation Measures

Communications
Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
Display the head or regional office contact information
Dust Management
Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.
Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
Make the complaints log available to the local authority when asked.
Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.
Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked
Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period
Avoid site runoff of water or mud.
Keep site fencing, barriers and scaffolding clean using wet methods.
Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
Cover, seed or fence stockpiles to prevent wind whipping.
Ensure all vehicles switch off engines when stationary - no idling vehicles.
Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems
Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
Use enclosed chutes and conveyors and covered skips
Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.

Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods
Avoid bonfires and burning of waste materials.
Demolition
Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
Avoid explosive blasting, using appropriate manual or mechanical alternatives.
Bag and remove any biological debris or damp down such material before demolition.
Earthworks
Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable
Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
Only remove the cover in small areas during work and not all at once
Construction
Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
Trackout
Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
Avoid dry sweeping of large areas.
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
Record all inspections of haul routes and any subsequent action in a site log book.
Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
Access gates to be located at least 10m from receptors where possible.

Following the implementation of the mitigation measures detailed in the tables above, the impact significance of the construction phase is not considered to be significant.

8. Conclusions

WYG have conducted an air quality assessment for the proposed purpose-built student accommodation development at 195-197 City Road, Cardiff.

Appropriate site-specific mitigation measures have been recommended based on Section 8.2 of the IAQM Guidance on the Assessment of Dust from Demolition, Earthworks, Construction and Trackout. It is anticipated that with these appropriate mitigation measures in place, the risk of adverse effects due to emissions from the construction phase will not be significant.

The 2019 assessment of the effect of emissions from traffic associated with the scheme, has determined that as there are no traffic flows associated with the proposed development, there are no predicted increases in the annual average exposure to NO_2, PM_{10} or $PM_{2.5}$ at any existing receptor.

All modelled receptors predict NO_2 concentrations of below 60 µg/m^3 in all scenarios. Therefore, it is unlikely for any exceedances of the short-term NO_2 AQO to occur as outlined in LAQM TG16 technical guidance.

All modelled existing and proposed receptors are predicted to be below the respective AQOs for NO_2, PM_{10} and $PM_{2.5}$ in the 'do minimum' and 'do something' scenarios.

The significance of exposure for NO_2, PM_{10} and $PM_{2.5}$ is determined to be 'negligible' at all receptors, based on the methodology outlined in section 3.

In conclusion, following the adoption of the recommended mitigation measures, the proposed development is not considered to be contrary to any of the national and local planning policies.

Figures

Figure 1 Air Quality Assessment Area

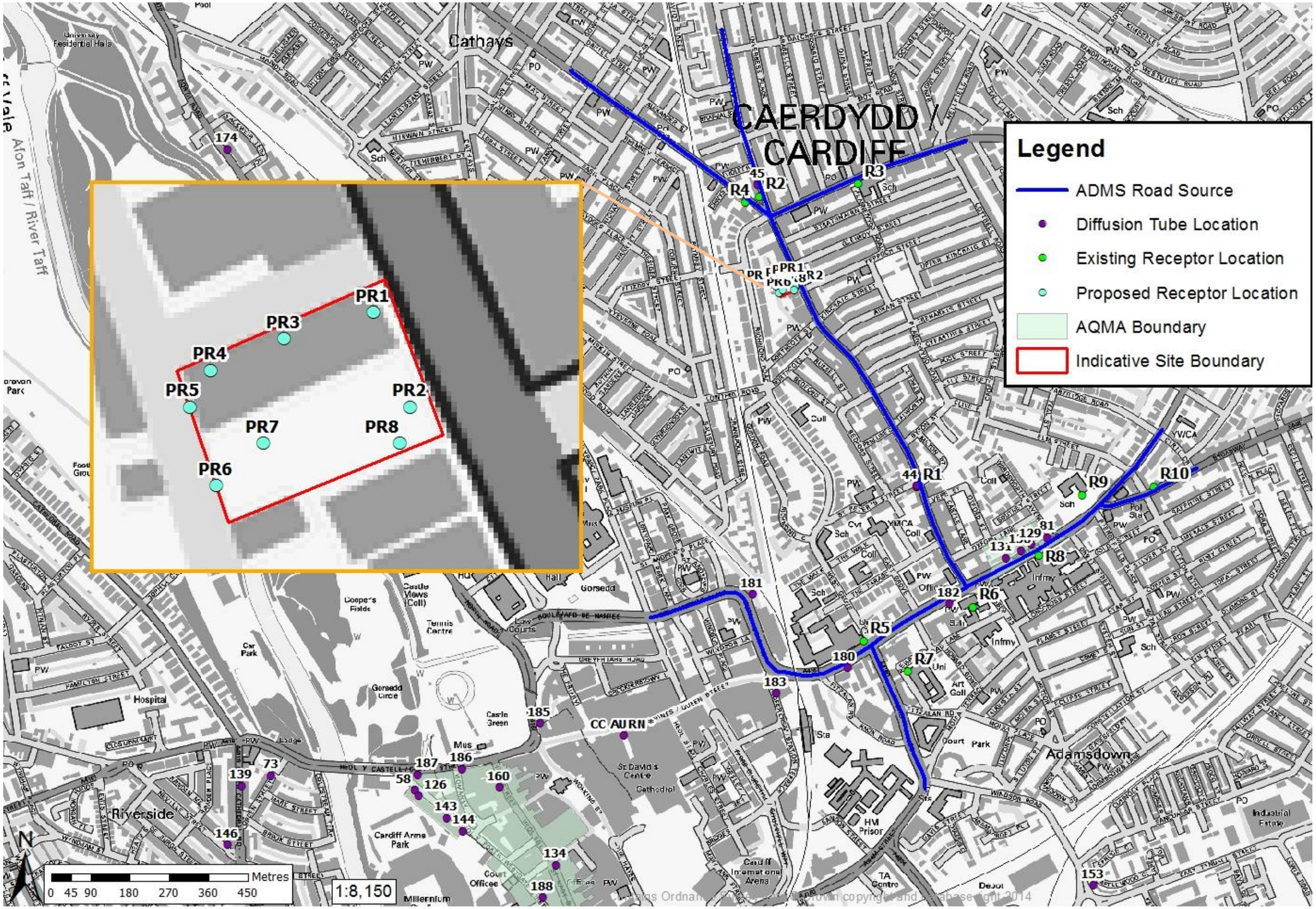


Figure 2 Cardiff 2017 Meteorological Station Wind Rose

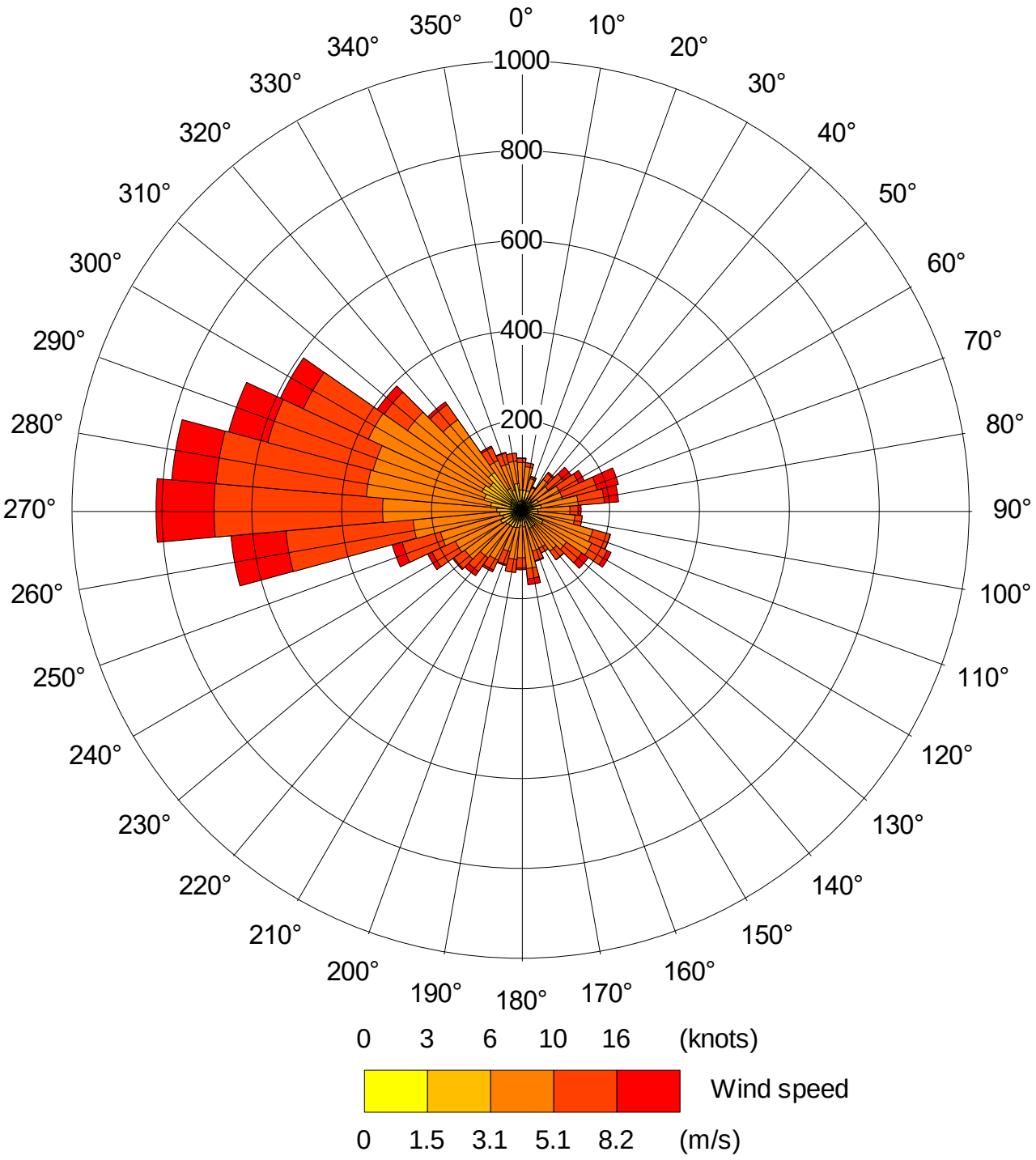
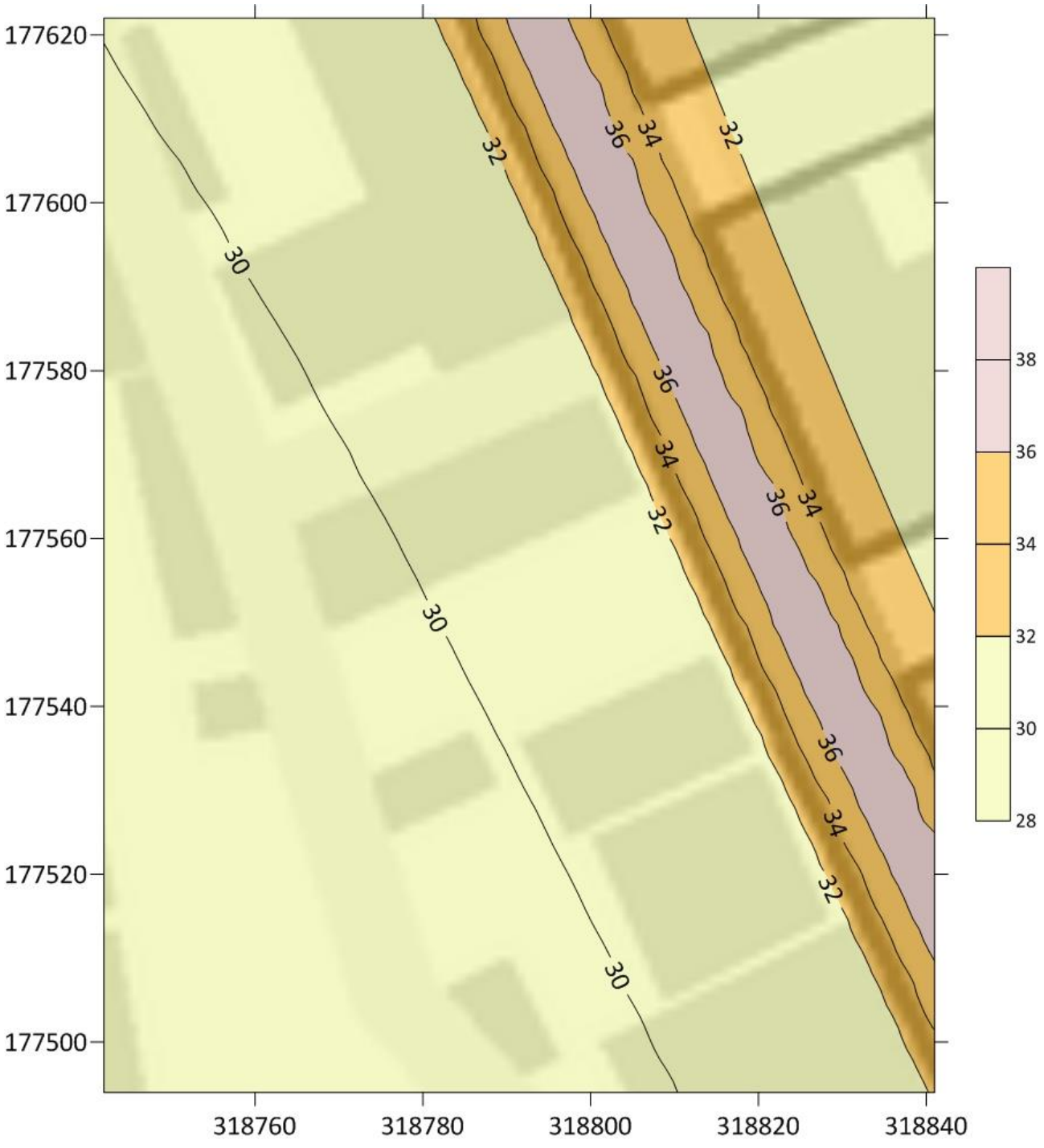


Figure 3 Predicted Development Contribution NO_2 Contour Plot



Appendix A Construction Phase Assessment Methodology

The following information sets out the adopted approach to the construction phase impact assessment in accordance with the aforementioned IAQM guidance[2].

Step 1 – Screen the Requirement for a more Detailed Assessment

An assessment is required if there are sensitive receptors within 350m of the site boundary, within 50m of the route(s) used by construction vehicles on the surrounding road network, or within 500m from the site entrance. A detailed assessment is also required if there is an ecological receptor within 50m of the site boundary.

Step 2A – Define the Potential Dust Emission Magnitude

Demolition

The dust emission magnitude for the demolition phase has been determined based on the below criteria:

- *Large*: Total building volume >50 000m^3, potentially dusty construction (e.g. concrete), on-site crushing and screening, demolition activities >20m above ground level;
- *Medium*: Total building volume 20 000m^3 – 50 000m^3, potentially dusty construction material, demolition activities 10-20m above ground level; and,
- *Small*: Total building volume <20 000m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months.

Earthworks

The dust emission magnitude for the planned earthworks has been determined based on the below criteria:

- *Large:* Total site area >10 000m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), > 10 heavy earth moving vehicles active at any one time, formation of bunds >8m in height, total material moved >100 000 tonnes;
- *Medium*: Total site area 2 500m^2 – 10 000m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4m-8m in height, total material moved 20 000 tonnes – 100 000 tonnes; and
- *Small*: Total site area <2 500 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <10 000 tonnes, earthworks during wetter months.

Construction

The dust emission magnitude for the construction phase has been determined based on the below criteria:

- *Large:* Total building volume >100 000m^3, on site concrete batching; sandblasting
- *Medium:* Total building volume 25 000m^3 – 100 000m^3, potentially dusty construction material (e.g. concrete), on site concrete batching; and,
- *Small:* Total building volume <25 000m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

Trackout

The dust emission magnitude for trackout has been determined based on the below criteria:

- *Large:* >50 HGV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;

[2] Institute of Air Quality Management 2014. *Guidance on the Assessment of dust from demolition and construction.*

- *Medium:* 10-50 HGV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100m; and,
- *Small:* <10 HGV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50m.

Step 2B – Defining the Sensitivity of the Area

Sensitivities of People to Dust Soiling Effects

- *High:*
  - Users can reasonably expect an enjoyment of a high level of amenity;
  - The appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably expect to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land; and,
  - Indicative examples include dwellings, museums and other culturally important collections, medium- and long-term car parks and car showrooms.
- *Medium:*
  - Users can reasonably expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home;
  - The appearance, aesthetics or value of their property could be diminished by soiling;
  - The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land; and,
  - Indicative examples include parks and places of work.
- *Low:*
  - The enjoyment of amenity would not reasonably be expected;
  - Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling;
  - There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land; and,
  - Indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.

The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout, using the following table:

Table A1– Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Note – The likely routes the construction traffic will use should also be included to enable the presence of trackout receptors to be included in the assessment. As a general guidance, without site-specific mitigation, trackout may occur along the public highway up to 500 m from large sites (as defined in step 2A), 200 m from medium sites and 50 m from small sites, as measured from the site exit.

Sensitivities of People to the Health Effects of PM_{10}

- *High:*
  - Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day);
  - Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.
- *Medium:*
  - Locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day); and,
  - Indicative examples include office and shop workers but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.
- *Low:*
  - Locations where human exposure is transient; and,
  - Indicative examples include public footpaths, playing fields, parks and shopping streets.

The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout, using the following table:

Table A2- Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28 – 32 µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24 – 28 µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	1-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Note – The likely routes the construction traffic will use should also be included to enable the presence of trackout receptors to be included in the assessment. As a general guidance, without site-specific mitigation, trackout may occur along the public highway up to 500 m from large sites (as defined in step 2A), 200 m from medium sites and 50 m from small sites, as measured from the site exit.

Sensitivities of Receptors to Ecological Effects

- *High:*
  - Locations with an international or national designation and the designated features may be affected by dust soiling;
  - Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List for Great Britain; and,
  - Indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.

- *Medium:*
  - Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown;
  - Locations with a national designation where the features may be affected by dust deposition; and,
  - Indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.
- *Low:*
  - Locations with a local designation where the features may be affected by dust deposition; and,
  - Indicative example is a local Nature Reserve with dust sensitive features.

The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout, using the following table:

Table A3 – Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Note – The likely routes the construction traffic will use should also be included to enable the presence of trackout receptors to be included in the assessment. As a general guidance, without site-specific mitigation, trackout may occur along the public highway up to 500 m from large sites (as defined in step 2A), 200 m from medium sites and 50 m from small sites, as measured from the site exit.

Step 2C – Defining the Risk of Impacts

The risk of impacts with no mitigation is determined by combining the dust emission magnitude determined in Step 2A and the sensitivity of the area determined in Step 2B.

The following tables provide a method of assigning the level of risk for each activity.

Demolition

Table A4 – Risk of Dust Impacts, Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Earthworks

Table A5 – Risk of Dust Impacts, Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Construction

Table A6 – Risk of Dust Impacts, Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Trackout

Table A7 – Risk of Dust Impacts, Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

Step 3 – Site Specific Mitigation

The dust risk categories for each of the four activities determined in Step 2C should be used to define the appropriate, site-specific mitigation measures to be adopted.

These mitigation measures are contained within section 8.2 of the IAQM Guidance on the Assessment of Dust from Demolition and Construction.

Appendix B Theoretical Results

Table B1 Theoretical Scenario NO_2 Results

Receptor		NO_2 (µg/m³)			
		Baseline 2017	Do Minimum 2019	Do Something 2019	Development Contribution
R1	57 City Road	31.76	31.80	31.80	0.00
R2	7 Mackintosh Place	37.25	37.35	37.35	0.00
R3	Albany Primary School	34.83	34.89	34.89	0.00
R4	1 Crwys Road	35.43	35.50	35.50	0.00
R5	Cardiff Sixth Form College	47.84	47.93	47.93	0.00
R6	Tredegarvill CW Primary School	30.67	30.71	30.71	0.00
R7	Cardiff University McKenzie House	30.85	30.90	30.90	0.00
R8	Cardiff Royal Infirmary	41.06	41.16	41.16	0.00
R9	St Peters RC Primary School	33.70	33.72	33.72	0.00
R10	Clifton House	34.96	35.01	35.01	0.00
PR1	Proposed Receptor	-	-	31.75	-
PR2	Proposed Receptor	-	-	31.57	-
PR3	Proposed Receptor	-	-	30.41	-
PR4	Proposed Receptor	-	-	30.02	-
PR5	Proposed Receptor	-	-	29.92	-
PR6	Proposed Receptor	-	-	29.88	-
PR7	Proposed Receptor	-	-	30.07	-
PR8	Proposed Receptor	-	-	31.04	-
Annual Mean AQO not to be exceeded: 40 µg/m³					

Table B2 Theoretical Scenario PM_{10} Results

Receptor		PM_{10} (µg/m³)			
		Baseline 2017	Do Minimum 2019	Do Something 2019	Development Contribution
R1	57 City Road	19.31	19.31	19.31	0.00
R2	7 Mackintosh Place	18.87	18.88	18.88	0.00
R3	Albany Primary School	18.58	18.58	18.58	0.00
R4	1 Crwys Road	18.65	18.66	18.66	0.00
R5	Cardiff Sixth Form College	19.45	19.46	19.46	0.00
R6	Tredegarvill CW Primary School	17.64	17.64	17.64	0.00
R7	Cardiff University McKenzie House	17.69	17.70	17.70	0.00
R8	Cardiff Royal Infirmary	18.35	18.36	18.36	0.00
R9	St Peters RC Primary School	19.07	19.08	19.08	0.00
R10	Clifton House	19.34	19.34	19.34	0.00
PR1	Proposed Receptor	-	-	18.36	-
PR2	Proposed Receptor	-	-	18.33	-
PR3	Proposed Receptor	-	-	18.11	-
PR4	Proposed Receptor	-	-	18.04	-
PR5	Proposed Receptor	-	-	18.02	-
PR6	Proposed Receptor	-	-	18.01	-
PR7	Proposed Receptor	-	-	18.05	-
PR8	Proposed Receptor	-	-	18.23	-

Receptor		PM_{10} (µg/m³)			
		Baseline 2017	Do Minimum 2019	Do Something 2019	Development Contribution
Annual Mean AQO not to be exceeded: 40 µg/m³					

Table B3 Theoretical Scenario $PM_{2.5}$ Results

Receptor		$PM_{2.5}$ (µg/m³)			
		Baseline 2017	Do Minimum 2019	Do Something 2019	Development Contribution
R1	57 City Road	13.31	13.31	13.31	0.00
R2	7 Mackintosh Place	12.77	12.78	12.78	0.00
R3	Albany Primary School	12.59	12.60	12.60	0.00
R4	1 Crwys Road	12.64	12.64	12.64	0.00
R5	Cardiff Sixth Form College	12.94	12.94	12.94	0.00
R6	Tredegarvill CW Primary School	11.76	11.76	11.76	0.00
R7	Cardiff University McKenzie House	11.79	11.79	11.79	0.00
R8	Cardiff Royal Infirmary	12.17	12.17	12.17	0.00
R9	St Peters RC Primary School	13.18	13.18	13.18	0.00
R10	Clifton House	13.33	13.33	13.33	0.00
PR1	Proposed Receptor	-	-	12.47	-
PR2	Proposed Receptor	-	-	12.45	-
PR3	Proposed Receptor	-	-	12.32	-
PR4	Proposed Receptor	-	-	12.28	-
PR5	Proposed Receptor	-	-	12.27	-
PR6	Proposed Receptor	-	-	12.27	-
PR7	Proposed Receptor	-	-	12.29	-
PR8	Proposed Receptor	-	-	12.39	-
Annual Mean AQO not to be exceeded: 25 µg/m³					

For Scenario 2, the assessment of the effect of emissions from traffic associated with the scheme, has determined that as there are no traffic flows associated with the proposed development, there are no predicted increases in the annual average exposure to NO_2, PM_{10} or $PM_{2.5}$ at any existing receptor.

All modelled receptors predict NO_2 concentrations of below 60 µg/m³ in all scenarios. Therefore, it is unlikely for any exceedances of the short-term NO_2 AQO to occur as outlined in LAQM TG16 technical guidance.

With respect to predicted NO_2 exposure, the significance of the proposed development is determined to be 'negligible' at all modelled receptors.

With respect to predicted PM_{10} and $PM_{2.5}$ exposure, the significance of the proposed development is determined to be 'negligible' at all modelled receptors.

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